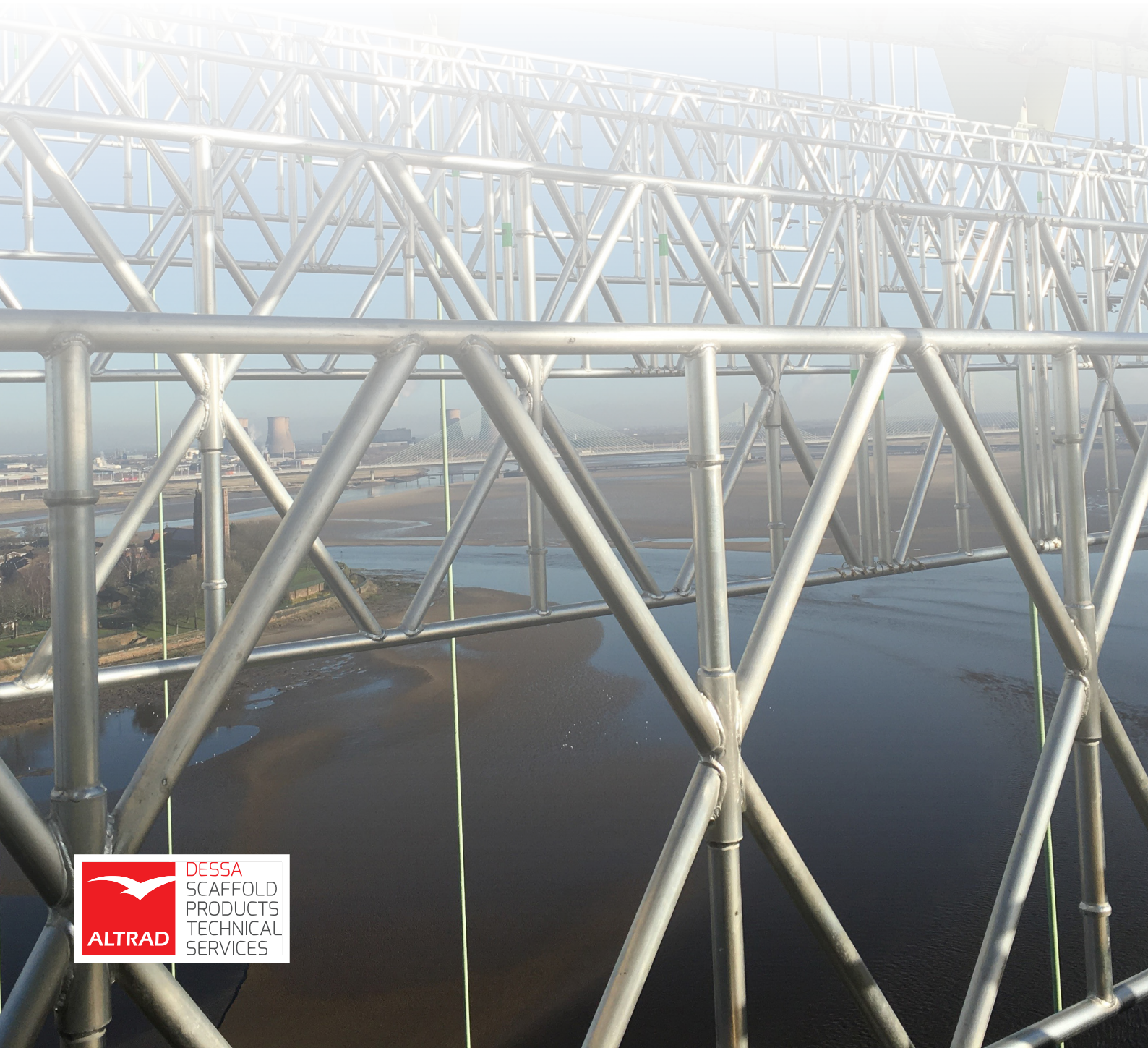
LATTICE BEAMS

USER GUIDE



ALTRAD DESSA SCAFFOLD PRODUCTS TECHNICAL SERVICES

Foreword

DESSA offers efficient lightweight temporary roofing, encapsulation solutions, aluminium lattice girders and safety products. DESSA's unique and distinctive aluminium solutions are suitable for not only grandstands, stages and events but also public utility works, local authorities, government buildings, historic buildings, highways, bridges and industrial market sectors. Time proven on demanding and complex applications across varied climates throughout the UK, Canada, UAE, Australia and Europe, DESSA offers unrivalled span capabilities and alternative configurations. From a choice of roofing solutions and general purpose lattice girders providing unrivalled cost to strength ratio, to high capacity lattice girders complete with a dedicated bracing system, we provide the industry with an ever widening range of cost effective products along with extensive after sales support to the highest professional standards. At DESSA we develop innovative and practical solutions for the support, access and weather protection industries. All of our designs are technically proven and are registered with protected design rights, meaning only DESSA can offer superior solutions through our products. Our senior management team at DESSA offer considerable experience in the fields of contracting, engineering, manufacture and customer service. Having introduced a number of class leading products into the UK market, we have worked closely with a number of key clients in developing bespoke solutions to their problems which we manufacture on an exclusive basis.

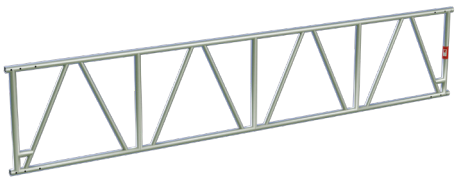
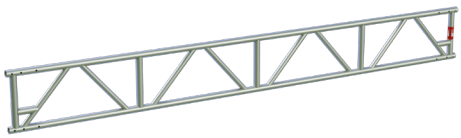
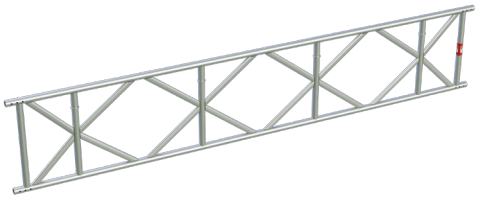
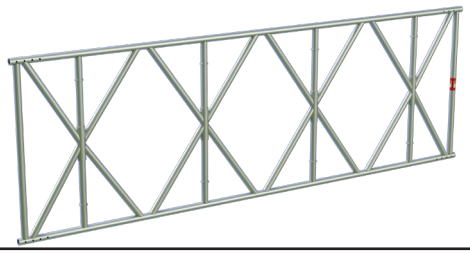
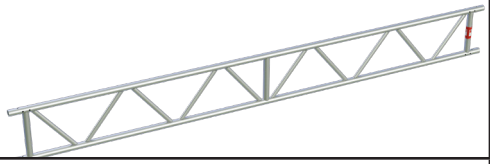
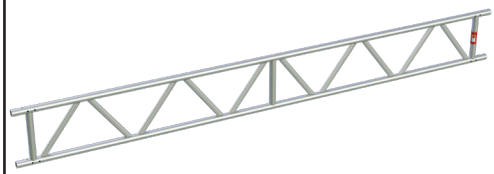
Contents

1.0 General

1.1 Scope

This document relates to DESSA aluminium lattice beams, joined using tubular spigots and bolts or quick release pins. This document provides best practice and outlines technical, practical and safety information. This document allows users of DESSA products to safely ensure their application and installation. This document does not provide detailed technical guidance and it is recommended that this is always obtained from appropriately qualified engineers.

1.2 DESSA Beam Range

BEAM SERIES		CHORD C/C (MM)	PRODUCT CODE	LENGTH (M)	WEIGHT (KG)
D78		732	BA1000 BA2000 BA3000 BA4000 BA5000 BA6000	1.0 2.0 3.0 4.0 5.0 6.0	6.34 11.63 16.92 22.21 27.50 32.79
D45		400	BB1000 BB2000 BB3000 BB4000 BB5000 BB6000 BB8000	1.0 2.0 3.0 4.0 5.0 6.0 8.0	5.50 9.52 14.08 18.30 23.21 28.60 37.00
ASTERIX		702	BC0600 BC1000 BC2000 BC3000 BC4000 BC5000 BC6000	0.6 1.0 2.0 3.0 4.0 5.0 6.0	4.84 8.00 14.25 20.49 26.74 32.99 39.23
ASTERIX HD		1280	BD0550 BD1000 BD2000 BD3000 BD4000	0.55 1.0 2.0 3.0 4.0	6.33 13.33 22.60 31.87 41.13
S45		400	BE4100 BE6100 BE8100	4.1 6.1 8.1	16.21 23.97 31.74
L45		400	BH2000 BH3000 BH4000 BH5000 BH6000 BH8000	2.0 3.0 4.0 5.0 6.0 8.0	8.00 11.75 15.62 19.61 23.11 30.98
NOTE: SPECIAL LENGTHS AVAILABLE ON REQUEST					

2.0 Practical

2.1 Tools

The following tools may be required for the installation and dismantling of DESSA alumiunium lattice beams:-

- 7/16" BSW swing-over spanner
- Podger spike
- 19mm flat spanner

2.2 Handling

Care must be exercised when manually handling lattice beams. It is recommended that beams are held upright, not side on, and that two persons handle each beam, one at each end, where the weight of the lift is above 15kg. Prior to any beam lift, it is important to inspect the beam externally and internally of the chords, for loose debris.

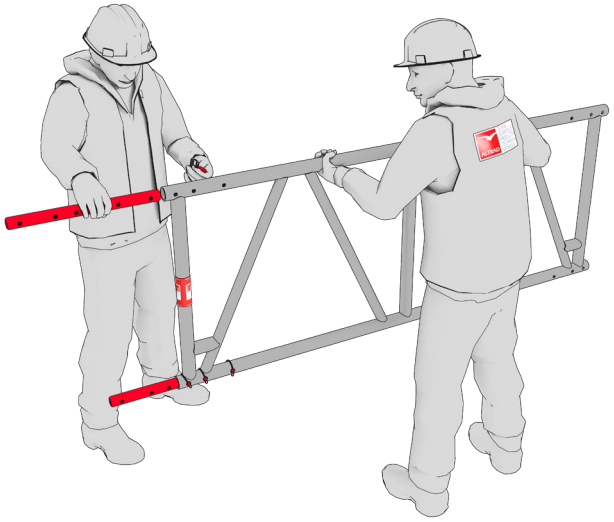
2.3 Connecting beams

Beams are connected using DESSA steel or aluminium spigots and secured with quick release spring pins or M12 Grade 8.8 bolts. Beams are connected through the top and bottom chords - see steps 1-4 on the next page. All beams are to be checked to ensure they are free from loose debris. To avoid objects and debris being placed in open beam ends during use, it is advisable to close all open ends with plastic tube caps or similar following installation.

The spigots have been designed to withstand the full design loads in the beam chords. The table below provides details of the spigots required to join each beam type and the number to connecting pins required to achieve maximum capacity. If less connecting pins are used than stated in the following table, the joint capacity is reduced and reference should be made to the Technical Information Sheet (TIS) for the beam type in question.

BEAM SERIES	TECHNICAL INFORMATION SHEET REFERENCE	SPIGOT PART NUMBER	CONNECTING PINS REQUIRED
D78	TIS17011	BS0001	6
D45	TIS17001	BS0001	6
ASTERIX	TIS17013	BS0005	6
ASTERIX HD	TIS17014	BS0006	8
S45	TIS17017	BS0012	6
L45	TIS17017	BS0012	6

1



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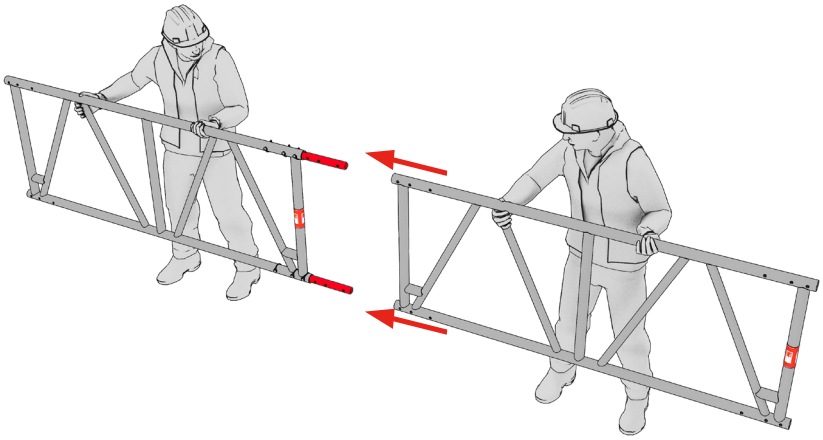

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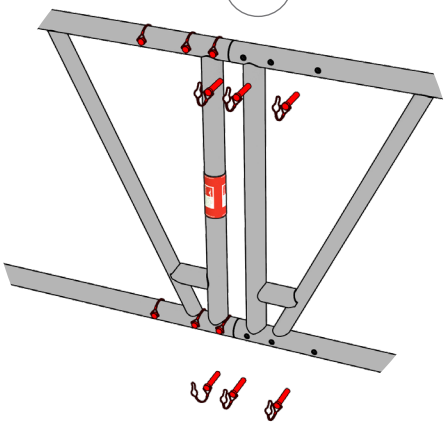

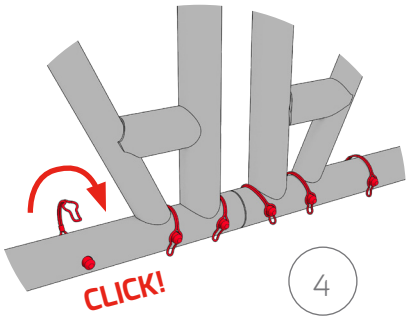

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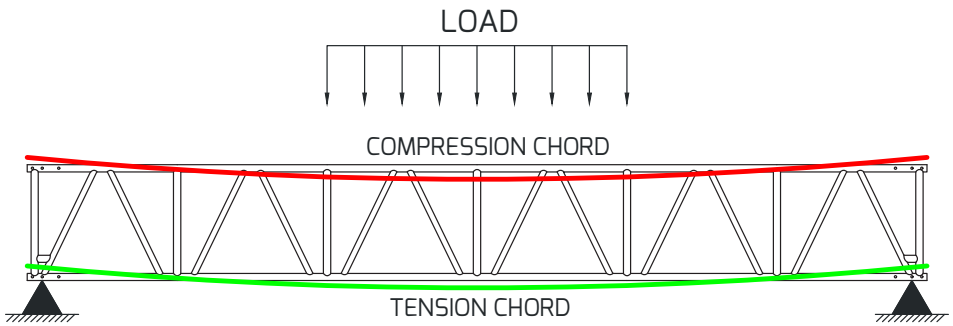
2.4 Location of tension and compression zones

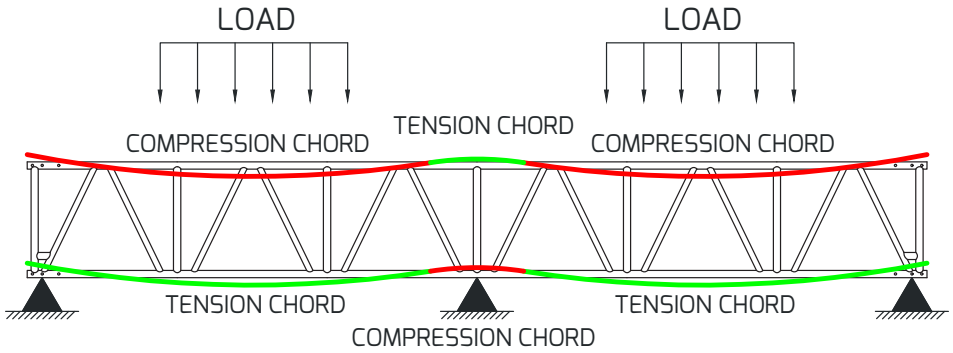
Lattice beams subject to bending loads transfer forces internally through tension and compression. Compression chords are liable to buckling and it is therefore essential to identify their location. Adequate bracing must be applied to such chords. Section 2.5 provides outline guidance but must not be considered as exhaustive.

Below is a rough guide with typical load scenarios:-

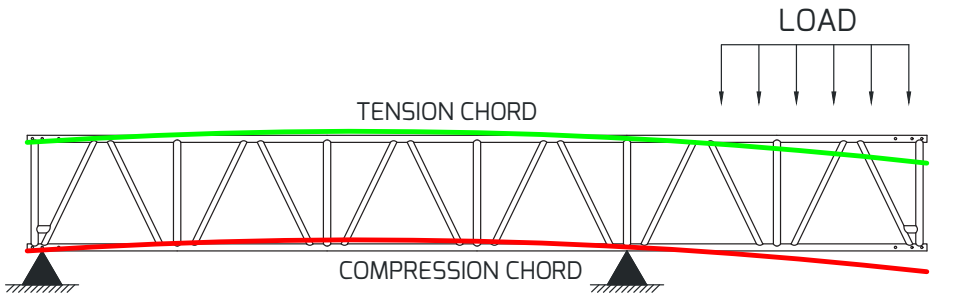
SIMPLE SPAN



CONTINUOUS SPAN

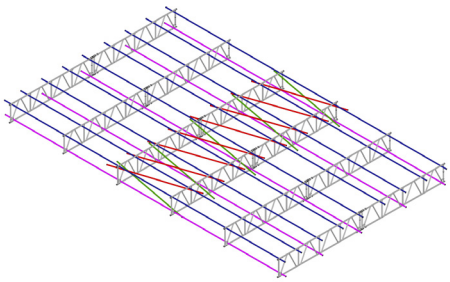
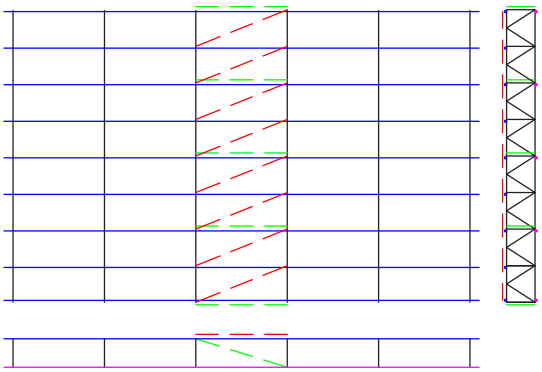


CANTILEVER

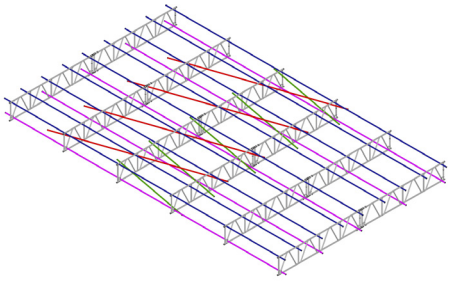


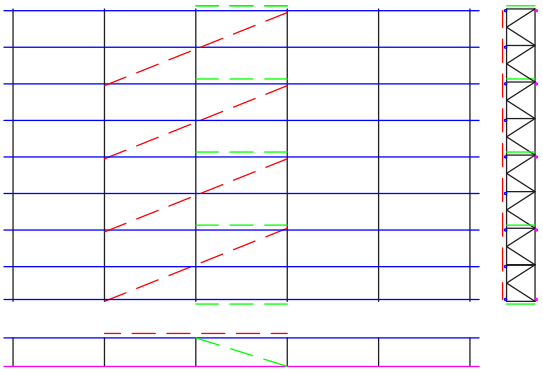
2.5 Lacing and bracing

All lattice beams require lacing and bracing at correct centres to achieve their maximum strength. Lattice beams must never be used singularly, the minimum being a braced pair to achieve structural integrity. Bracing components should be applied at least one in every five bays and consist of plan bracing and section (diagonal) bracing. All bracing elements must be continuous across all joints. Tube and fittings and/or DESSA modular components can be used for effective lacing and bracing. It is recommended that only EN74 certified couplers are used for connecting to DESSA lattice beams. This section provides typical details and best practice when lacing and bracing beam spans.

TUBE AND FITTING #1		
 ✓		
LACING AND BRACING TYPE		
COMPRESSION CHORD LACING		1m C/C, THROUGH ALL BAYS
TENSION CHORD LACING		2m C/C, THROUGH ALL BAYS
COMPRESSION CHORD PLAN BRACING		1m C/C, BRACED BAYS
DIAGONAL BRACING		2m C/C, BRACED BAYS

TUBE AND FITTING #2





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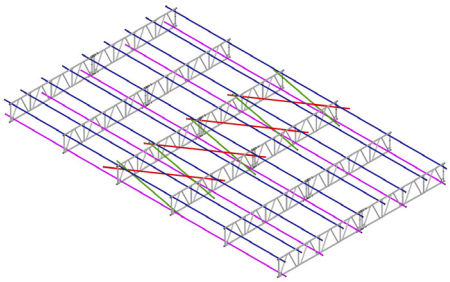
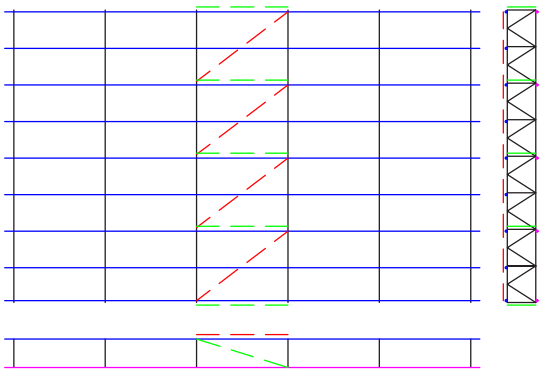
LACING AND BRACING TYPE		
COMPRESSION CHORD LACING		1m C/C, THROUGH ALL BAYS
TENSION CHORD LACING		2m C/C, THROUGH ALL BAYS
COMPRESSION CHORD PLAN BRACING		2m C/C, BRACED AND ADJACENT BAYS
DIAGONAL BRACING		2m C/C, BRACED BAYS

TUBE AND FITTING #3





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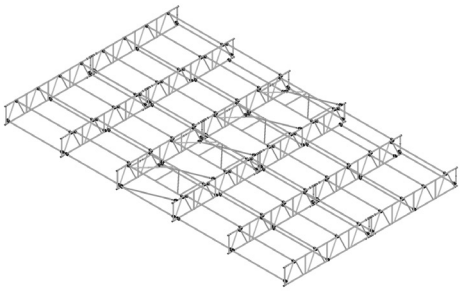
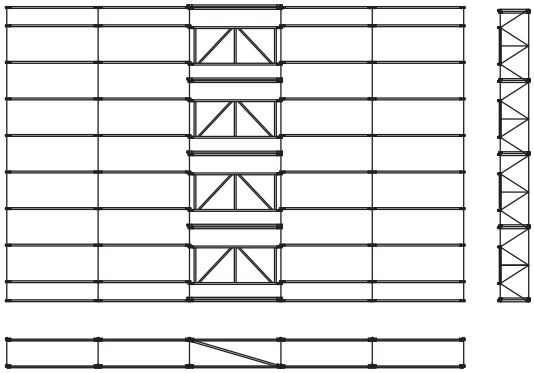
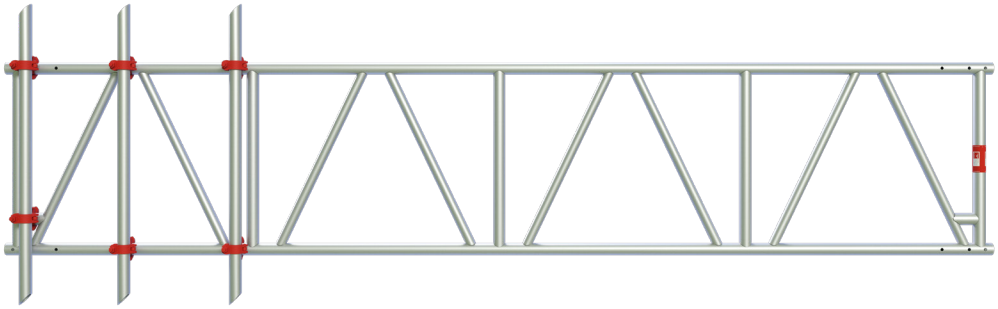
LACING AND BRACING TYPE		
COMPRESSION CHORD LACING		1m C/C, THROUGH ALL BAYS
TENSION CHORD LACING		2m C/C, THROUGH ALL BAYS
COMPRESSION CHORD PLAN BRACING		2m C/C, BRACED BAYS
DIAGONAL BRACING		2m C/C, BRACED BAYS

DESSA COMPONENTS	
 	
LACING AND BRACING TYPE	
COMPRESSION CHORD LACING	1mM C/C, THROUGH ALL BAYS
TENSION CHORD LACING	2m C/C, THROUGH ALL BAYS
COMPRESSION CHORD PLAN BRACING	UNI FRAMES @ 2m C/C (EFF. 1m C/C)
DIAGONAL BRACING	2m C/C, BRACED BAYS

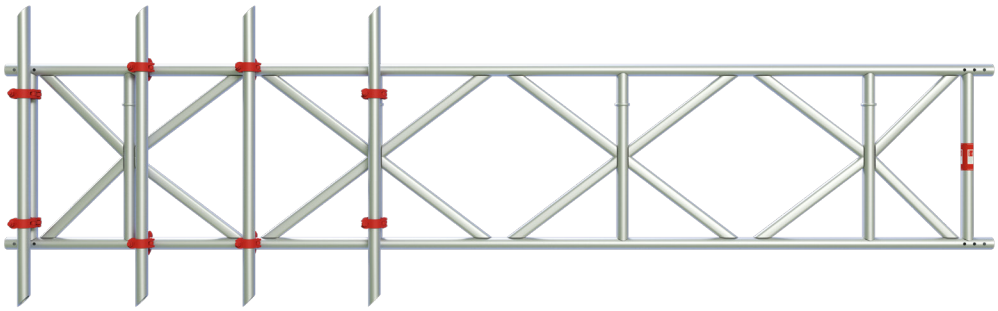
2.6 Connecting puncheons

Scaffold tube puncheons may be connected to DESSA lattice beams. It is recommended that only EN74 certified couplers are used for connecting puncheons to DESSA lattice beams. It is permissible to connect couplers to the chords on all DESSA beam types. The following tables highlight where couplers can be connected on the DESSA beam range:-

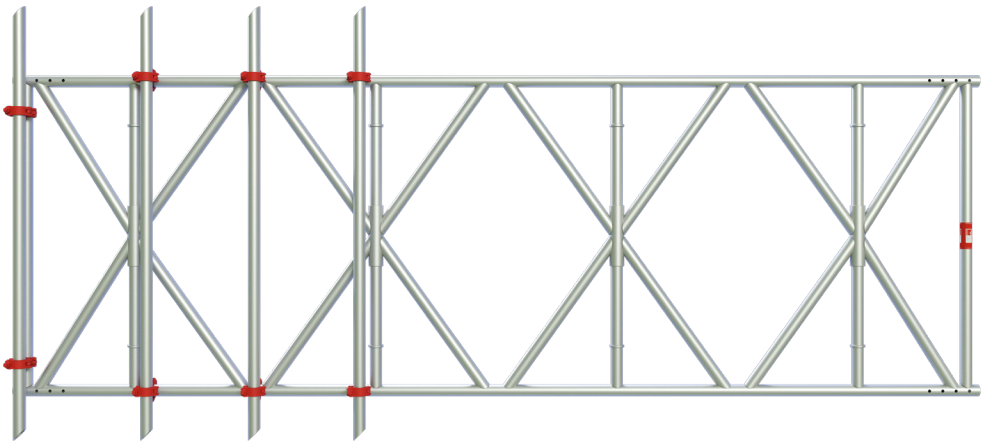
D78 / D45 SERIES	
CONNECTION POINT	
CHORD	Y
POST	N
DIAGONAL	N
STIFFENER	Y

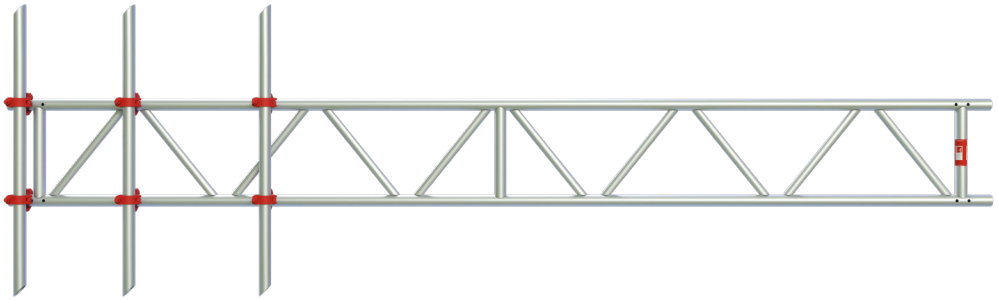


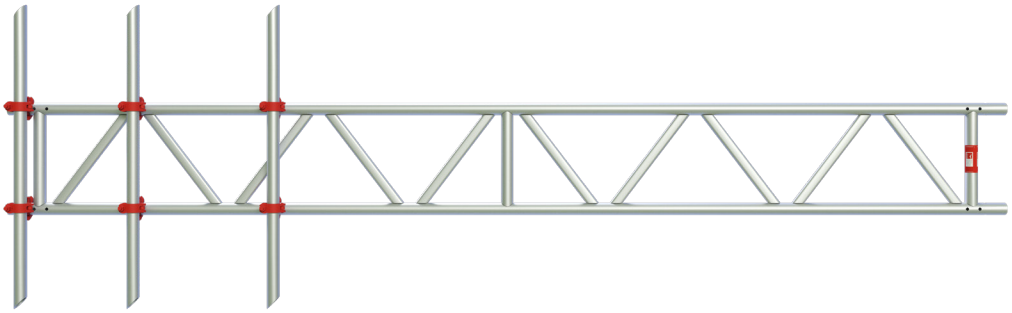
ASTERIX SERIES	
CONNECTION POINT	
CHORD	Y
POST	Y
DIAGONAL	N
STIFFENER	N/A



ASTERIX HD SERIES	
CONNECTION POINT	
CHORD	Y
POST	Y
DIAGONAL	N
STIFFENER	N/A



S45 SERIES		
CONNECTION POINT		
CHORD	Y	
POST	N	
DIAGONAL	N	
STIFFENER	N/A	

L45 SERIES		
CONNECTION POINT		
CHORD	Y	
POST	N	
DIAGONAL	N	
STIFFENER	N/A	

2.7 Dismantling

Dismantling is generally the reverse of installation, however it is essential that the bracing integrity is maintained at all time during dismantle and it is for this reason that it is recommended to leave dismantling of the braced bays until last for each section.

It is recommended that all spigots should be removed from the beams on dismantling of the works and stored separately.

Objects and debris placed inside the beam can fall out during dismantling, potentially causing injury. To avoid this, beam ends should be capped following installation.

!	ENSURE THAT NO LOOSE DEBRIS OR PARTS ARE PRESENT INSIDE THE BEAM TUBES DURING THE INSTALLATION OR DISMANTLING STAGE	!

3.0 Technical

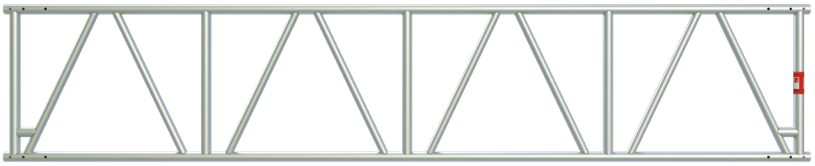
3.1 Safe Load Tables

The following tables summarise the key structural performance safe load data for each beam series:

DESSA D78
MATERIAL: ALLOY 6082-T6
SELF-WEIGHT: 0.06kN/m

PERMISSIBLE MOMENT: 38.8kNm
PERMISSIBLE SHEAR: 23.7kN

TOP CHORD LACING AT 1.0M C/C



LOADING	UNITS	SPAN (M)				
		4	6	8	10	12
UNIFORMLY DISTRIBUTED LOAD	kN/m	11.86	7.89	4.83	3.08	2.13
SINGLE POINT LOAD, MID-SPAN	kN	23.70	23.70	19.31	15.38	12.75
TWO POINT LOADS, THIRD-SPANS	kN	23.70	19.37	14.48	11.54	9.56
THREE POINT LOADS, QTR-SPANS	kN	15.81	12.92	9.66	7.69	6.38

DESSA D45
MATERIAL: ALLOY 6082-T6
SELF-WEIGHT: 0.05kN/m

PERMISSIBLE MOMENT: 22.8kNm
PERMISSIBLE SHEAR: 18.1kN

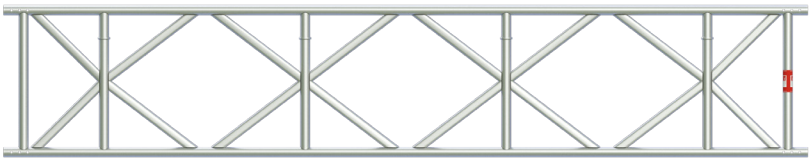
TOP CHORD LACING AT 1.0M C/C

LOADING	UNITS	SPAN (M)				
		4	6	8	10	12
UNIFORMLY DISTRIBUTED LOAD	kN/m	9.04	5.02	2.80	1.78	1.22
SINGLE POINT LOAD, MID-SPAN	kN	18.10	15.05	11.21	8.88	7.32
TWO POINT LOADS, THIRD-SPANS	kN	17.01	11.29	8.40	6.66	5.49
THREE POINT LOADS, QTR-SPANS	kN	9.06	7.52	5.60	4.44	3.66

DESSA ASTERIX
MATERIAL: ALLOY 6082-T6
SELF-WEIGHT: 0.07kN/m

PERMISSIBLE MOMENT: 41.3kNm
PERMISSIBLE SHEAR: 23.7kN

TOP CHORD LACING AT 1.0M C/C

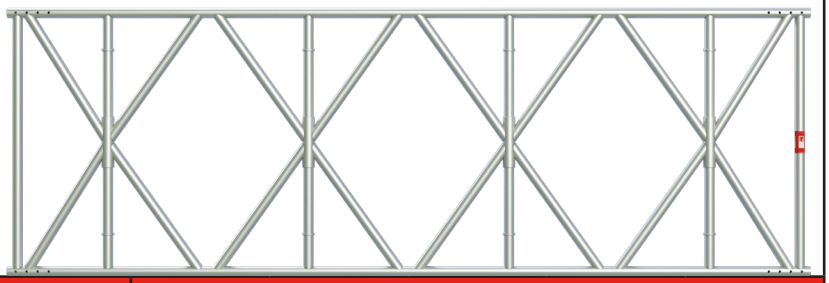


LOADING	UNITS	SPAN (M)				
		4	6	8	10	12
UNIFORMLY DISTRIBUTED LOAD	kN/m	11.86	7.89	5.14	3.27	2.26
SINGLE POINT LOAD, MID-SPAN	kN	23.70	23.70	20.54	16.37	13.57
TWO POINT LOADS, THIRD-SPANS	kN	23.70	20.61	15.41	12.28	10.18
THREE POINT LOADS, QTR-SPANS	kN	15.81	13.74	10.27	8.18	6.79

DESSA ASTERIX HD
MATERIAL: ALLOY 6082-T6
SELF-WEIGHT: 0.11kN/m

PERMISSIBLE MOMENT: 102.2kNm
PERMISSIBLE SHEAR: 32.6kN

FULLY RESTRAINED



LOADING	UNITS	SPAN (M)				
		4	8	12	16	20
UNIFORMLY DISTRIBUTED LOAD	kN/m	15.21	7.57	5.02	3.15	1.99
SINGLE POINT LOAD, MID-SPAN	kN	47.57	47.57	33.94	25.22	19.94
TWO POINT LOADS, THIRD-SPANS	kN	30.41	30.28	25.46	18.92	14.95
THREE POINT LOADS, QTR-SPANS	kN	20.27	20.19	16.97	12.61	9.97

DESSA S45
MATERIAL: ALLOY 6082-T6
SELF-WEIGHT: 0.04kN/m

PERMISSIBLE MOMENT: 20.19kNm
PERMISSIBLE SHEAR: 11.66kN

TOP CHORD LACING AT 1.0M C/C

LOADING	UNITS	SPAN (M)				
		4	6	8	10	12
UNIFORMLY DISTRIBUTED LOAD	kN/m	5.83	3.88	2.50	1.59	1.10
SINGLE POINT LOAD, MID-SPAN	kN	20.19	13.42	10.02	7.97	6.59
TWO POINT LOADS, THIRD-SPANS	kN	11.66	10.06	7.51	5.98	4.94
THREE POINT LOADS, QTR-SPANS	kN	7.78	6.71	5.01	3.98	3.30

DESSA L45
MATERIAL: ALLOY 6082-T6
SELF-WEIGHT: 0.04kN/m

PERMISSIBLE MOMENT: 21.98kNm
PERMISSIBLE SHEAR: 11.69kN

TOP CHORD LACING AT 1.0M C/C

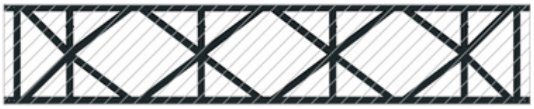
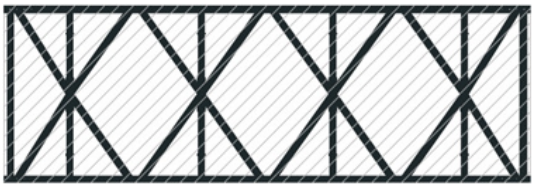
LOADING	UNITS	SPAN (M)				
		4	6	8	10	12
UNIFORMLY DISTRIBUTED LOAD	kN/m	5.84	3.89	2.73	1.74	1.20
SINGLE POINT LOAD, MID-SPAN	kN	21.98	14.61	10.91	8.68	7.19
TWO POINT LOADS, THIRD-SPANS	kN	11.69	10.96	8.18	6.51	5.39
THREE POINT LOADS, QTR-SPANS	kN	7.79	7.30	5.45	4.34	3.59

3.2 Information for Designers

- Beam lacing or bracing elements must not carry more than 15% of their capacity to be classed as an effective lateral restraint.
- Lacing and bracing elements must be continuous and free from joints.
- Local bending at nodes must be considered on a case by case basis taking into account the exact location of each connecting member, together with any eccentricity due to coupler type.
- CAD blocks are available to download from the support centre of the DESSA website.

www.altrad-dessa.com

3.3 Solidity Ratios

BEAM SERIES		PART NUMBER	ENVELOPE AREA	MEMBER AREA	SOLIDITY RATIO
			A_c	A	Φ
D78		BA1000 BA2000 BA3000 BA4000 BA5000 BA6000	0.780 1.561 2.341 3.121 3.902 4.682	0.225 0.413 0.600 0.787 0.975 1.162	0.288 0.264 0.256 0.252 0.250 0.248
D45		BB1000 BB2000 BB3000 BB4000 BB5000 BB6000 BB8000	0.448 0.897 1.345 1.793 2.242 2.690 3.586	0.176 0.325 0.475 0.625 0.775 0.925 1.224	0.392 0.363 0.353 0.349 0.346 0.344 0.341
ASTERIX		BC0600 BC1000 BC2000 BC3000 BC4000 BC5000 BC6000	0.450 0.750 1.501 2.251 3.001 3.752 4.502	0.159 0.268 0.488 0.708 0.928 1.148 1.369	0.352 0.357 0.325 0.315 0.309 0.306 0.304
ASTERIX HD		BD0550 BD1000 BD2000 BD3000 BD4000	0.731 1.328 2.657 3.985 5.313	0.238 0.406 0.702 0.997 1.293	0.326 0.306 0.264 0.250 0.243
S45		BE4100 BE6100 BE8100	1.838 2.735 3.631	0.595 0.880 1.165	0.324 0.322 0.321
L45		BH2000 BH3000 BH4000 BH5000 BH6000 BH8000	0.897 1.345 1.793 2.242 2.690 3.586	0.315 0.465 0.614 0.781 0.913 1.230	0.351 0.345 0.342 0.348 0.339 0.343
NOTE: DIAGRAM REPRESENTATIVE OF 4M BEAM LENGTHS ONLY					

4.0 Safety

4.1 General

- All prevailing Health and Safety regulations and the NASC guidance must be followed.

4.2 PPE

- Ensure that harnesses are worn at all times when beams are being erected or dismantled at height.
- The following PPE should also be worn at all times when erecting beam; hard hat, hi-visibility clothing, safety boots and safety gloves.

4.3 Specific risks and hazards to health

- Beams must never be used singularly.
- Incorrect procedure for lifting can generate muscular pain and manual handling injuries. Ensure that beams that require a two man lift are lifted appropriately.
- Loose debris and/or materials may be left inside the beam for example nuts, bolts and spigots. It is essential that these are removed prior to dismantling as they can be ejected at high speed when beams are angled downwards, causing serious injury.

4.4 Inspection

- Ensure that all beams and associated equipment are in good condition and fit for use. Any incorrect or damaged equipment should be replaced prior to commencement of works.
- Ensure the correct spigot is applied to the beam.
- Ensure that the amount of fittings for the spigot to beam connection are available, joints with less than the advised number of fittings will not provide the same structural strength.
- Ensure that connections made between spigot and beam are secured, using correct tools where applicable.
- Ensure that connections are not susceptible to accidental damage or disconnection.
- Ensure the working platform/area is free from hazards and level, prior to beam erection.
- Ensure that when using tube and fitting to lace and brace, the all couplers used are EN74 certified.

5.0 Logistics

5.1 Loading / Unloading

- Ensure that equipment receives no damage during the loading/unloading process.
- Lifting multiple beams is a feasible operation providing they are strapped together and a suitable forklift truck is available.
- If manually unloading a beam, ensure this is conducted by two people and that the beam is carried correctly, not dragged on the ground.

5.2 Transport

- Pre-plan the size and type of transportation for the beams in advance.
- Once loaded, ensure the beams are secured to the vehicle using straps at appropriate intervals.

5.3 Storage

- When in storage, DESSA beams can be strapped together upright in groups of no more than 10. Ensure that strapping is applied at regular intervals and not over-tightened.
- Packs of beams less than 2/3 of their height should be stored flat as opposed to upright to avoid toppling and distortion.

6.0 Inspection, Maintenance and Repair

- After initial installation, routine inspections should be scheduled. It is best practise to inspect beam structures before each work shift and after any occurrence which could affect the structural integrity of the system.
- Fixings and connections should also be checked after adverse weather conditions.
- Any damaged beams should be taken out of service and quarantined.
- Any maintenance or repair should be carried out with approval or supervision from DESSA appointed representatives.

7.0 References

7.1 Normative

- BS EN 12810-1:Façade scaffolds made of prefabricated components-product specifications
- BS EN 12811-1:Temporary works equipment: Scaffold Performance requirements and general design
- BS EN 13374:Temporary edge protection systems – Product specification, test methods
- BS EN 1991-1-3:Actions on structures. General actions, Snow loads
- BS EN 1991-1-4:Actions on structures. General actions, Wind loads
- NA to BS EN 1991-1-3:Actions on structures. General actions, Snow loads
- NA to BS EN 1991-1-4:Actions on structures. General actions, Wind loads
- BS EN 1999-1-1:Design of Aluminium Structures
- BS EN 74-1:Couplers for tubes. Requirements and test procedures

7.2 Regulatory

- Working at Height Regulations
- Construction (Design and Management) Regulations
- Health and Safety at Work Act
- Manual Handling Operations Regulations

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