Lattice'Beam'User'Guide

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Issue 3 July 2017

Contents

INTRODUCTION

This User guide has been prepared in accordance with the guidance as set out within BS EN12810-1:2003 clause 8, the NASC Code of Practice and where applicable additional information within associated European Standards. This User Guide is only applicable to VR Access Solutions Lattice beams and associated components, other applications such as temporary roofing scaffolds outside of the scope of this guide must be designed and calculated by a competent engineer in accordance with the requirements of BS EN12811, TG20:08 and BS5975:2003. For further technical information see the Technical Data and Support section at the rear of this guide.

It is recommended that all uses of the VR Access Solutions Lattice Beams should be initially based upon the technical information included in this guide but should also be independently verified and checked by a suitably qualified and experienced temporary works engineer in accordance with the requirements of BS EN 12811 or BS5973:2003 for its specific intended use.

Manufacturing and Distribution

VR Access Solutions Lattice Beams are manufactured under a quality management procedure in accordance with ISO 9001 Quality Management Systems and the system is documented and implemented in accordance with this. Inspections and testing of the products are carried out by qualified and well trained persons. Each product is checked at every production stage form incoming materials to final finishing and delivery as per the relevant inspection forms and specific customer needs. Inspection forms are laid down to meet the dimension requirements, which are determined on the basis of design drawings. The components and system configurations all undergo the necessary testing and calculation checks in accordance with the current codes of practice. All fixtures, testing equipment, measuring instruments and gauges are calibrated at planned intervals. Our branches work under a regime of constant monitoring of our components.

SAFETY ASPECTS

All scaffold erectors must wear a harness while erecting, dismantling and working on any scaffold over 4 metres lift height. They must follow site, local and national occupational health and safety regulations and the requirements of SG04:10 from the NASC in Britain.

Safety Information

1. Ensure that all scaffolds are erected on a foundation and is capable of resisting design loads.
2. Platform units shall be locked against unintentional lifting.
3. Do not overload the scaffold with bricks and other materials. Load materials as close to the Standard as possible.
4. All lattice beams should be installed to provide adequate restraint to the compression flange in accordance with the design criteria using loose tubes to EN39 and couplers to EN74 which are also available from VR Access Solutions.
5. Ensure that working and access areas are safeguarded by a side protection consisting of at least two guardrails and a toe board.
6. Side protection shall be secured against unintentional removal.
7. The side protection should not be provided by cladding on its own.
8. All installations should comply with the design drawings and should be checked and certified by the designer prior to use as being in accordance with the design intentions.
9. The platform surface shall be free from trip hazards.
10. Working areas shall be as level as practicable.
11. The gaps between platform units shall be as small as possible but not exceeding 25mm.
12. Lateral stability shall be provided by tie members to the adjacent building or structure. Any part of a building or structure used to support the scaffold shall be capable of supporting the maximum intended load to be applied.
13. Provide adequate bracing to give stiff vertical plane of scaffold.

14. Connections between separate parts shall be effective and easy to monitor. They shall be easy to assemble and secure against accidental disconnection.

15. Inspection of scaffold shall be carried out by competent person before use every time and a report issued/filed.

16. No ties should be removed without adequate supervision, and if necessary, the prior fixing of alternative ties or bracing should take place to ensure the continuing safety of the scaffold.

RULES OF USE

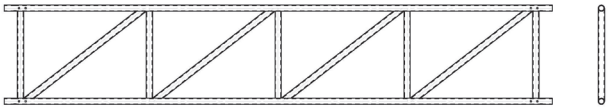
- Never remove ties or bracing.
- Never remove ladders
- Never remove components or adapt a certified scaffold.
- Never remove guardrails, toe boards or brick guards.
- Never create gaps in the working platform by removing scaffolding boards.
- Never work on or use scaffolds which are in the process of being erected or dismantled.
- Never undermine the scaffold by digging trenches or foundations under or adjacent to it.
- Never add sheeting or debris netting to a scaffold without the approval of the scaffolding designer.
- Never forklift loads directly onto an access scaffold or platform using lattice beams for support use a suitably designed loading tower.
- Never allow site vehicles to run over scaffolding materials, damaged scaffold boards cause accidents.
- Never allow site vehicles to run into a scaffold. Bent tubes could lead to collapse of the structure even the slightest misalignment will significantly reduce the scaffolds capacity.
- Never jump on to planks or platforms.

VR ACCESS SOLUTIONS LATTICE BEAM COMPONENTS

750mm Lattice Beams

The 750mm N2 Lattice Beams are constructed out of 48.3mm diameter by 4.0mm wall thickness in 6082-T6 aluminum tubes. Beam lengths are generally in 1m increments up to 7m and sections can be connected together using 38.1mm diameter x 4.0mm thick spigot connectors in pairs using 2 x M12 bolts.

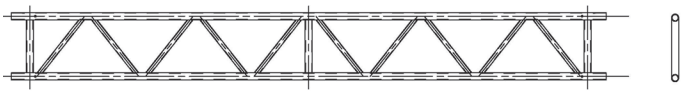
Code	Nominal Length (m)	Overall Length (m)	Weight (kg)
VRS24	1.0	1.15	7.94
VRS25	2.0	2.198	14.19
VRS26	3.0	3.173	20.44
VRS27	4.0	4.148	26.61
VRS28	5.0	5.123	32.78
VRS29	6.0	6.098	38.96
VRS30	7.0	7.073	45.13



450mm Lattice Beams , Available in 1m - 8m and 1.1m -8.1m

The 450mm Lattice Beams are constructed out of 48.3mm diameter by 4.0mm wall thickness top bottom and vertical tubes, in 6082-T6 aluminum. Diagonal members are oval sections of 22mm x 38.2mm minor and major axes with a 2.6mm wall thickness. Beam lengths are generally in 2m increments up to 8m with a 1m additional length and sections can be connected together using 38.1mm diameter x 4.0mm thick spigot connectors in pairs using 2 x M12 bolts

Code	Nominal Length (m)	Overall Length (m)	Weight (kg)
VRS31	1.1	1.1	5.23
VRS32	2.1	2.1	8.77
VRS33	3.1	3.1	13.13
VRS34	4.1	4.1	16.67
VRS35	5.1	5.1	20.20
VRS36	6.1	6.1	24.6
VRS37	8.1	8.1	32.47



Spigot Connectors

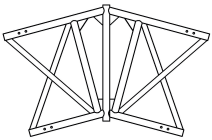
This item connects the differing lengths of trusses to enable non standard sizes to be built up for specific uses. They are connected into each end of the trusses and fixed using 2No. M12 bolts to each side of the joint and are always used in pairs to the top and bottom chords

Code	Weight (kg)
VRS38	2.15

750mm Beam Ridge Piece

To enable the formation of a duo-pitched roof form for temporary roof construction. They are always used in conjunction with two lattice beams and 4No. Splices.

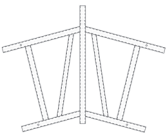
Code	Weight (kg)
VRS40	12.15



450mm Beam Ridge Piece

To enable the formation of a duo-pitched roof form for temporary roof construction. They are always used in conjunction with two lattice beams and 4No. Splices.

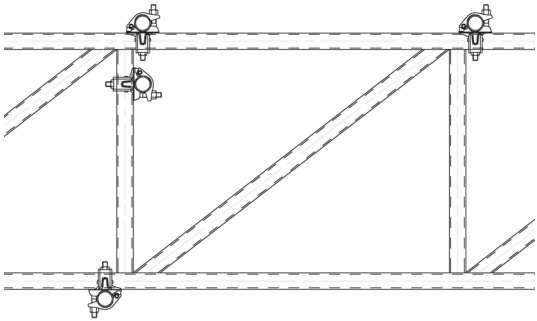
Code	Weight (kg)
VRS41	10.5



CONNECTION LOCATIONS

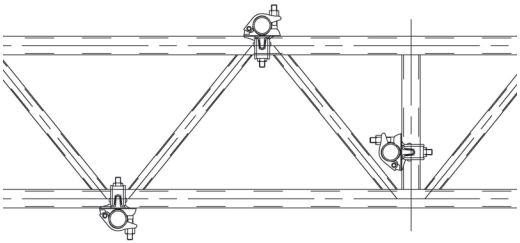
750mm Lattice Beams

The use of standard tube dimensions to the elements allows for the connection of couplers to the top, bottom or vertical members using EN74 couplers. All couplers should be located as close as possible to the nodes to minimize any secondary effects.



450mm Lattice Beams

The spacing of the pairs of diagonals between the vertical members is set out to allow for the location of couplers to the top and bottom chords apart from the interface of a diagonal to a vertical member. At these locations the connector should be placed to the vertical member only and as close to the top or bottom chord as possible.



BEAM BRACING

When a lattice beam spans an opening it will act as a beam by creating a tension force in one chord and a compression force in the opposite one. The beams work to their capacity if the compression chord is held in place along its full length. In typical scaffolding arrangements this continuous support is not normally present and so the compression chord will tend to buckle between the centers of lateral support, normally by transoms or brace ties perpendicular to the span, thereby reducing the capacity of the beam. The greater gap between these points of restraint the less capacity the lattice beam will be able to accommodate.

In simply supported beam arrangements where the beams span between two supports and the primary loading is downwards the compression force is the top chord. Should the wind loading be high at the site and the supported load low then it is possible that the out of service loadcase could reverse this condition and the bottom chord could go into compression. In the case of cantilever beams or continuous beams the bottom chord at internal supports will be in compression and depending on the span lengths this will swap over to the top chord along its length.

When using VR Access Soultions lattice beams it is therefore important to brace the compression chord perpendicularly (between adjacent beam chords) and diagonally (through plan bracing) as well as tying the beams tension chords with vertical diagonal braces and tension chord ties.

In some conditions where the compression force chord changes from the top to the bottom along its length there will be a need for chord braces and plan bracing to both chords. For more information regarding the bracing requirements for different beam configurations you should consult VR Access Solutions, a suitably qualified Engineer or the Scaffolding designer.

Note: Incorrectly installed beam bracing will reduce the load bearing capacity of the beams and hence the scaffold significantly and may lead to collapse at low loads.

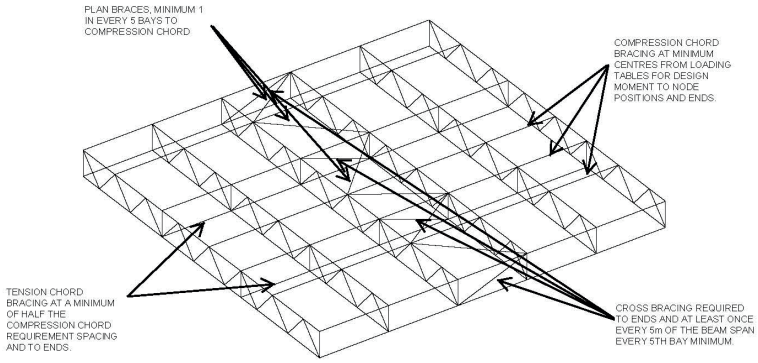
Compression chord bracing should be installed to the minimum centers as determined from the span load tables for the design case moment. Tension chord bracing should be installed at a minimum of twice the spacing of the compression chord and both braces should be installed at the bearings.

Plan bracing is required to the compression chord once every fifth bay for the beams full length and should then be continuous with a system of braced down to ground or a tie to the main building structure.

Cross bracing should be installed to the beam ends and a minimum of every 5m of the beams span all at a minimum of one bay in every 5.

Bracing Arrangement

The bracing arrangement indicated below is a typical arrangement for a simply supported span condition where the loadcase is vertically downwards.



All standards to the beams span should be fixed to both the top and bottom chords with check fitting in accordance with the design drawings.

All knee braces or tie back braces should also be fixed to both the top and bottom chords and will normally require a number of check fittings to each location.

All beam bearings should be made to both the top and bottom chords close to a node point and with the necessary check fittings to comply with the design.

SPIGOT CONNECTION

In order to provide for longer spans of the 450mm Lattice Beam the spigot connector can be used to connect together two lengths of beam. The spigot connector is secured by 2No. M12 Bolts to each of the two beams and this is repeated in both the top and bottom chord of the beam.

The permissible tension force in the spigot is high enough to enable the full design load in the beams chords to be safely transferred across the joint.

It is recommended that in a series of beams the spigot joint positions of adjacent beams are staggered. The spigot joints should also be located away from any points of vertical loading

INSTRUCTIONS FOR STORAGE, MAINTENANCE OR REPAIR

1.STORAGE

1. Prefabricated components shall be stored, if possible, under a suitable cover, protected from weather in a dry location. They shall be exposed to good ventilation. They shall be supported during storage so as to avoid permanent set.

2. At the work site, provide enough space to drive the forklift and other vehicles otherwise there are chances of damages to the components.

3. Tags should be used to differentiate good components from the damaged components.

4. All the components shall be stored in a marked storage place.

5. Do not stack any items on the road to avoid injury to passersby.

2.MAINTENANCE

1. Before allowing people or material on the scaffold structure ensure that it has been erected correctly and complies with the user's requirements.

2. Ensure that all people using the scaffold are aware of the purpose for which it is intended to be used and the maximum loading to which it can be subjected.

3. Ensure that users understand that any unauthorised modification to the scaffold or removal of components other than those which have been specifically designed for it will materially weaken the scaffold and create a safety hazard.

4. Carry out regular inspections to check that components have not been removed or damaged, or that components have not been removed and replaced incorrectly.

5. Alterations or extensions-(e.g. removal or repositioning of ties, removal of guardrails or handrails, the addition of boarded platform, sheeting, debris netting, etc) should only be carried out within the restrictions set out in this handbook or under the direction of a competent designer who is prepared to accept the onus of his modifications.

6. Provide barriers and warning notices to prevent access to incomplete sections of scaffolding.

7. Ensure that safe access and egress routes are provided to all working platforms, and that such route, including ladders or preferably stairways, are kept clear.

8. Do not overload platforms-use properly designed loading towers and ensure that crane and forklift drivers understand loading restrictions on each part of the scaffold structure.

9. Where necessary ensure that all areas below scaffolds in use are marked so that site personnel can avoid the area. If the area has to be accessed then the site personnel should be made aware of the potential risks or hazards.

10. Because of the increased use of mechanical lifting plant on site there is an increased possibility for scaffolding components to become found / caught. When using cranes or other mechanical lifting devices near any scaffold structure care should be taken to ensure that nothing catches under any part of the scaffold otherwise uplift could occur with potentially dangerous consequences.

3 REPAIRS

If any scaffold gets damaged, inform the scaffolding contractor or authorized person then repairs can be carried out. The repaired item is only to be used after the approval of said competent person.

4.TRANSPORT

During transportation it should be ensured that the prefabricated components are loaded properly and securely tightened to the vehicle to avoid dropping of components during travelling. Loading and unloading should be carried out under the supervision of a competent person to avoid damage to the components.

Material Specification	6082 T6 Aluminium
Section Specification	48.3 x 4.0mm chords & verticals, 33 x 22 x 2.6mm elliptical struts
Design Codes	BS EN 1999-1-1:2007+A2:2013

Safe Working Loads

Compression Chord Restraints at 1.0m c/c:

Permissible Bending Moment	16.5 kN.m
Permissible Shear	14.6 kN[6]

		Span (m)					
		2	4	6	8	10	12
UDL[1]	kN/m	11.6	6.0	3.3	2.2	1.3	0.9
Total UDL [2]	kN	23.2	24.0	19.8	17.6	13.0	10.8
Centre PL	kN	15.4	17	12.9	9.3	7.1	5.4
Two PL at 1/3 Point	kN each	-	9.1	8.5	8.4	4.8	4.1
Three PL at ¼ Point	kN each	-	6.1	6.0	4.4	3.3	2.6

Compression Chord Restraints at 1.5m c/c:

Permissible Bending Moment	10.5 kN.m
Permissible Shear	14.6 kN[6]

		Span (m)					
		2	4	6	8	10	12
UDL[1]	kN/m	11.6	5.6	2.5	1.4	0.8	0.5
Total UDL [2]	kN	23.2	22.4	15	11.2	8.0	6.0
Centre PL	kN	15.4	10.8	8.1	5.8	4.4	3.4
Two PL at 1/3 Point	kN each	-	9.2	5.3	5.2	3.0	2.5
Three PL at ¼ Point	kN each	-	5.9	4.6	2.7	2.1	1.6

Refer to Sheet 2/2 for Notes to Tables

Material Specification	6082 T6 Aluminium
Section Specification	48.3 x 4.0mm chords & verticals, 33 x 22 x 2.6mm elliptical struts
Design Codes	BS EN 1999-1-1:2007+A2:2013

Safe Working Loads

Compression Chord Restraints at 2.0m c/c:

Permissible Bending Moment	6.5 kN.m
Permissible Shear	14.6 kN[6]

		Span (m)					
		2	4	6	8	10	12
UDL[1]	kN/m	11.6	3.4	1.5	0.8	0.5	0.3
Total UDL [2]	kN	23.2	20.4	9.0	6.4	5.0	3.6
Centre PL	kN	15.4	6.6	5.0	3.6	2.7	2.0
Two PL at 1/3 Point	kN each	-	8.2	3.3	3.2	1.8	1.5
Three PL at ¼ Point	kN each	-	3.6	2.8	1.7	1.2	0.9

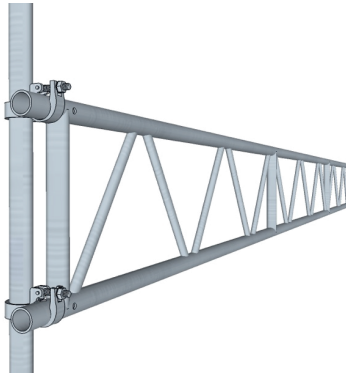


Figure 1 – Beam Support Detail

Notes

1) UDL is applied at node points only
2) Total UDL is UDL applied at node points only
3) Safe working loads should be compared against unfactored applied loads
4) Loads must be applied at node points only, with the exception of the 'True UDL' loading
5) Capacities are based on simple supports at each end
6) Permissible shear assumes beam is supported on top and bottom chords – see Figure 1

Material Specification	6082 T6 Aluminium
Section Specification	48.3mm diameter x 4.4mm wall thickness to all sections
Design Codes	BS EN 1999-1-1:2007+A2:2013

Safe Working Loads

Compression Chord Restraints at 1.0m c/c:

Permissible Bending Moment	39 kN.m
Permissible Shear	26.8 kN[7]

		Span (m)					
		2	3	4	5	6	7
True UDL[1]	kN/m	9.8	8.8	7.2	6.1	5	4.2
UDL[2]	kN/m	54.7	27.4	18.2	13.6	9	6.8
Total UDL [3]	kN	110	82	73	68	54	48
Centre PL	kN	53.3	40	39.7	33.1	26.4	23
Two PL at 1/3 Point	kN each		26.7	26.6	22.1	19.7	19.7
Three PL at ¼ Point	kN each				16.6	15.8	10.8

NB – restraints at 1m c/c should be provided at the node points

Compression Chord Restraints at 1.5m c/c:

Permissible Bending Moment	18.5 kN.m
Permissible Shear	26.8 kN[7]

		Span (m)					
		2	3	4	5	6	7
True UDL[1]	kN/m	8.6	7.1	5.2	4.1	3.1	2.5
UDL[2]	kN/m	38.8	19.4	9.7	6.4	4.3	3.2
Total UDL [3]	kN	78	58	39	32	26	22
Centre PL	kN	37.8	28.3	18.8	15.7	12.5	10.9
Two PL at 1/3 Point	kN each		18.9	18.8	11.8	9.3	9.3
Three PL at ¼ Point	kN each				8.6	7.5	5.1

Refer to Sheet 2/2 for Notes to Tables

Material Specification	6082 T6 Aluminium
Section Specification	48.3mm diameter x 4.4mm wall thickness to all sections
Design Codes	BS EN 1999-1-1:2007+A2:2013

Safe Working Loads

Compression Chord Restraints at 2.0m c/c:

Permissible Bending Moment	12.3 kN.m
Permissible Shear	26.8 kN[7]

		Span (m)					
		2	3	4	5	6	7
True UDL[1]	kN/m	7.8	6	4.1	3.1	2.3	1.8
UDL[2]	kN/m	25.8	12.8	6.5	4.3	2.8	2.1
Total UDL [3]	kN	50	38	26	22	17	14.7
Centre PL	kN	25.1	18.8	12.5	10.4	8.3	7.3
Two PL at 1/3 Point	kN each		12.5	12.5	7.8	6.2	6.2
Three PL at ¼ Point	kN each				5.7	5	3.4

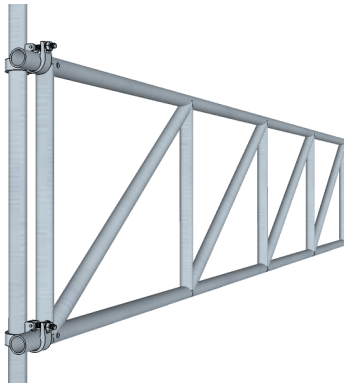


Figure 1 – Beam Support Detail

Notes

1) True UDL is a load applied continuously along the top chord
2) UDL is applied at node points only
3) Total UDL is UDL applied at node points only
4) Safe working loads should be compared against unfactored applied loads
5) Loads must be applied at node points only, with the exception of the 'True UDL' loading
6) Capacities are based on simple supports at each end
7) Permissible shear assumes beam is supported on top and bottom chords – see Figure 1

SPAN LOAD TABLES AND CAPACITIES.

All Section Capacities are based on unfactored safe working loads derived in accordance with BS EN 12811-1:2003 BS EN1999:2007+A2:2013 and BS EN 1993-1-1:2005.

The safe span tables and section capacities contained within the User Guide are based upon live loading from the intended use only. Additional loading may accrue on the working platforms or components as a consequence of atmospheric precipitations such as ice, snow, sand or dust. The working processes may also cause debris such as sand, grit or demolition debris to accumulate on the working platform of components which will increase the live loading above that allowed for within the live loading. Where this is seen to occur or is known will occur, further guidance should be sought from VR Access Solutions Ltd which may result in a downgrading of the Load Class for the scaffold.

Most scaffolds will impose forces upon an adjacent structure they are fixed to through their ties. An assessment should be initially made regarding the ability of the structure to sustain the loads either globally, due to its own instability, or locally as a result of defective finishes. Loadings from the ties into the supporting structure are dependent upon the live loading to the working platforms, the height of the scaffold and in the majority of cases the wind loading imposed upon the scaffold and its cladding status. For guidance with regards to the design of ties into building facades we would refer you to Section 5 of TG20:08 or to VR Access Solutions.

RESCUE PLAN

Erectors need to be mindful of the risks and plan to work as safely as possible. In accordance with the Fall From Heights Regulations 2005 (as amended), every attempt should be made to "mitigate the risk involved by prevention of falls by using work equipment or other measures to prevent fall. Where they cannot avoid working at height and where they cannot eliminate the risk of a fall, use work equipment or other measures to minimize the distance and consequences of a fall should one occur".

VR Access Solutions recommend the use of collective measures such as Advanced Guardrail systems, Hop-Ups and Steps where structural parts and handrails can be installed from a place of safety during the erection process. Alternatively the use of fall protection equipment to restrain and limit any falls. Harnesses should be worn and used at all stages of erection of scaffolds using VR Access Solutions Lattice Beams.

The "Work at Height Regulations 2005" specifically requires every employer to take account of the need for an easy and timely evacuation in the event of an emergency where scaffolders or operatives suffer disability or falls when suspended in a harness.

A site specific Risk Assessment and Method Statement is essential in determining the plan required for the recovery of a disabled or incapacitated person. VR Access Solutions recommend that contractors and employers develop their own rescue plan in accordance with the recommendations of the NASC in their documents SG4:10 and Guide to Formulating a Rescue Plan SG19:06.

All erectors should be trained in the use of special rescue equipment and ensure all equipment for rescue is available and is fit for use at all times.

NB: Legislation is constantly being updated and users are responsible to ensure that the latest and most appropriate is used at the time.

TECHNICAL SERVICES

This User guide incorporates the basic information on the capacities and safe use of the VR Access Solutions Lattice Beams for typical use situations only. For specialist arrangements and locations of use it is recommended that you contact VR Access Solutions in the first instance, or our Consulting Structural Engineers, S-Mech Ltd, for more specialist advice or a competent temporary works engineer.

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