PURLINS & OTHER USES - APEX

Introduction

Welcome to the Apex Purlin Design Charts. They have been customized over to be as user friendly as possible but with the minor limitation that we would believe that they should be used by qualified structural engineers with a very good understanding of the structure into which they are being designed.

It is not the intention that they shall only be used as purlins and in fact, considerable care and thought has gone into them being used as wall girts, floor joists, partition members and a substitution for middle to light weight rolled sections, where appropriate. Hence you will find that we have given advice with regards to deflections of 1 to 150 and deflections 1 to 600.

For most applications, the use of a specialist structural engineer or program can result in the reduction of bridging centres and in some cases, purlin sizes. However, we strongly recommend to all design engineers that they need to think through, then having selected in most cases the 50 year wind for the design of a roof, there is an implication that that takes into account variations from other sources to that roof that could affect a design. An example is air conditioning put on top of a roof, this may well minimize wind uplift, whilst increasing dead load downwards. Another, clients on the odd occasion suspend ceilings to office complexes from roofing systems designed to have deflection ratios of 1/150, when most office ceilings are designed for around 1/300.

Further, there are some construction difficulties, particularly if bridging is not put in at reasonable spacings to accommodate the use of putting roof decking/flooring on in such a way that local twisting and warping of the members already in place can occur.

Methods around this are to put in additional bracing where roofing iron/flooring material is to be placed and/or stacked during construction and perhaps even increasing the size of the purlins so that this can occur during construction.

We cannot emphasise too strongly that the effects for Occupational Health & Safety on construction methodologies, the use of less and less materials where it is perceived to be placing worker's at risk, is becoming a major review within the industry. Therefore deflection limits, stresses induced during construction when the roof sheeting is not there to control the top flange or the purlin or the outer skin of a wall girt may need to be considered more than the during design life loadings.

Further, the charts assume that you are using the current Australian Standards and that it is a limit state approach that is being applied.

To ensure that you get the maximum benefit and the potential savings that we believe are inherent in being reasonably thorough and working through options and alternatives, we have taken one of the charts and indicated on it what the various colours, delineation, bolding etc. means in an easy to read format and it is strongly suggested that you utilize this chart and its pull downs to get a much better feel for how to optimize your design.

Further, the charts are done in such a way that you can download them and use a tick box approach to the elements that you have covered and then highlight the purlin size, bracing and bridging etc. that you have chosen and utilize it as part of the in put into your computations. This will facilitate other parties being able to double check what has been proposed.

Then what follows from this discussion is a series of items which we have given a number. They are the numbers that show up on the bottom of each chart per member or configuration so that you can tick box them through as you have covered the relevant points, just making sure that everything is done to the correct and proper standards.

1. Section Properties

Section properties shown are for full size members and they are adjusted for Code limitations. It should be noted that in some localized areas where bolts go through or where fitments are connected reduction to sectional properties do occur. These may not affect the capacities in the charts, but may be of some concern if localized bending and/or point load supports for equipment etc. are being applied at these locations.

2. Spanning and Spacing

Purlin spacing can be adjusted to suit increased loads particularly when services are placed on the construction. Value can be gained along the edges of certain constructions by adjusting spacing to handle the locally high wind load effects or additional loads, thereafter reverting back to larger spacings.

In continuous construction, it is always the first span that controls hence the mixed gauge charts have been designed with stronger first span members as an option. With rigorous analysis it is possible to construct to the same size purlins throughout but with the two end spans being 20% reduced in length. An analysis of this kind does require specific input and lapping does alter the result. Input from a structural engineer experienced in lightweight steel and design analysis should be engaged.

3. Bridging Locations

Taking into account industry standards and basic safety recommendations, bridging shall be installed for all ‘Z’ or ‘C’ 100 purlins wherever they span more than 2 metres, for all 150 purlins wherever they span more than 3 meters, and for all 200, 250 and 300 purlins wherever they span more than 4 meters. Read charts carefully as with this limitation an advantage may be gained and smaller sizes can be utilized with the use of bridging.

4 Bridging Function

It should be noted that bridging is not intended for the support of any element during construction. Every effort shall be made to ensure that no sheeting, purlins or other loads are applied to the bridging. When bridging is used in a vertical wall situation; the wall shall not be used for the purpose of climbing. Load distributors shall be used at all times to ensure that no loads additional to the design are applied.

5. Variable Loads

Roofing elements may carry loads of a variable nature, i.e: they may not be ideal uniform loads. These loads can be brought about by air conditioning units, fire services, electrical fittings and variations in wind load. To ensure that a suitable loading pattern is chosen, it is best to take into account the actual construction particularly its support type. If the structure is simply supported; then standard point loads and their location are used to determine the critical bending moment and then by working backwards to resolve the equivalent UDL. If the structure is of continuous construction a similar approach can be used, ie: using only a two span continuous approach is conservative ignoring lapping if it occurs.

If we wish to include lapped construction, specialist skills are needed to gain optimum value. A simple approach is to take the lesser 'I' value of the purlins in a two span configuration and assume that the fixed end moment is amplified by 15%. Following that a moment distribution is used to work out the critical moments and back work those to determine the equivalent UDL. If a more elegant approach is required, the input of a structural engineer experienced in lightweight steel design and analysis should be engaged.

6. Secondary Loads

Under no circumstances should any loads (ie. fire services, suspended ceilings, air conditioner units or any other point type loads) be hung directly from the bottom lip of any purlin. All connections shall be made through the web of the purlin and/or onto and over the top of the purlin. This also includes the use of drilling holes through the bottom or top flange of the purlin for any load carrying purpose. If such connections can not be avoided, input of a structural engineer experienced in lightweight steel design and analysis should be engaged.

7. Cleat Plate and Bolts

Each chart contains an optimizing statement as to which size bolt is recommended to give the capacities as shown. It is the engineer's responsibility to determine the size of the cleat plates. Generally cleat plate steels have a lower stress grade than purlins, thus the cleat plate thickness will be greater than the purlins. Recommended bolt sizes given in tables are for two bolts only; these can be replaced with four (4) bolts of smaller sized bolts if required. Construction practicalities may control in these cases.

8. Decking

Considerable savings can be made by choosing decking that is suitable for the slope required. Also one should try different spacings to compare the gauge of the decking versus the size/centers of the purlins, bridging and connection details.

9. Purlin Design

The basic span is the distance between the bolts that affix the purlins to the cleats. This is slightly smaller than the centre to centre of the rafters. Where lapping occurs it is the centre line of the lap.

All charts (particularly those including multiple size members) have been analyzed as integral components and can not be substituted with alternatives without running an analysis for such changed configuration. Whilst it may be possible to shift from one depth to a smaller depth (for the internal spans), it is not a recommended procedure. The continuous span charts and the guidance given (particularly for those of five or more spans) is conservative and a more refined analysis may give slightly different results. The second span size in these configurations should not be changed as it is important regarding stiffness in providing support for the first span.

The deflections have been given as 1:150. This does not imply that 1:150 is the correct or the appropriate deflection control for any system and/or configuration. It should be noted that with extremely flat roofs deflection limits should be significantly higher than that to guard against water ponding. Deflections greater than 1:150 have problems where some cladding/fixings are concerned. If utilizing higher deflections than for normal applications reference to the manufacturer's information is recommended.

The capacities as given in the charts include the self weight of the members. The charts are also formulated on the basic capacity that the sheeting (as applied in accordance with manufacturer's recommendation) gives continuous restraint to the top flange or the outer flange of girts, and that the bridging will be installed in accordance with the recommendations so that the charts with regards to internal capacities are also reached. It is further assumed that all construction has been done in accordance with the relevant Australian Standards, ie: all bolts tight, all welds are correct, and the construction procedure complies with good trade practices.

10. Overhangs

Span to loads as given in the simply supported section will adequately handle cantilevers of 20% of that span with correct end/support details to imitate torsional buckling. Should greater than same be required, input from a structural engineer experienced in lightweight steel and design analysis should be engaged.

11. Floor Joists

Studies have shown that peoples acceptance of deflections on steel floors is at about 1 in 600 to 1 in 900 deflection, largely due to bounce. Loads have been given for these deflections in the unlapped and lapped 2 span tables.

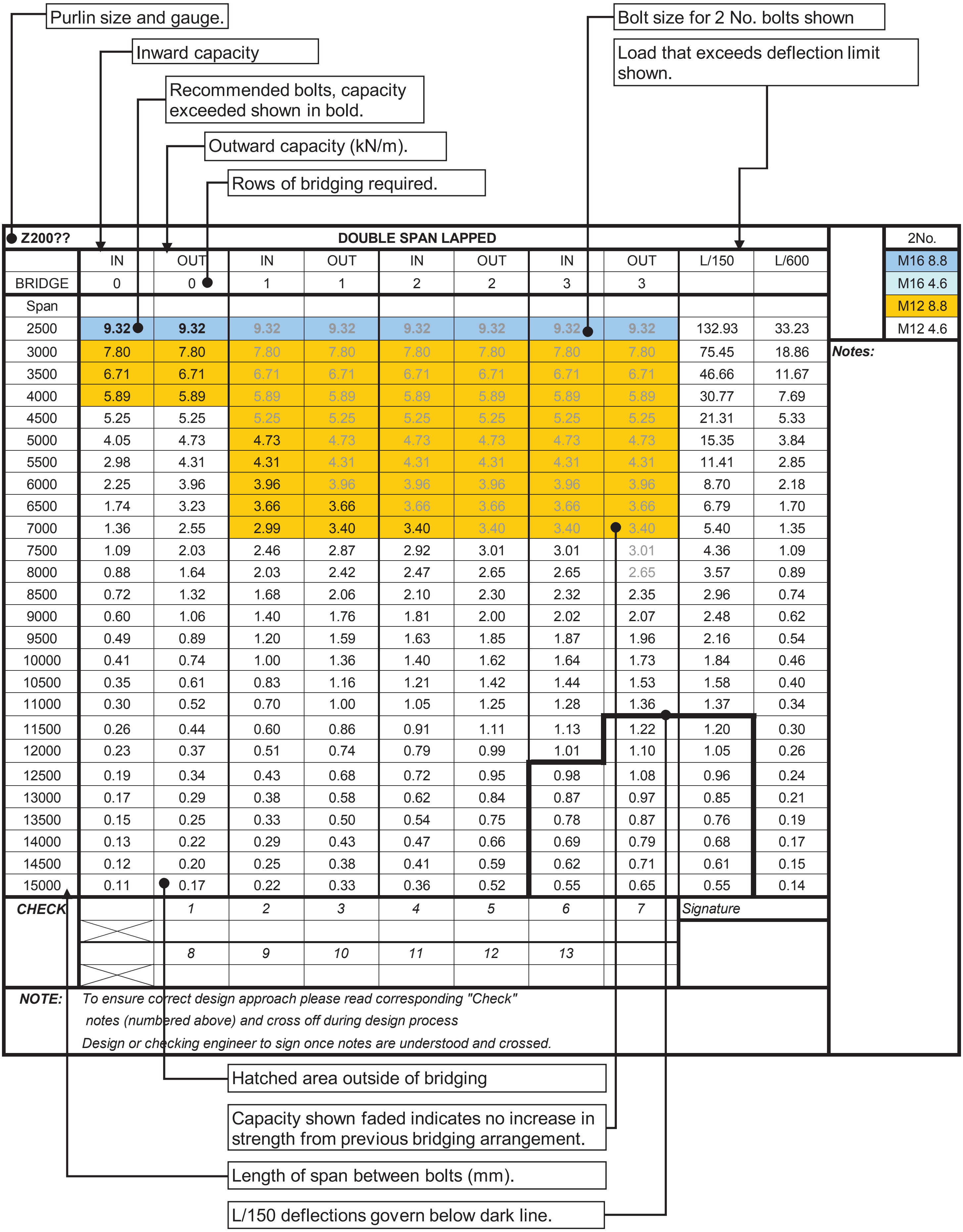
12. Construction Loads

There are numerous reasons why buildings fail or cease to work well during construction. Firstly the charts assume that we have the decking in place to restrain the top of the purlins for gravity type loads. When these are not in place, the purlins have a different configuration and therefore have a different load capacity.

Further, whilst lapped purlins are being put in place, they are in fact functioning as simply supported and therefore some care and thought might need to be put into how to align them, how to straighten them and how to true them. It is always advisable to consult with the construction company to go through any procedures that they have in place that may place additional stresses on your project or at least put notes on the drawing to handle the likelihood of these sorts of occurrences.

13. Combined Usage

The use of AS/NZS4600 is the only methodology by which combined bending/axial loads can be considered. If such an analysis is required, input of a structural engineer experienced in lightweight steel and design analysis should be engaged.



Purlin size and gauge.

Inward capacity

Recommended bolts, capacity exceeded shown in bold.

Outward capacity (kN/m).

Rows of bridging required.

Bolt size for 2 No. bolts shown

Load that exceeds deflection limit shown.

Z200??	DOUBLE SPAN LAPPED									
	IN	OUT	IN	OUT	IN	OUT	IN	OUT	L/150	L/600
BRIDGE	0	0	1	1	2	2	3	3		
Span										
2500	**9.32**	**9.32**	9.32	9.32	9.32	9.32	9.32	9.32	132.93	33.23
3000	7.80	7.80	7.80	7.80	7.80	7.80	7.80	7.80	75.45	18.86
3500	6.71	6.71	6.71	6.71	6.71	6.71	6.71	6.71	46.66	11.67
4000	5.89	5.89	5.89	5.89	5.89	5.89	5.89	5.89	30.77	7.69
4500	5.25	5.25	5.25	5.25	5.25	5.25	5.25	5.25	21.31	5.33
5000	4.05	4.73	4.73	4.73	4.73	4.73	4.73	4.73	15.35	3.84
5500	2.98	4.31	4.31	4.31	4.31	4.31	4.31	4.31	11.41	2.85
6000	2.25	3.96	3.96	3.96	3.96	3.96	3.96	3.96	8.70	2.18
6500	1.74	3.23	3.66	3.66	3.66	3.66	3.66	3.66	6.79	1.70
7000	1.36	2.55	2.99	3.40	3.40	3.40	3.40	3.40	5.40	1.35
7500	1.09	2.03	2.46	2.87	2.92	3.01	3.01	3.01	4.36	1.09
8000	0.88	1.64	2.03	2.42	2.47	2.65	2.65	2.65	3.57	0.89
8500	0.72	1.32	1.68	2.06	2.10	2.30	2.32	2.35	2.96	0.74
9000	0.60	1.06	1.40	1.76	1.81	2.00	2.02	2.07	2.48	0.62
9500	0.49	0.89	1.20	1.59	1.63	1.85	1.87	1.96	2.16	0.54
10000	0.41	0.74	1.00	1.36	1.40	1.62	1.64	1.73	1.84	0.46
10500	0.35	0.61	0.83	1.16	1.21	1.42	1.44	1.53	1.58	0.40
11000	0.30	0.52	0.70	1.00	1.05	1.25	1.28	1.36	1.37	0.34
11500	0.26	0.44	0.60	0.86	0.91	1.11	1.13	1.22	1.20	0.30
12000	0.23	0.37	0.51	0.74	0.79	0.99	1.01	1.10	1.05	0.26
12500	0.19	0.34	0.43	0.68	0.72	0.95	0.98	1.08	0.96	0.24
13000	0.17	0.29	0.38	0.58	0.62	0.84	0.87	0.97	0.85	0.21
13500	0.15	0.25	0.33	0.50	0.54	0.75	0.78	0.87	0.76	0.19
14000	0.13	0.22	0.29	0.43	0.47	0.66	0.69	0.79	0.68	0.17
14500	0.12	0.20	0.25	0.38	0.41	0.59	0.62	0.71	0.61	0.15
15000	0.11	0.17	0.22	0.33	0.36	0.52	0.55	0.65	0.55	0.14

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NOTE: *To ensure correct design approach please read corresponding "Check" notes (numbered above) and cross off during design process*

Design or checking engineer to sign once notes are understood and crossed.

2No.
M16 8.8
M16 4.6
M12 8.8
M12 4.6

Notes:

Hatched area outside of bridging

Capacity shown faded indicates no increase in strength from previous bridging arrangement.

Length of span between bolts (mm).

L/150 deflections govern below dark line.

UZ150-12	SINGLE SPAN									
	IN	OUT	IN	OUT	IN	OUT	IN	OUT	L/150	L/600
BRIDGES	0	0	1	1	2	2	3	3		
Span										
2500	7.10	7.35	7.40	7.40	7.40	7.40	7.40	7.40	8.65	2.16
3000	4.85	4.82	5.14	5.14	5.14	5.14	5.14	5.14	5.00	1.25
3500	3.52	3.29	3.78	3.74	3.78	3.78	3.78	3.78	3.15	0.79
4000	2.68	2.30	2.89	2.75	2.89	2.89	2.89	2.89	2.11	0.53
4500	2.10	1.61	2.28	2.07	2.28	2.28	2.28	2.28	1.48	0.37
5000	1.69	1.14	1.85	1.58	1.85	1.81	1.85	1.85	1.08	0.27
5500	1.39	0.83	1.53	1.23	1.53	1.45	1.53	1.53	0.81	0.20
6000	1.17	0.60	1.29	0.95	1.29	1.17	1.29	1.28	0.63	0.16
6500	0.99	0.44	1.10	0.73	1.10	0.96	1.10	1.07	0.49	0.12
7000	0.85	0.33	0.94	0.57	0.94	0.79	0.94	0.90	0.39	0.10
7500	0.74	0.26	0.82	0.46	0.82	0.65	0.82	0.76	0.32	0.08
8000	0.65	0.20	0.72	0.38	0.72	0.54	0.72	0.65	0.26	0.07
8500	0.57	0.16	0.64	0.29	0.64	0.44	0.64	0.56	0.22	0.06
9000	0.51	0.13	0.57	0.23	0.57	0.36	0.57	0.48	0.19	0.05
9500	0.46	0.11	0.51	0.19	0.51	0.30	0.51	0.41	0.16	0.04
10000	0.41	0.09	0.46	0.15	0.46	0.26	0.46	0.35	0.14	0.03
10500	0.37	0.07	0.42	0.13	0.42	0.21	0.42	0.30	0.12	0.03
11000	0.34	0.06	0.38	0.11	0.38	0.18	0.38	0.26	0.10	0.03
11500	0.31	0.05	0.35	0.09	0.35	0.15	0.35	0.22	0.09	0.02
12000	0.29	0.04	0.32	0.08	0.32	0.13	0.32	0.20	0.08	0.02
12500	0.26	0.04	0.30	0.07	0.30	0.11	0.30	0.17	0.07	0.02
13000	0.24	0.03	0.27	0.06	0.27	0.09	0.27	0.15	0.06	0.02
13500	0.22	0.03	0.25	0.05	0.25	0.08	0.25	0.13	0.06	0.01
14000	0.21	0.03	0.24	0.04	0.24	0.07	0.24	0.11	0.05	0.01
14500	0.19	0.02	0.22	0.04	0.22	0.06	0.22	0.10	0.04	0.01
15000	0.18	0.02	0.21	0.03	0.21	0.05	0.21	0.09	0.04	0.01
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2No.
M16 8.8
M16 4.6
M12 8.8
M12 4.6

Notes:

UZ150-15	SINGLE SPAN									
	IN	OUT	IN	OUT	IN	OUT	IN	OUT	L/150	L/600
BRIDGES	0	0	1	1	2	2	3	3		
Span										
2500	8.96	8.96	8.96	8.96	8.96	8.96	8.96	8.96	10.76	2.69
3000	6.14	6.22	6.22	6.22	6.22	6.22	6.22	6.22	6.23	1.56
3500	4.45	4.36	4.57	4.57	4.57	4.57	4.57	4.57	3.92	0.98
4000	3.37	3.11	3.50	3.50	3.50	3.50	3.50	3.50	2.63	0.66
4500	2.65	2.19	2.77	2.72	2.77	2.77	2.77	2.77	1.85	0.46
5000	2.13	1.52	2.24	2.11	2.24	2.24	2.24	2.24	1.35	0.34
5500	1.75	1.06	1.85	1.66	1.85	1.85	1.85	1.85	1.01	0.25
6000	1.47	0.76	1.56	1.30	1.56	1.54	1.56	1.56	0.78	0.19
6500	1.26	0.56	1.33	1.00	1.33	1.27	1.33	1.33	0.61	0.15
7000	1.07	0.43	1.14	0.78	1.14	1.06	1.14	1.14	0.49	0.12
7500	0.93	0.33	1.00	0.59	1.00	0.88	1.00	1.00	0.40	0.10
8000	0.82	0.26	0.88	0.46	0.88	0.73	0.88	0.86	0.33	0.08
8500	0.72	0.21	0.78	0.38	0.78	0.60	0.78	0.74	0.27	0.07
9000	0.64	0.17	0.69	0.29	0.69	0.49	0.69	0.64	0.23	0.06
9500	0.57	0.14	0.62	0.24	0.62	0.40	0.62	0.56	0.20	0.05
10000	0.52	0.11	0.56	0.20	0.56	0.33	0.56	0.49	0.17	0.04
10500	0.47	0.10	0.51	0.16	0.51	0.27	0.51	0.42	0.15	0.04
11000	0.43	0.08	0.46	0.14	0.46	0.23	0.46	0.36	0.13	0.03
11500	0.39	0.07	0.42	0.12	0.42	0.19	0.42	0.31	0.11	0.03
12000	0.36	0.06	0.39	0.10	0.39	0.16	0.39	0.26	0.10	0.02
12500	0.33	0.05	0.36	0.09	0.36	0.14	0.36	0.22	0.09	0.02
13000	0.30	0.04	0.33	0.07	0.33	0.12	0.33	0.19	0.08	0.02
13500	0.28	0.04	0.31	0.06	0.31	0.10	0.31	0.17	0.07	0.02
14000	0.26	0.03	0.29	0.06	0.29	0.09	0.29	0.14	0.06	0.02
14500	0.24	0.03	0.27	0.05	0.27	0.08	0.27	0.13	0.06	0.01
15000	0.23	0.03	0.25	0.04	0.25	0.07	0.25	0.11	0.05	0.01
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2No.
M16 8.8
M16 4.6
M12 8.8
M12 4.6

Notes:

10000	0.46	0.31	0.66	0.50	0.71	0.65	0.71	0.70	0.45	0.11
10500	0.40	0.26	0.59	0.42	0.63	0.57	0.63	0.62	0.39	0.10
11000	0.35	0.22	0.52	0.35	0.57	0.50	0.57	0.55	0.34	0.08
11500	0.31	0.18	0.47	0.29	0.51	0.43	0.52	0.49	0.29	0.07
12000	0.27	0.16	0.42	0.25	0.46	0.38	0.47	0.44	0.26	0.06
CHECK		1	2	3	4	5	6	7	Signature	
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UZ150-19	DOUBLE SPAN LAPPED									
	IN	OUT	IN	OUT	IN	OUT	IN	OUT	L/150	L/600
BRIDGE	0	0	1	1	2	2	3	3		
Span										
2500	17.06	21.04	21.04	21.04	21.04	21.04	21.04	21.04	41.69	10.42
3000	11.05	14.87	14.87	14.87	14.87	14.87	14.87	14.87	23.66	5.92
3500	7.62	11.09	11.09	11.09	11.09	11.09	11.09	11.09	14.63	3.66
4000	5.44	7.99	8.01	8.01	8.01	8.01	8.01	8.01	9.65	2.41
4500	4.06	5.87	5.92	5.92	5.92	5.92	5.92	5.92	6.68	1.67
5000	3.11	4.18	4.96	4.96	4.96	4.96	4.96	4.96	4.81	1.20
5500	2.46	3.16	3.62	3.62	3.62	3.62	3.62	3.62	3.58	0.89
6000	1.99	2.43	2.94	2.90	2.95	2.94	2.94	2.94	2.73	0.68
6500	1.64	1.90	2.42	2.33	2.44	2.44	2.44	2.44	2.13	0.53
7000	1.36	1.49	2.02	1.90	2.06	2.06	2.06	2.06	1.69	0.42
7500	1.15	1.18	1.70	1.56	1.76	1.76	1.76	1.76	1.37	0.34
8000	0.98	0.94	1.45	1.30	1.52	1.51	1.52	1.52	1.12	0.28
8500	0.84	0.75	1.25	1.08	1.33	1.29	1.33	1.33	0.93	0.23
9000	0.72	0.60	1.09	0.91	1.17	1.10	1.17	1.17	0.78	0.19
9500	0.63	0.51	0.99	0.79	1.11	1.00	1.11	1.10	0.68	0.17
10000	0.55	0.42	0.87	0.66	0.98	0.86	0.99	0.96	0.58	0.14
10500	0.48	0.35	0.76	0.56	0.87	0.75	0.89	0.84	0.50	0.12
11000	0.42	0.30	0.67	0.47	0.77	0.65	0.80	0.74	0.43	0.11
11500	0.38	0.25	0.60	0.40	0.68	0.57	0.72	0.66	0.38	0.09
12000	0.33	0.22	0.53	0.34	0.61	0.50	0.66	0.58	0.33	0.08
CHECK		1	2	3	4	5	6	7	Signature	
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		8	9	10	11	12	13			
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2No.
M16 8.8
M16 4.6
M12 8.8
M12 4.6
Notes:

UZ150-24	DOUBLE SPAN LAPPED									
	IN	OUT	IN	OUT	IN	OUT	IN	OUT	L/150	L/600
BRIDGE	0	0	1	1	2	2	3	3		
Span										
2500	20.12	28.12	28.12	28.12	28.12	28.12	28.12	28.12	50.22	12.55
3000	12.82	19.72	19.79	19.88	19.88	19.88	19.88	19.88	28.50	7.13
3500	8.69	14.01	14.30	14.83	14.82	14.82	14.82	14.82	17.63	4.41
4000	6.17	9.73	10.15	10.65	10.71	10.71	10.71	10.71	11.62	2.91
4500	4.59	6.91	7.40	7.71	7.91	7.91	7.91	7.91	8.05	2.01
5000	3.54	5.10	5.63	5.79	6.09	6.09	6.09	6.09	5.80	1.45
5500	2.80	3.86	4.42	4.48	4.84	4.84	4.84	4.84	4.31	1.08
6000	2.27	2.98	3.55	3.55	3.94	3.88	3.94	3.94	3.29	0.82
6500	1.87	2.34	2.91	2.85	3.25	3.16	3.27	3.27	2.57	0.64
7000	1.56	1.85	2.43	2.33	2.71	2.61	2.75	2.75	2.04	0.51
7500	1.32	1.48	2.05	1.92	2.29	2.19	2.35	2.31	1.65	0.41
8000	1.12	1.19	1.75	1.60	1.96	1.85	2.04	1.97	1.35	0.34
8500	0.97	0.96	1.51	1.34	1.69	1.58	1.78	1.69	1.12	0.28
9000	0.84	0.78	1.31	1.13	1.48	1.36	1.56	1.47	0.94	0.23
9500	0.73	0.66	1.19	0.99	1.36	1.23	1.45	1.35	0.81	0.20
10000	0.64	0.55	1.05	0.84	1.20	1.07	1.28	1.18	0.70	0.17
10500	0.57	0.46	0.92	0.71	1.06	0.93	1.14	1.04	0.60	0.15
11000	0.50	0.39	0.82	0.60	0.94	0.81	1.01	0.91	0.52	0.13
11500	0.45	0.34	0.73	0.51	0.84	0.71	0.91	0.81	0.45	0.11
12000	0.40	0.29	0.65	0.44	0.75	0.62	0.82	0.72	0.40	0.10
CHECK		1	2	3	4	5	6	7	Signature	
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NOTE: *To ensure correct design approach please read corresponding "Check" notes (numbered above) and cross off during design process*
Design or checking engineer to sign once notes are understood and crossed.

2No.
M16 8.8
M16 4.6
M12 8.8
M12 4.6
Notes:

UZ200-15	DOUBLE SPAN LAPPED									
	IN	OUT	IN	OUT	IN	OUT	IN	OUT	L/150	L/600
BRIDGE	0	0	1	1	2	2	3	3		
Span										
2500	12.17	12.17	12.16	12.16	12.17	12.17	12.17	12.16	71.72	17.93
3000	9.15	9.15	9.15	9.15	9.15	9.15	9.15	9.15	40.71	10.18
3500	7.16	7.16	7.16	7.16	7.16	7.16	7.16	7.16	25.18	6.29
4000	5.76	5.76	5.74	5.74	5.74	5.74	5.74	5.74	16.60	4.15
4500	4.70	4.70	4.72	4.72	4.72	4.70	4.70	4.70	11.50	2.87
5000	3.62	3.91	3.91	3.91	3.91	3.91	3.91	3.91	8.28	2.07
5500	2.87	3.29	3.29	3.29	3.29	3.29	3.29	3.29	6.15	1.54
6000	2.32	2.81	2.81	2.81	2.81	2.81	2.81	2.81	4.70	1.17
6500	1.91	2.26	2.42	2.42	2.42	2.42	2.42	2.42	3.66	0.92
7000	1.60	1.85	2.10	2.07	2.10	2.10	2.10	2.10	2.91	0.73
7500	1.36	1.52	1.78	1.74	1.81	1.81	1.81	1.81	2.35	0.59
8000	1.16	1.26	1.53	1.47	1.57	1.57	1.57	1.57	1.93	0.48
8500	1.00	1.05	1.32	1.26	1.37	1.37	1.37	1.37	1.60	0.40
9000	0.87	0.87	1.16	1.08	1.21	1.19	1.21	1.21	1.34	0.34
9500	0.78	0.76	1.07	0.99	1.15	1.11	1.15	1.15	1.16	0.29
10000	0.69	0.64	0.95	0.85	1.02	0.97	1.02	1.02	0.99	0.25
10500	0.61	0.54	0.84	0.74	0.91	0.86	0.91	0.91	0.85	0.21
11000	0.54	0.46	0.75	0.64	0.82	0.76	0.82	0.81	0.74	0.18
11500	0.48	0.39	0.67	0.56	0.73	0.67	0.75	0.72	0.64	0.16
12000	0.43	0.33	0.61	0.49	0.66	0.60	0.68	0.65	0.57	0.14
12500	0.40	0.29	0.58	0.45	0.65	0.58	0.69	0.64	0.52	0.13
13000	0.36	0.25	0.53	0.40	0.59	0.52	0.62	0.58	0.46	0.11
13500	0.33	0.22	0.48	0.35	0.53	0.46	0.57	0.52	0.41	0.10
14000	0.29	0.19	0.43	0.31	0.48	0.42	0.52	0.47	0.36	0.09
14500	0.27	0.17	0.39	0.27	0.44	0.37	0.47	0.43	0.33	0.08
15000	0.24	0.15	0.36	0.24	0.41	0.33	0.44	0.39	0.29	0.07
CHECK		1	2	3	4	5	6	7	Signature	
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Design or checking engineer to sign once notes are understood and crossed.

2No.
M16 8.8
M16 4.6
M12 8.8
M12 4.6
Notes:

UZ200-19	DOUBLE SPAN LAPPED									
	IN	OUT	IN	OUT	IN	OUT	IN	OUT	L/150	L/600
BRIDGE	0	0	1	1	2	2	3	3		
Span										
2500	23.80	23.80	23.79	23.79	23.80	23.80	23.79	23.80	90.28	22.57
3000	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	51.24	12.81
3500	12.00	13.00	13.00	13.00	13.00	13.00	13.00	13.00	31.69	7.92
4000	8.38	10.09	10.09	10.09	10.09	10.09	10.09	10.09	20.89	5.22
4500	6.15	8.02	8.02	8.02	8.02	8.02	8.02	8.02	14.47	3.62
5000	4.69	6.50	6.50	6.50	6.50	6.50	6.50	6.50	10.42	2.61
5500	3.69	5.28	5.36	5.36	5.36	5.36	5.36	5.36	7.75	1.94
6000	2.97	4.18	4.38	4.38	4.38	4.38	4.38	4.38	5.91	1.48
6500	2.43	3.37	3.64	3.64	3.64	3.64	3.64	3.64	4.61	1.15
7000	2.03	2.75	3.07	3.07	3.07	3.07	3.07	3.07	3.67	0.92
7500	1.71	2.27	2.60	2.58	2.62	2.62	2.62	2.62	2.96	0.74
8000	1.46	1.88	2.23	2.20	2.27	2.27	2.27	2.27	2.43	0.61
8500	1.25	1.55	1.94	1.88	1.98	1.98	1.98	1.98	2.01	0.50
9000	1.09	1.27	1.69	1.62	1.74	1.74	1.74	1.74	1.69	0.42
9500	0.95	1.07	1.57	1.48	1.66	1.65	1.66	1.66	1.46	0.37
10000	0.83	0.88	1.38	1.28	1.48	1.45	1.48	1.48	1.25	0.31
10500	0.76	0.73	1.23	1.11	1.32	1.28	1.32	1.32	1.07	0.27
11000	0.65	0.61	1.10	0.97	1.19	1.13	1.19	1.19	0.93	0.23
11500	0.58	0.52	0.98	0.83	1.08	1.01	1.08	1.08	0.81	0.20
12000	0.52	0.44	0.88	0.72	0.98	0.90	0.98	0.97	0.71	0.18
12500	0.47	0.39	0.85	0.64	0.96	0.88	1.00	0.96	0.65	0.16
13000	0.42	0.34	0.77	0.55	0.87	0.78	0.91	0.86	0.58	0.14
13500	0.38	0.29	0.70	0.47	0.79	0.70	0.83	0.78	0.51	0.13
14000	0.35	0.26	0.63	0.41	0.72	0.63	0.77	0.71	0.46	0.11
14500	0.31	0.23	0.58	0.36	0.66	0.56	0.71	0.64	0.41	0.10
15000	0.29	0.20	0.52	0.32	0.60	0.49	0.65	0.58	0.37	0.09
CHECK		1	2	3	4	5	6	7	Signature	
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Design or checking engineer to sign once notes are understood and crossed.

2No.
M16 8.8
M16 4.6
M12 8.8
M12 4.6
Notes:

UZ200-24	DOUBLE SPAN LAPPED									
	IN	OUT	IN	OUT	IN	OUT	IN	OUT	L/150	L/600
BRIDGE	0	0	1	1	2	2	3	3		
Span										
2500	36.38	42.04	42.04	42.04	42.04	42.04	42.04	42.04	111.89	27.96
3000	21.17	29.96	29.96	29.96	29.96	29.96	29.96	29.96	63.48	15.87
3500	13.76	21.48	21.48	21.48	21.48	21.48	21.48	21.48	39.26	9.82
4000	9.48	16.03	16.03	16.03	16.03	16.03	16.03	16.03	25.89	6.47
4500	6.91	12.15	12.15	12.15	12.15	12.15	12.15	12.15	17.93	4.48
5000	5.25	9.34	9.35	9.35	9.35	9.35	9.35	9.35	12.91	3.23
5500	4.11	7.16	7.43	7.43	7.43	7.43	7.43	7.43	9.60	2.40
6000	3.31	5.60	6.04	6.04	6.04	6.04	6.04	6.04	7.32	1.83
6500	2.71	4.46	4.96	5.01	5.01	5.01	5.01	5.01	5.71	1.43
7000	2.26	3.59	4.13	4.23	4.23	4.23	4.23	4.23	4.54	1.14
7500	1.90	2.91	3.48	3.53	3.61	3.61	3.61	3.61	3.67	0.92
8000	1.63	2.38	2.97	2.97	3.13	3.13	3.13	3.13	3.01	0.75
8500	1.40	1.96	2.56	2.52	2.73	2.73	2.73	2.73	2.49	0.62
9000	1.22	1.61	2.23	2.15	2.41	2.41	2.41	2.41	2.09	0.52
9500	1.07	1.36	2.04	1.93	2.28	2.27	2.28	2.28	1.81	0.45
10000	0.94	1.12	1.79	1.66	2.03	1.98	2.03	2.03	1.55	0.39
10500	0.84	0.94	1.58	1.42	1.82	1.74	1.82	1.82	1.33	0.33
11000	0.75	0.79	1.41	1.23	1.64	1.53	1.64	1.64	1.15	0.29
11500	0.67	0.67	1.26	1.06	1.48	1.35	1.49	1.49	1.01	0.25
12000	0.60	0.57	1.13	0.92	1.33	1.20	1.35	1.33	0.88	0.22
12500	0.54	0.51	1.06	0.82	1.29	1.14	1.37	1.30	0.81	0.20
13000	0.49	0.44	0.95	0.71	1.16	1.01	1.25	1.16	0.71	0.18
13500	0.45	0.39	0.86	0.61	1.05	0.90	1.15	1.04	0.64	0.16
14000	0.41	0.34	0.77	0.54	0.95	0.80	1.06	0.94	0.57	0.14
14500	0.37	0.30	0.70	0.47	0.87	0.71	0.97	0.85	0.51	0.13
15000	0.34	0.27	0.64	0.41	0.79	0.63	0.88	0.77	0.46	0.11
CHECK		1	2	3	4	5	6	7	Signature	
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Design or checking engineer to sign once notes are understood and crossed.

2No.
M16 8.8
M16 4.6
M12 8.8
M12 4.6
Notes:

UZ250-19	DOUBLE SPAN LAPPED									
	IN	OUT	IN	OUT	IN	OUT	IN	OUT	L/150	L/600
BRIDGE	0	0	1	1	2	2	3	3		
Span										
2500	19.82	19.82	19.81	19.81	19.82	19.82	19.82	19.81	153.14	38.29
3000	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	86.92	21.73
3500	11.80	11.80	11.80	11.80	11.80	11.80	11.80	11.80	53.76	13.44
4000	9.53	9.53	9.53	9.53	9.53	9.53	9.53	9.53	35.44	8.86
4500	7.21	7.85	7.85	7.85	7.85	7.85	7.85	7.85	24.55	6.14
5000	5.52	6.56	6.56	6.56	6.56	6.56	6.56	6.56	17.68	4.42
5500	4.35	5.55	5.55	5.55	5.55	5.55	5.55	5.55	13.16	3.29
6000	3.51	4.75	4.75	4.75	4.75	4.75	4.75	4.75	10.03	2.51
6500	2.89	3.95	4.11	4.11	4.11	4.11	4.11	4.11	7.82	1.96
7000	2.42	3.31	3.58	3.58	3.58	3.58	3.58	3.58	6.22	1.55
7500	2.05	2.64	3.04	3.04	3.14	3.14	3.14	3.14	5.02	1.26
8000	1.75	2.19	2.61	2.57	2.78	2.78	2.78	2.78	4.11	1.03
8500	1.52	1.82	2.26	2.20	2.42	2.40	2.42	2.42	3.41	0.85
9000	1.32	1.51	1.97	1.89	2.14	2.09	2.14	2.14	2.86	0.72
9500	1.17	1.31	1.82	1.72	2.02	1.94	2.03	2.03	2.48	0.62
10000	1.03	1.11	1.61	1.49	1.78	1.70	1.81	1.79	2.12	0.53
10500	0.91	0.93	1.43	1.29	1.58	1.50	1.62	1.59	1.82	0.46
11000	0.81	0.78	1.27	1.12	1.42	1.33	1.46	1.42	1.58	0.39
11500	0.72	0.65	1.14	0.97	1.27	1.18	1.32	1.27	1.38	0.34
12000	0.64	0.56	1.02	0.85	1.15	1.05	1.20	1.14	1.21	0.30
12500	0.58	0.49	0.98	0.78	1.12	1.02	1.20	1.12	1.10	0.28
13000	0.52	0.43	0.89	0.68	1.01	0.91	1.09	1.01	0.98	0.24
13500	0.47	0.37	0.80	0.60	0.92	0.81	0.99	0.91	0.87	0.22
14000	0.43	0.32	0.73	0.52	0.84	0.72	0.90	0.82	0.78	0.19
14500	0.39	0.28	0.66	0.46	0.76	0.65	0.83	0.75	0.70	0.17
15000	0.35	0.25	0.60	0.40	0.70	0.58	0.76	0.68	0.63	0.16
CHECK		1	2	3	4	5	6	7	Signature	
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Design or checking engineer to sign once notes are understood and crossed.

2No.
M16 8.8
M16 4.6
M12 8.8
M12 4.6
Notes:

UZ250-24	DOUBLE SPAN LAPPED									
	IN	OUT	IN	OUT	IN	OUT	IN	OUT	L/150	L/600
BRIDGE	0	0	1	1	2	2	3	3		
Span										
2500	38.86	38.86	38.86	38.86	38.87	38.86	38.86	38.87	190.71	47.68
3000	26.37	28.57	28.57	28.57	28.57	28.57	28.57	28.57	108.24	27.06
3500	16.82	21.82	21.82	21.82	21.81	21.81	21.82	21.82	66.94	16.74
4000	11.59	17.13	17.13	17.13	17.13	17.13	17.13	17.13	44.14	11.03
4500	8.44	13.75	13.75	13.75	13.74	13.75	13.75	13.75	30.57	7.64
5000	6.40	11.23	11.23	11.23	11.23	11.23	11.23	11.23	22.02	5.50
5500	5.02	9.10	9.32	9.32	9.32	9.31	9.32	9.31	16.36	4.09
6000	4.03	7.19	7.57	7.58	7.58	7.58	7.58	7.58	12.49	3.12
6500	3.30	5.78	6.21	6.29	6.29	6.29	6.29	6.29	9.74	2.44
7000	2.75	4.71	5.19	5.30	5.30	5.30	5.30	5.30	7.74	1.94
7500	2.32	3.85	4.39	4.46	4.53	4.53	4.53	4.53	6.25	1.56
8000	1.98	3.12	3.76	3.78	3.92	3.92	3.92	3.92	5.12	1.28
8500	1.71	2.54	3.25	3.23	3.42	3.42	3.42	3.42	4.25	1.06
9000	1.48	2.07	2.84	2.77	3.02	3.02	3.02	3.02	3.56	0.89
9500	1.30	1.73	2.62	2.53	2.87	2.86	2.87	2.87	3.09	0.77
10000	1.15	1.42	2.30	2.17	2.55	2.50	2.55	2.55	2.64	0.66
10500	1.02	1.18	2.04	1.86	2.29	2.21	2.29	2.29	2.27	0.57
11000	0.91	0.99	1.82	1.58	2.06	1.95	2.06	2.06	1.97	0.49
11500	0.81	0.84	1.63	1.36	1.86	1.74	1.86	1.86	1.71	0.43
12000	0.73	0.72	1.47	1.17	1.68	1.55	1.70	1.68	1.50	0.38
12500	0.66	0.64	1.36	1.04	1.64	1.50	1.72	1.65	1.38	0.34
13000	0.60	0.55	1.22	0.89	1.48	1.32	1.57	1.48	1.22	0.30
13500	0.54	0.48	1.10	0.77	1.34	1.17	1.44	1.34	1.08	0.27
14000	0.49	0.42	0.99	0.67	1.22	1.03	1.33	1.21	0.97	0.24
14500	0.45	0.37	0.89	0.58	1.12	0.92	1.21	1.10	0.87	0.22
15000	0.41	0.32	0.81	0.52	1.02	0.81	1.11	1.00	0.78	0.20
CHECK		1	2	3	4	5	6	7	Signature	
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Design or checking engineer to sign once notes are understood and crossed.

2No.
M16 8.8
M16 4.6
M12 8.8
M12 4.6
Notes:

UZ150-12	FIVE SPANS LAPPED									
	IN	OUT	IN	OUT	IN	OUT	IN	OUT	L/150	L/600
BRIDGE	0	0	1	1	2	2	3	3		
Span										
2500	9.09	9.09	9.07	9.07	9.10	9.10	9.10	9.10	19.68	4.92
3000	6.86	6.86	6.86	6.86	6.86	6.86	6.86	6.86	11.25	2.81
3500	5.19	5.37	5.37	5.37	5.35	5.35	5.37	5.37	7.01	1.75
4000	3.83	4.31	4.30	4.30	4.30	4.30	4.31	4.31	4.65	1.16
4500	2.92	3.27	3.52	3.52	3.52	3.52	3.52	3.52	3.24	0.81
5000	2.28	2.41	2.92	2.91	2.92	2.92	2.92	2.92	2.34	0.59
5500	1.80	1.77	2.43	2.26	2.43	2.43	2.43	2.43	1.75	0.44
6000	1.45	1.31	1.98	1.76	1.98	1.98	1.98	1.98	1.34	0.34
6500	1.18	1.00	1.64	1.39	1.64	1.62	1.64	1.64	1.05	0.26
7000	0.97	0.77	1.38	1.11	1.38	1.33	1.38	1.38	0.84	0.21
7500	0.81	0.59	1.18	0.89	1.18	1.11	1.18	1.18	0.68	0.17
8000	0.68	0.46	1.02	0.71	1.02	0.93	1.02	1.01	0.56	0.14
8500	0.57	0.36	0.88	0.58	0.89	0.78	0.89	0.86	0.46	0.12
9000	0.49	0.29	0.77	0.48	0.79	0.66	0.79	0.74	0.39	0.10
9500	0.43	0.24	0.70	0.40	0.75	0.58	0.75	0.67	0.33	0.08
10000	0.37	0.20	0.62	0.33	0.66	0.49	0.67	0.58	0.29	0.07
10500	0.32	0.16	0.55	0.27	0.59	0.41	0.60	0.50	0.25	0.06
11000	0.27	0.14	0.48	0.23	0.52	0.35	0.54	0.44	0.21	0.05
11500	0.24	0.12	0.43	0.19	0.47	0.30	0.49	0.38	0.19	0.05
12000	0.20	0.10	0.38	0.16	0.42	0.26	0.44	0.33	0.16	0.04
CHECK		1	2	3	4	5	6	7	Signature	
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NOTE: *To ensure correct design approach please read corresponding "Check" notes (numbered above) and cross off during design process*
Design or checking engineer to sign once notes are understood and crossed.

2No.
M16 8.8
M16 4.6
M12 8.8
M12 4.6
Notes:

UZ150-15	FIVE SPANS LAPPED									
	IN	OUT	IN	OUT	IN	OUT	IN	OUT	L/150	L/600
BRIDGE	0	0	1	1	2	2	3	3		
Span										
2500	14.31	19.06	19.07	19.07	19.06	19.06	19.06	19.06	24.49	6.12
3000	9.46	10.34	10.37	10.37	10.36	10.36	10.34	10.34	14.00	3.50
3500	6.59	7.54	7.56	7.56	7.54	7.54	7.54	7.54	8.72	2.18
4000	4.81	5.73	5.74	5.74	5.73	5.73	5.73	5.73	5.79	1.45
4500	3.64	4.37	4.51	4.51	4.50	4.50	4.50	4.50	4.03	1.01
5000	2.82	3.30	3.63	3.63	3.63	3.63	3.63	3.63	2.92	0.73
5500	2.23	2.41	2.94	2.94	2.94	2.94	2.94	2.94	2.18	0.54
6000	1.79	1.76	2.38	2.35	2.39	2.39	2.39	2.39	1.67	0.42
6500	1.46	1.30	1.99	1.88	1.99	1.99	1.99	1.99	1.31	0.33
7000	1.20	0.97	1.68	1.52	1.68	1.68	1.68	1.68	1.04	0.26
7500	0.99	0.75	1.43	1.21	1.43	1.43	1.43	1.43	0.84	0.21
8000	0.83	0.58	1.24	0.97	1.24	1.23	1.24	1.24	0.69	0.17
8500	0.70	0.46	1.08	0.78	1.08	1.05	1.08	1.08	0.58	0.14
9000	0.59	0.37	0.95	0.62	0.95	0.89	0.95	0.95	0.48	0.12
9500	0.51	0.31	0.91	0.51	0.91	0.80	0.91	0.90	0.42	0.10
10000	0.44	0.26	0.81	0.42	0.81	0.67	0.81	0.78	0.36	0.09
10500	0.38	0.21	0.71	0.35	0.72	0.57	0.72	0.68	0.31	0.08
11000	0.33	0.18	0.64	0.29	0.65	0.48	0.65	0.60	0.27	0.07
11500	0.29	0.15	0.57	0.25	0.58	0.40	0.59	0.52	0.23	0.06
12000	0.23	0.12	0.43	0.19	0.46	0.31	0.46	0.41	0.19	0.05
CHECK		1	2	3	4	5	6	7	Signature	
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Design or checking engineer to sign once notes are understood and crossed.

2No.
M16 8.8
M16 4.6
M12 8.8
M12 4.6
Notes:

UZ150-19	FIVE SPANS LAPPED									
	IN	OUT	IN	OUT	IN	OUT	IN	OUT	L/150	L/600
BRIDGE	0	0	1	1	2	2	3	3		
Span										
2500	17.73	21.03	21.05	21.05	21.03	21.03	21.01	21.01	31.42	7.85
3000	11.31	14.65	14.68	14.68	14.66	14.66	14.65	14.65	17.97	4.49
3500	7.75	10.53	10.55	10.55	10.53	10.53	10.53	10.53	11.19	2.80
4000	5.59	7.93	8.02	8.02	8.01	8.01	8.00	8.00	7.43	1.86
4500	4.19	5.78	6.30	6.30	6.29	6.29	6.29	6.29	5.17	1.29
5000	3.23	4.26	5.07	5.07	5.07	5.07	5.07	5.07	3.74	0.94
5500	2.55	3.13	4.11	4.03	4.11	4.11	4.11	4.11	2.80	0.70
6000	2.05	2.31	3.34	3.13	3.34	3.34	3.34	3.34	2.14	0.54
6500	1.68	1.71	2.78	2.47	2.78	2.78	2.78	2.78	1.68	0.42
7000	1.39	1.29	2.34	1.97	2.34	2.34	2.34	2.34	1.34	0.33
7500	1.16	0.99	2.00	1.58	2.00	1.98	2.00	2.00	1.08	0.27
8000	0.98	0.78	1.73	1.28	1.73	1.65	1.73	1.73	0.89	0.22
8500	0.84	0.62	1.50	1.03	1.51	1.39	1.51	1.51	0.74	0.18
9000	0.72	0.50	1.31	0.83	1.33	1.18	1.33	1.33	0.62	0.16
9500	0.62	0.42	1.20	0.69	1.26	1.04	1.26	1.20	0.53	0.13
10000	0.54	0.35	1.05	0.57	1.13	0.88	1.13	1.04	0.46	0.11
10500	0.47	0.29	0.93	0.47	1.01	0.75	1.01	0.90	0.39	0.10
11000	0.41	0.25	0.83	0.39	0.91	0.63	0.91	0.78	0.34	0.09
11500	0.36	0.21	0.74	0.33	0.82	0.54	0.82	0.68	0.30	0.07
12000	0.32	0.18	0.66	0.28	0.74	0.46	0.75	0.59	0.26	0.07
CHECK		1	2	3	4	5	6	7	Signature	
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Design or checking engineer to sign once notes are understood and crossed.

2No.
M16 8.8
M16 4.6
M12 8.8
M12 4.6
Notes:

UZ150-24	FIVE SPANS LAPPED									
	IN	OUT	IN	OUT	IN	OUT	IN	OUT	L/150	L/600
BRIDGE	0	0	1	1	2	2	3	3		
Span										
2500	20.98	28.09	28.12	28.12	28.09	28.09	28.09	28.09	37.85	9.46
3000	13.21	19.30	19.34	19.34	19.32	19.32	19.32	19.32	21.64	5.41
3500	8.96	13.56	14.09	14.09	14.07	14.07	14.06	14.06	13.48	3.37
4000	6.38	9.68	10.71	10.71	10.69	10.69	10.69	10.69	8.95	2.24
4500	4.76	7.06	8.27	8.25	8.40	8.40	8.40	8.40	6.23	1.56
5000	3.65	5.22	6.52	6.37	6.77	6.77	6.77	6.77	4.51	1.13
5500	2.89	3.86	5.20	4.93	5.48	5.48	5.48	5.48	3.37	0.84
6000	2.34	2.87	4.18	3.85	4.46	4.40	4.47	4.47	2.58	0.64
6500	1.92	2.14	3.44	3.04	3.71	3.56	3.71	3.71	2.02	0.50
7000	1.60	1.63	2.87	2.43	3.13	2.92	3.13	3.13	1.61	0.40
7500	1.35	1.26	2.43	1.96	2.67	2.42	2.67	2.63	1.30	0.33
8000	1.15	1.00	2.08	1.59	2.31	2.03	2.31	2.22	1.07	0.27
8500	0.99	0.80	1.79	1.30	2.02	1.71	2.02	1.90	0.89	0.22
9000	0.85	0.65	1.56	1.06	1.77	1.45	1.78	1.63	0.75	0.19
9500	0.75	0.55	1.43	0.88	1.64	1.29	1.69	1.48	0.64	0.16
10000	0.66	0.46	1.26	0.73	1.44	1.09	1.50	1.28	0.55	0.14
10500	0.58	0.39	1.12	0.61	1.27	0.93	1.35	1.11	0.47	0.12
11000	0.51	0.33	0.99	0.51	1.13	0.80	1.21	0.97	0.41	0.10
11500	0.45	0.28	0.89	0.44	1.01	0.68	1.08	0.84	0.36	0.09
12000	0.40	0.25	0.80	0.37	0.91	0.58	0.97	0.74	0.32	0.08
12500	0.37	0.22	0.75	0.33	0.87	0.51	0.94	0.68	0.28	0.07
13000	0.33	0.19	0.67	0.29	0.78	0.44	0.85	0.59	0.25	0.06
13500	0.30	0.17	0.61	0.25	0.71	0.38	0.77	0.51	0.23	0.06
14000	0.27	0.15	0.55	0.22	0.64	0.33	0.70	0.45	0.20	0.05
14500	0.24	0.14	0.50	0.20	0.58	0.29	0.63	0.39	0.18	0.05
15000	0.22	0.12	0.45	0.17	0.53	0.26	0.58	0.35	0.16	0.04
CHECK		1	2	3	4	5	6	7	Signature	
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Design or checking engineer to sign once notes are understood and crossed.

2No.
M16 8.8
M16 4.6
M12 8.8
M12 4.6
Notes:

UZ200-15	FIVE SPANS LAPPED									
	IN	OUT	IN	OUT	IN	OUT	IN	OUT	L/150	L/600
BRIDGE	0	0	1	1	2	2	3	3		
Span										
2500	13.28	13.28	13.29	13.29	13.29	13.29	13.29	13.29	54.06	13.51
3000	10.13	10.13	10.13	10.13	10.13	10.13	10.13	10.13	30.91	7.73
3500	8.03	8.03	8.03	8.03	8.00	8.00	8.03	8.03	19.26	4.81
4000	6.53	6.53	6.53	6.53	6.53	6.53	6.53	6.53	12.78	3.19
4500	5.00	5.40	5.40	5.40	5.40	5.40	5.40	5.40	8.90	2.23
5000	3.90	4.54	4.54	4.54	4.54	4.54	4.54	4.54	6.44	1.61
5500	3.10	3.86	3.85	3.85	3.86	3.86	3.86	3.86	4.81	1.20
6000	2.50	3.03	3.31	3.31	3.31	3.31	3.31	3.31	3.68	0.92
6500	2.06	2.39	2.87	2.83	2.87	2.87	2.87	2.87	2.88	0.72
7000	1.71	1.90	2.47	2.32	2.47	2.47	2.47	2.47	2.30	0.57
7500	1.45	1.51	2.11	1.93	2.11	2.11	2.11	2.11	1.86	0.47
8000	1.23	1.21	1.82	1.61	1.83	1.82	1.83	1.83	1.53	0.38
8500	1.06	0.99	1.58	1.36	1.60	1.56	1.60	1.60	1.27	0.32
9000	0.92	0.81	1.38	1.15	1.41	1.35	1.41	1.41	1.07	0.27
9500	0.82	0.67	1.29	1.01	1.34	1.24	1.34	1.33	0.92	0.23
10000	0.72	0.55	1.14	0.85	1.19	1.08	1.19	1.17	0.79	0.20
10500	0.63	0.45	1.01	0.72	1.07	0.94	1.07	1.03	0.68	0.17
11000	0.56	0.38	0.91	0.62	0.96	0.83	0.96	0.91	0.59	0.15
11500	0.49	0.32	0.81	0.53	0.87	0.73	0.87	0.81	0.51	0.13
12000	0.43	0.27	0.73	0.46	0.79	0.64	0.79	0.72	0.45	0.11
12500	0.39	0.24	0.71	0.40	0.78	0.60	0.80	0.70	0.41	0.10
13000	0.35	0.21	0.64	0.34	0.71	0.52	0.73	0.62	0.36	0.09
13500	0.31	0.18	0.58	0.30	0.64	0.46	0.67	0.56	0.32	0.08
14000	0.28	0.15	0.53	0.26	0.58	0.41	0.62	0.50	0.29	0.07
14500	0.25	0.14	0.48	0.22	0.53	0.36	0.56	0.45	0.26	0.06
15000	0.22	0.12	0.44	0.20	0.49	0.32	0.52	0.40	0.23	0.06
CHECK		1	2	3	4	5	6	7	Signature	
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2No.
M16 8.8
M16 4.6
M12 8.8
M12 4.6
Notes:

UZ200-19	FIVE SPANS LAPPED									
	IN	OUT	IN	OUT	IN	OUT	IN	OUT	L/150	L/600
BRIDGE	0	0	1	1	2	2	3	3		
Span										
2500	26.74	26.74	26.75	26.75	26.76	26.76	26.76	26.76	68.04	17.01
3000	18.35	19.85	19.85	19.85	19.85	19.85	19.84	19.84	38.91	9.73
3500	12.21	15.24	15.24	15.24	15.16	15.16	15.24	15.23	24.24	6.06
4000	8.56	11.98	11.98	11.98	11.98	11.98	11.99	11.99	16.08	4.02
4500	6.27	9.46	9.46	9.46	9.46	9.46	9.46	9.46	11.20	2.80
5000	4.78	7.51	7.63	7.63	7.62	7.62	7.62	7.62	8.11	2.03
5500	3.75	5.82	6.17	6.17	6.17	6.17	6.17	6.17	6.05	1.51
6000	3.02	4.54	5.02	5.02	5.02	5.02	5.02	5.02	4.64	1.16
6500	2.47	3.58	4.17	4.17	4.17	4.17	4.17	4.17	3.63	0.91
7000	2.05	2.79	3.52	3.47	3.52	3.52	3.52	3.52	2.89	0.72
7500	1.73	2.17	3.01	2.88	3.01	3.01	3.01	3.01	2.34	0.59
8000	1.47	1.69	2.60	2.41	2.60	2.60	2.60	2.60	1.92	0.48
8500	1.26	1.34	2.27	2.04	2.27	2.27	2.27	2.27	1.60	0.40
9000	1.09	1.07	2.00	1.73	2.00	2.00	2.00	2.00	1.34	0.34
9500	0.95	0.89	1.87	1.50	1.90	1.86	1.90	1.90	1.16	0.29
10000	0.84	0.73	1.65	1.24	1.69	1.62	1.69	1.69	0.99	0.25
10500	0.73	0.61	1.47	1.03	1.52	1.41	1.52	1.52	0.85	0.21
11000	0.65	0.51	1.31	0.86	1.37	1.24	1.37	1.36	0.74	0.18
11500	0.58	0.43	1.18	0.72	1.24	1.09	1.24	1.21	0.65	0.16
12000	0.51	0.37	1.06	0.61	1.13	0.97	1.13	1.08	0.57	0.14
12500	0.46	0.32	1.03	0.54	1.14	0.88	1.14	1.05	0.51	0.13
13000	0.42	0.28	0.93	0.46	1.04	0.76	1.04	0.94	0.45	0.11
13500	0.37	0.24	0.85	0.40	0.95	0.66	0.96	0.84	0.40	0.10
14000	0.34	0.21	0.77	0.35	0.87	0.57	0.88	0.75	0.36	0.09
14500	0.31	0.19	0.70	0.30	0.79	0.50	0.81	0.67	0.33	0.08
15000	0.28	0.16	0.65	0.27	0.73	0.43	0.75	0.60	0.29	0.07
CHECK		1	2	3	4	5	6	7	Signature	
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2No.
M16 8.8
M16 4.6
M12 8.8
M12 4.6
Notes:

UZ200-24	FIVE SPANS LAPPED									
	IN	OUT	IN	OUT	IN	OUT	IN	OUT	L/150	L/600
BRIDGE	0	0	1	1	2	2	3	3		
Span										
2500	35.76	43.50	43.54	43.54	43.49	43.49	43.49	43.46	84.30	21.07
3000	21.74	29.88	29.96	29.95	29.92	29.91	29.91	29.88	48.20	12.05
3500	14.13	21.77	21.83	21.83	21.79	21.79	21.77	21.77	30.03	7.51
4000	9.73	16.57	16.59	16.59	16.56	16.56	16.56	16.56	19.92	4.98
4500	7.09	13.02	13.02	13.02	13.01	13.00	13.00	13.00	13.88	3.47
5000	5.38	10.04	10.49	10.49	10.48	10.48	10.48	10.48	10.05	2.51
5500	4.21	7.64	8.49	8.49	8.49	8.49	8.49	8.49	7.50	1.87
6000	3.38	5.84	6.91	6.91	6.91	6.91	6.91	6.91	5.74	1.44
6500	2.77	4.52	5.74	5.72	5.74	5.74	5.74	5.74	4.50	1.12
7000	2.31	3.52	4.84	4.65	4.84	4.84	4.84	4.84	3.58	0.90
7500	1.95	2.75	4.09	3.82	4.14	4.14	4.14	4.14	2.90	0.73
8000	1.66	2.15	3.49	3.16	3.58	3.58	3.58	3.58	2.38	0.60
8500	1.43	1.71	3.01	2.63	3.13	3.13	3.13	3.13	1.98	0.50
9000	1.24	1.37	2.62	2.20	2.75	2.73	2.75	2.75	1.66	0.42
9500	1.09	1.14	2.40	1.90	2.62	2.48	2.62	2.62	1.43	0.36
10000	0.96	0.94	2.12	1.58	2.33	2.14	2.33	2.33	1.23	0.31
10500	0.85	0.79	1.87	1.32	2.09	1.85	2.09	2.09	1.06	0.26
11000	0.76	0.66	1.67	1.10	1.88	1.61	1.88	1.84	0.92	0.23
11500	0.68	0.56	1.49	0.93	1.70	1.41	1.70	1.63	0.80	0.20
12000	0.61	0.48	1.34	0.79	1.55	1.23	1.55	1.44	0.70	0.18
12500	0.55	0.43	1.27	0.70	1.56	1.12	1.57	1.37	0.63	0.16
13000	0.50	0.37	1.15	0.60	1.40	0.97	1.44	1.21	0.56	0.14
13500	0.45	0.32	1.04	0.52	1.27	0.84	1.32	1.08	0.50	0.13
14000	0.41	0.28	0.94	0.45	1.15	0.73	1.21	0.96	0.45	0.11
14500	0.37	0.25	0.86	0.40	1.05	0.64	1.12	0.85	0.40	0.10
15000	0.36	0.22	0.78	0.35	0.96	0.56	1.04	0.76	0.36	0.09
CHECK		1	2	3	4	5	6	7	Signature	
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		8	9	10	11	12	13			
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2No.
M16 8.8
M16 4.6
M12 8.8
M12 4.6
Notes:

UZ250-19	FIVE SPANS LAPPED									
	IN	OUT	IN	OUT	IN	OUT	IN	OUT	L/150	L/600
BRIDGE	0	0	1	1	2	2	3	3		
Span										
2500	21.54	21.54	21.50	21.50	21.56	21.50	21.56	21.55	115.42	28.86
3000	16.49	16.49	16.49	16.49	16.49	16.49	16.49	16.49	66.00	16.50
3500	13.13	13.13	13.13	13.13	13.09	13.09	13.13	13.13	41.11	10.28
4000	10.08	10.73	10.72	10.72	10.72	10.72	10.73	10.73	27.28	6.82
4500	7.55	8.93	8.93	8.93	8.93	8.93	8.93	8.93	19.00	4.75
5000	5.86	7.54	7.54	7.54	7.54	7.54	7.54	7.54	13.75	3.44
5500	4.62	6.44	6.43	6.43	6.44	6.44	6.44	6.44	10.27	2.57
6000	3.71	5.29	5.55	5.55	5.55	5.55	5.55	5.55	7.87	1.97
6500	3.04	4.16	4.83	4.83	4.83	4.83	4.83	4.83	6.16	1.54
7000	2.53	3.30	4.23	4.06	4.23	4.23	4.23	4.23	4.91	1.23
7500	2.13	2.62	3.60	3.36	3.73	3.73	3.73	3.73	3.98	0.99
8000	1.81	2.11	3.09	2.81	3.27	3.19	3.27	3.27	3.26	0.82
8500	1.55	1.71	2.68	2.37	2.85	2.73	2.85	2.85	2.71	0.68
9000	1.34	1.37	2.34	2.00	2.51	2.36	2.51	2.51	2.28	0.57
9500	1.17	1.13	2.17	1.76	2.39	2.17	2.39	2.33	1.96	0.49
10000	1.03	0.93	1.92	1.48	2.12	1.88	2.12	2.04	1.68	0.42
10500	0.90	0.77	1.70	1.26	1.89	1.65	1.90	1.80	1.45	0.36
11000	0.80	0.64	1.52	1.07	1.69	1.44	1.71	1.59	1.25	0.31
11500	0.71	0.54	1.37	0.92	1.52	1.27	1.55	1.42	1.09	0.27
12000	0.63	0.46	1.23	0.78	1.38	1.12	1.41	1.27	0.96	0.24
12500	0.57	0.41	1.19	0.68	1.35	1.04	1.43	1.22	0.87	0.22
13000	0.51	0.35	1.08	0.58	1.22	0.91	1.30	1.09	0.77	0.19
13500	0.46	0.30	0.98	0.50	1.11	0.80	1.18	0.97	0.69	0.17
14000	0.41	0.26	0.89	0.44	1.01	0.71	1.08	0.87	0.61	0.15
14500	0.37	0.23	0.81	0.38	0.92	0.63	0.99	0.78	0.55	0.14
15000	0.34	0.20	0.74	0.33	0.85	0.55	0.90	0.70	0.50	0.12
CHECK		1	2	3	4	5	6	7	Signature	
	☒									
		8	9	10	11	12	13			
	☒									

NOTE: *To ensure correct design approach please read corresponding "Check" notes (numbered above) and cross off during design process*
Design or checking engineer to sign once notes are understood and crossed.

2No.
M16 8.8
M16 4.6
M12 8.8
M12 4.6
Notes:

UZ250-24	FIVE SPANS LAPPED									
	IN	OUT	IN	OUT	IN	OUT	IN	OUT	L/150	L/600
BRIDGE	0	0	1	1	2	2	3	3		
Span										
2500	43.17	43.17	43.10	43.10	43.20	43.20	43.20	43.20	143.73	35.93
3000	27.04	32.38	32.37	32.38	32.38	32.38	32.37	32.38	82.19	20.55
3500	17.22	25.15	25.16	25.16	25.08	25.08	25.15	25.15	51.20	12.80
4000	11.85	20.03	20.01	20.01	20.00	20.00	20.03	20.03	33.97	8.49
4500	8.62	16.25	16.25	16.25	16.25	16.25	16.25	16.25	23.66	5.92
5000	6.54	12.94	13.39	13.39	13.39	13.39	13.39	13.39	17.13	4.28
5500	5.12	9.99	10.86	10.86	10.86	10.86	10.86	10.86	12.79	3.20
6000	4.11	7.74	8.84	8.84	8.84	8.84	8.84	8.84	9.79	2.45
6500	3.36	5.96	7.32	7.27	7.34	7.34	7.34	7.34	7.67	1.92
7000	2.80	4.58	6.11	5.96	6.19	6.19	6.19	6.19	6.11	1.53
7500	2.36	3.53	5.17	4.95	5.29	5.29	5.29	5.29	4.93	1.24
8000	2.01	2.73	4.43	4.13	4.58	4.58	4.58	4.58	4.06	1.02
8500	1.73	2.17	3.83	3.48	4.00	4.00	4.00	4.00	3.38	0.84
9000	1.50	1.75	3.34	2.87	3.52	3.48	3.52	3.52	2.84	0.71
9500	1.32	1.45	3.09	2.45	3.35	3.19	3.35	3.35	2.44	0.61
10000	1.16	1.19	2.73	2.02	2.98	2.77	2.98	2.98	2.09	0.52
10500	1.03	0.99	2.42	1.67	2.67	2.42	2.67	2.65	1.80	0.45
11000	0.91	0.83	2.16	1.39	2.40	2.12	2.40	2.35	1.56	0.39
11500	0.81	0.70	1.94	1.17	2.18	1.84	2.18	2.09	1.36	0.34
12000	0.73	0.60	1.75	1.00	1.98	1.60	1.98	1.86	1.20	0.30
12500	0.66	0.53	1.64	0.87	1.97	1.44	2.01	1.80	1.08	0.27
13000	0.60	0.46	1.47	0.75	1.78	1.24	1.84	1.60	0.96	0.24
13500	0.54	0.40	1.33	0.65	1.62	1.07	1.68	1.41	0.85	0.21
14000	0.49	0.35	1.21	0.57	1.48	0.92	1.55	1.25	0.76	0.19
14500	0.45	0.30	1.09	0.49	1.35	0.81	1.43	1.10	0.69	0.17
15000	0.41	0.27	1.00	0.43	1.24	0.71	1.32	0.98	0.62	0.15
CHECK		1	2	3	4	5	6	7	Signature	
	☒									
		8	9	10	11	12	13			
	☒									

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2No.
M16 8.8
M16 4.6
M12 8.8
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Notes:

APEX

ULTRA PURLINS

DIMENSIONS						
Purlin Section	W mm	F1 mm	F2 mm	L mm	Thickness mm	Mass kg/m
Z150-12	157	58	50	23	1.2	2.89
Z150-15	157	58	50	25	1.5	3.59
Z150-19	160	59	50	27	1.9	4.51
Z150-24	158	60	49	26	2.4	5.70
Z200-15	207	69	61	25	1.5	4.49
Z200-19	207	71	61	27	1.9	5.74
Z200-24	207	72	62	29	2.4	7.24
Z250-19	262	72	63	26	1.9	6.50
Z250-24	260	74	64	26	2.4	8.16