



**LP**

BUILDING PRODUCTS

**SOLIDSTART™**

ENGINEERED WOOD PRODUCTS

## TECHNICAL GUIDE FOR RESIDENTIAL FLOORS AND ROOFS

### FEATURING

- LP® SOLIDSTART™ I-JOISTS
- LP® SOLIDSTART™ LVL
- LP® SOLIDSTART™ LSL
- LP® SOLIDSTART™ RIM BOARD



**BUILD WITH US:**

Please verify availability with the LP® SolidStart™ Engineered Wood Products distributor in your area prior to specifying these products.



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## Designed to Outperform Traditional Timber

### LP® SOLIDSTART™ I-JOISTS



LP SolidStart I-Joists make true and uniform floors and ceilings possible for residential and commercial construction. Machine made for precise, straight lines that stay straight, they are lighter yet stronger than traditional timber joists and less likely to split, shrink, twist, warp or bow. LP SolidStart I-Joists\* are lightweight and available in longer lengths and deeper depths than traditional timber, resulting in design freedom.

### LP® SOLIDSTART™ LVL



Delivering a greater load carrying capacity than traditional softwood timber, LP SolidStart LVL provides consistent dimensions, enhanced durability and reduced shrinkage. An improvement over solid timber, LP SolidStart LVL\* minimizes problems that naturally occur as traditional timber dries, such as twisting, splitting, checking, bowing and warping.

### LP® SOLIDSTART™ LSL



The consistency and strength of LP SolidStart LSL means a more predictable and uniform structure. With wider widths, there's no need to spend extra time and material building up beams or headers. LP SolidStart LSL has many advantages over traditional softwood timber products including better fastener connections, consistency, straightness, predictability and increased design flexibility.

### LP® SOLIDSTART™ RIM BOARD



Precision cut to work perfectly with LP SolidStart I-Joist, LVL and LSL beams, LP SolidStart Rim Board is ideal for supporting vertical and lateral wall loads as part of a floor or roof framing system. LP SolidStart Rim Board is available in long 4.88m lengths and eliminates the need for discretionary blocking.



## SUSTAINABLE FORESTRY INITIATIVE

*Good for you. Good for our forests.\**

**IT'S MORE THAN OUR PRODUCTS.  
IT'S THE WAY WE DO BUSINESS.**

At LP Building Products, we're proud to offer integrated building solutions that work together to save you time and money, and we're proud that our products offer so many environmental benefits. But something else sets us apart: the way we do business. We believe that "sustainability" means acting in a way that protects the environment, embraces social responsibilities, and builds economic prosperity today and for future generations. That is why we set a higher standard by using certified procurement systems. Our systems are certified by the same third-party that certifies sustainable forestlands and it ensures our timber comes from non-controversial sources.

LP® SOLIDSTART™

**LIFETIME  
LIMITED WARRANTY**

Australian builders can offer their customers the peace of mind that comes with warranties that support quality products from LP Building Products. LP will cover all reasonable repair and/or replacement cost as per the conditions of our limited warranties.

Visit [LPCorp.com/AU](http://LPCorp.com/AU) to see complete warranties or contact your local LP® SolidStart™ Engineered Wood Products distributor or sales office for more information.



## DESIGN VALUES

Series	Depth (mm)	Weight	Moment	Shear	$EI_w \times 10^6$	$C_w A_w \times 10^4$
		(kg/m)	(kN-m)	(kN)	(N-mm <sup>2</sup> )	(N)
LPI™ 53-T	225	3.25	10.5	12.4	488	2990
	241	3.35	11.4	13.3	574	3190
	302	3.75	14.7	15.7	967	3940
	356	4.11	17.4	17.7	1412	4620
	406	4.45	19.9	19.7	1911	5260
LPI™ 70-T	225	3.97	14.2	12.4	651	3040
	241	4.07	15.4	13.3	769	3240
	302	4.48	19.9	15.7	1286	4000
	356	4.84	23.6	17.7	1871	4690
	406	5.18	27.0	19.7	2528	5340

## NOTES:

- LP® SolidStart™ I-joists shall be designed for dry-use conditions only. Dry-use applies to products installed in dry, covered and well ventilated interior conditions in which the equivalent moisture content in timber will not exceed 16%.
- Moment and Shear values shall be adjusted by k1 for load duration from AS1720.1.
- Moment cannot be increased using k9 greater than 1.0.
- Deflection calculations shall include both bending and shear deformations.

$$\text{Deflection for a simple span, uniform load: } \Delta = \frac{5wL^4}{384EI} + \frac{wL^2}{C_w A_w}$$

Where:

- $\Delta$  = deflection (mm)
- $EI$  = bending stiffness (from table)
- $w$  = uniform load (kN/m)
- $GA = C_w A_w$
- $L$  = design span (mm)

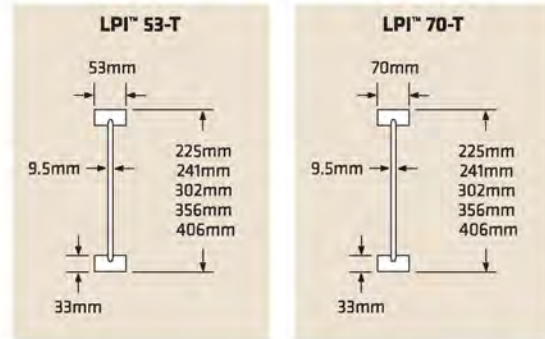
Equations for other conditions can be found in engineering references.

## REACTION AND BEARING CHARACTERISTIC VALUES

Series	Depth (mm)	End Supports (kN)		Interior Supports (kN)		Flange Bearing (N/mm)
		W/out Stiffeners	With Stiffeners	W/out Stiffeners	With Stiffeners	
LPI™ 53-T	225	9.3	11.5	20.7	22.6	370
	241	9.3	11.9	20.7	23.0	
	302	9.3	13.1	20.9	24.5	
	356	9.3	14.2	20.9	25.8	
	406	9.3	15.3	21.0	27.1	
LPI™ 70-T	225	9.5	11.6	21.7	24.1	500
	241	9.5	12.0	22.0	24.4	
	302	9.5	13.4	22.9	25.5	
	356	9.5	14.7	23.7	26.5	
	406	9.5	15.9	24.5	27.5	

## NOTES

- End and Interior Reaction Capacity shall be limited by the Flange Bearing Capacity or the bearing capacity of the support material, whichever is less. The Flange Bearing Capacity, per mm of bearing length, is based on the compression perpendicular-to-grain of the I-joist flange, accounting for raised edges (subtract 2.5mm from the flange width), and may be further limited by the bearing strength of the support material. The bearing capacity of a timber support is based on the species of the timber or type of composite timber. For Radiata Pine (12 MPa), the Flange Bearing Capacity for the LPI™ 20 may be used.
- Reaction Capacity is for instantaneous load duration and shall be adjusted using k1.
- The reaction and bearing table values are based on a minimum bearing length of 38mm for end supports and 63mm for intermediate or cantilever supports.
- No end support reaction increase for web stiffeners when detail F5 is used.



### HR Design Group Pty Ltd

10 April 2012  
File: 12-0126  
*Please read the full letter of intent before finalising any contract.*

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**Attn: Al Haber**  
Louisiana Pacific Corporation

Re: Certification of LP SolidStart Products in Australia

**Dear Al:**

The final design values that we recommended for the AustJoist timber joist on pages 6, 8 and 9 of the 2013 LP Australia Technical Guide for Residential Floors and Rafters and in HR Design Qualification Report. These characteristic strength values have been allocated from recognised testing laboratories approved in the USA, and the qualifications state generated by our engineers in accordance with the testative procedures of AS/NZS 4357:2010, AS/NZS 4357:2006 (NVL).

The products included in this assessment have been: LPI™ Solid 53-T and 70-T, using A27M (D90S-08A, and 2007C 161.1-0C), LPI™ L5; E10 Grade (Laminated Strand Lumber) using A27M 5456-08; AS/NZS 4357:2008 and finally LPI™ L5; E15; E13 & E14 Grade using AS/NZS 4357:2006.

Also cited in the Department of the Australian Quality were the following standards:

- AS1720.1-2010 Timber Design Code
- AS/NZS 1170 series – Loading Code
- AS 1864.1-1989 Residential Timber Framed Construction – Details Code
- AS 1864.2, 3, 4 – 2010 Residential Timber Framed Construction
- AS 4555-2008 Wind Loads on Housing

Therefore, I certify that all the characteristic values, with all products included in this manual, and the items included and contained in accordance with the requirements set out throughout this manual, are in full compliance with the requirements of the Building Code of Australia, and Australian building practice.

Should you require any further information or confirmation in any of the above matters, please do not hesitate to contact me at any time.

**Yours faithfully,**  
**STEPHEN JOHN HUNT** HR Design Group Pty Ltd

**Stephen John Hunt** BEng (Civil), CREng  
(MSE Aust 2008/177), (MREG 2177), APPEP

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Relating project, client and engineering together.

DESIGN CHARACTERISTIC VALUES									
Product	Grade	Density kg/m <sup>3</sup>	Modulus of Elasticity E MPa	Modulus of Rigidity G MPa	Bending F <sub>b</sub> MPa	Shear F <sub>v</sub> MPa	Compression Perp-to-Grain f <sub>p</sub> MPa	Parallel-to-Grain	
								Compression f <sub>c</sub> MPa	Tension F <sub>t</sub> MPa
LSL (LVL)	E10	745 (660)	10000	500	32	5.3	12	28	20
LVL	E13	660	13200	660	38	5.3	12	31	25
LVL	E14 (F17)	660	14000	700	42	5.3	12	42	25

**NOTES:**

- Design values for E, G, F<sub>b</sub>, F<sub>v</sub> and F<sub>c</sub> are for loads applied to the edge of the member ("Beam" orientation), parallel to the face of the strands (LSL) or veneers (LVL).
- F<sub>b</sub> is for 300 depth (d). For depths other than 300mm, use K11 shape factor from AS1720.1
- The values above are for Instantaneous load duration, Bending (F<sub>b</sub>), Shear (F<sub>v</sub>), Compression Perpendicular-to-Grain (f<sub>p</sub>), Compression (F<sub>c</sub>) Parallel-to-Grain and Tension (F<sub>t</sub>) Parallel-to-Grain may be adjusted by k1 factor in accordance with AS1720.1. Modulus of Elasticity (E) and Modulus of Rigidity (G) shall NOT be adjusted.

**LSL AND LVL FASTENER VALUES:**

For all connections, use a joint strength grade of JD4 and all nail, screw and bolt capacities in accordance with AS1720.1, or manufacturer's specifications, where appropriate, for JD4 material.

SECTION PROPERTIES													
Product	Depth (mm)	Weight <sup>1</sup> (kg/m <sup>3</sup> )			Moment of Inertia I <sub>x</sub> x 10 <sup>4</sup> mm <sup>4</sup>			Moment of Inertia I <sub>y</sub> x 10 <sup>4</sup> mm <sup>4</sup>			Torsion Constant J x 10 <sup>4</sup> mm <sup>4</sup>		
		35mm	45mm	63mm	35mm	45mm	63mm	35mm	45mm	63mm	35mm	45mm	63mm
E10 LSL (LVL)	90	2.35	3.02	5.97	2.13	2.73	5.41	0.32	0.68	5.29	0.97	1.87	7.57
	120	3.13	4.02	7.95	5.04	6.48	12.82	0.43	0.91	7.05	1.40	2.78	15.02
	130	3.39	4.36	8.62	5.41	8.24	16.29	0.46	0.99	7.64	1.54	3.09	17.37
	140	3.65	4.69	9.28	5.80	10.29	20.35	0.50	1.06	8.22	1.69	3.39	19.72
	150	3.91	5.03	9.95	6.18	12.66	25.03	0.54	1.14	8.81	1.83	3.70	22.07
	170	4.43	5.70	11.27	7.13	14.33	36.44	0.61	1.29	9.99	2.11	4.30	26.77
	190	4.95	6.37	12.60	8.08	20.01	50.87	0.68	1.44	11.16	2.40	4.91	31.47
	200	5.22	6.71	13.26	8.46	23.33	59.33	0.71	1.52	11.75	2.54	5.21	33.82
	225	5.87	7.54	14.92	9.32	33.22	84.48	0.80	1.71	13.22	2.90	5.97	39.70
	240	6.25	8.05	15.91	10.00	40.32	102.53	0.85	1.82	14.10	3.11	6.43	43.22
	241	6.28	8.08	15.98	10.03	40.35	102.56	0.85	1.83	14.13	3.13	6.46	43.46
	290	7.56	9.72	19.23	11.13	51.46	180.89	1.04	2.20	17.04	3.83	7.95	54.97
	300	7.82	10.06	19.89	11.51	58.75	200.25	1.07	2.28	17.62	3.97	8.25	57.32
	302	7.87	10.12	20.02	11.56	60.34	204.28	1.08	2.29	17.74	4.00	8.31	57.79
	356	9.28	11.93	23.60	13.15	80.39	334.63	1.27	2.70	20.91	4.77	9.95	70.48
	360	9.39	12.07	23.87	13.26	83.08	346.03	1.29	2.73	21.15	4.83	10.07	71.42
E13 LVL (63mm) and E14 (F17) LVL (35mm and 45mm)	90	2.08	2.67	3.74	2.13	2.73	3.83	0.32	0.68	1.88	0.97	1.87	4.19
	120	2.77	3.56	4.99	5.04	6.48	9.07	0.43	0.91	2.50	1.40	2.78	6.69
	130	3.00	3.86	5.41	5.41	8.24	11.53	0.46	0.99	2.71	1.54	3.09	7.53
	140	3.23	4.16	5.82	5.80	10.29	14.41	0.50	1.06	2.92	1.69	3.39	8.36
	150	3.47	4.46	6.24	6.18	12.66	17.72	0.54	1.14	3.13	1.83	3.70	9.19
	170	3.93	5.05	7.07	7.13	14.33	25.79	0.61	1.29	3.54	2.11	4.30	10.86
	190	4.39	5.64	7.90	8.08	20.01	36.01	0.68	1.44	3.96	2.40	4.91	12.53
	200	4.62	5.94	8.32	8.46	23.33	42.00	0.71	1.52	4.17	2.54	5.21	13.36
	225	5.20	6.68	9.36	9.32	33.22	59.80	0.80	1.71	4.69	2.90	5.97	15.45
	240	5.54	7.13	9.98	10.00	40.32	72.58	0.86	1.82	5.00	3.11	6.43	16.70
	241	5.57	7.16	10.02	10.03	40.35	72.58	0.86	1.83	5.02	3.13	6.46	16.78
	290	6.70	8.61	12.06	11.13	51.46	128.04	1.04	2.20	6.04	3.83	7.95	20.86
	300	6.93	8.91	12.47	11.51	58.75	147.75	1.07	2.28	6.25	3.97	8.25	21.70
	302	6.98	8.97	12.56	11.56	60.34	144.60	1.08	2.29	6.29	4.00	8.31	21.86
	356	8.22	10.57	14.80	13.15	80.39	236.87	1.27	2.70	7.42	4.77	9.95	26.36
	360	8.32	10.69	14.97	13.26	83.08	244.94	1.29	2.73	7.50	4.83	10.07	26.70
400	9.24	11.88	16.63	14.63	103.29	336.00	1.43	3.04	8.33	5.40	11.29	30.03	
406	9.38	12.05	16.88	14.75	105.99	351.35	1.45	3.08	8.46	5.49	11.47	30.53	
450	10.40	13.37	18.71	16.27	128.04	478.41	1.61	3.42	9.38	6.12	12.81	34.20	
457	10.56	13.57	19.00	16.38	131.59	501.08	1.63	3.47	9.52	6.22	13.02	34.78	

**NOTES:**

- The weight for E10 LSL (LVL) is based on the density of E10 LSL. To determine the weight for E10 LVL, multiply the tabulated values by 0.886.

MAXIMUM REACTION (kN)								
Product	Width (mm)	Bearing Length (mm)						
		45mm	63mm	70mm	85mm	90mm	120mm	140mm
LSL and LVL	95	18.9	26.5	29.4	35.7	37.8	50.4	58.8
	45	24.3	34.0	37.8	45.9	48.6	64.8	75.6
	63	34.0	47.6	52.9	64.3	68.0	90.7	105.8
	89	48.1	67.3	74.8	90.8	96.1	128.2	149.5

**HOW TO USE MAXIMUM REACTION CHART:**

- Determine the thickness required for the LP® SolidStart™ LSL and LP® SolidStart™ LVL beam and calculate the maximum reaction.
- Select the appropriate line based on bearing width.
- Using the appropriate Limit State Reactions for load combinations required evaluate the limit state reaction.
- Divide the reaction by the required phi value for domestic, primary or post disaster as per AS1720.1, for bearing.
- Divide the result also by the appropriate k1 load duration factor from AS1720.1 for the combination to be checked.
- Select a bearing length with a maximum reaction that meets or exceeds your calculated value.
- Make sure the support is structurally adequate to carry the reaction.

**EXAMPLE:** An 89mm LP® SolidStart™ LSL beam is required, and the Dead Load + Floor Live Load reaction is 42.2kN, with phi=0.9 and k1=0.8. The reaction to look up is 42.2 / (0.9 \* 0.8) = 58.6kN.

**SOLUTION:** The minimum bearing length required for this beam is 63mm.

**GENERAL NOTES:**

- Tabulated values are based on a support with a minimum edge bearing value of 12.0 MPa. This is suitable for beams bearing on steel or the end grain of studs.
- Make sure the support is structurally adequate to carry the reaction. Compressive strength parallel to grain of studs may require more studs than the bearing length above indicates.
- For beams bearing on timber top plates, the required bearing length may increase based on the bearing strength (compression perpendicular to grain) of the species and grade used for the top plate material.
- Verify AS1684 code requirements concerning minimum bearing.

**ADDITIONAL NOTES:**

- Minimum bearing length is 45mm at end supports and 63mm at intermediate supports. Span tables may be based on longer bearing lengths.
- Capacity reduction factor phi = 0.9 for domestic houses. For primary structures use 0.85 and 0.8 for post disaster structures.
- Lateral support of beam compression edge is required at intervals of 600mm centres or closer.
- Values shown throughout this brochure are applicable to untreated LP® SolidStart™ LSL in dry-service conditions only.
- All modification factors, including k1, are per AS 1720.1, section 8.4. Values and design rules for LVL material may be applied for LSL beams.
- Joint group, classification: JD4.
- For values of modification factors other than those shown in this guide, contact your LP representative.
- Section properties are based on the actual member size. Width and depth shown in the table are converted from actual sizes and may vary by +/- 0.5mm.

**SINGLE SPAN - MAXIMUM ALLOWABLE SPANS (m)**

	Joist Size (mm)	300			400			450			480			600		
		E10	E13	E14	E10	E13	E14	E10	E13	E14	E10	E13	E14	E10	E13	E14
		Tile Floor 100 kg/m <sup>2</sup> Dead Load	90x35	1.7	1.9	2.0	1.6	1.7	1.8	1.5	1.7	1.7	1.5	1.6	1.7	1.4
120x35	2.3		2.6	2.6	2.1	2.3	2.4	2.0	2.2	2.3	2.0	2.2	2.2	1.9	2.0	2.1
130x35	2.5		2.8	2.8	2.3	2.5	2.6	2.2	2.4	2.5	2.2	2.4	2.4	2.0	2.2	2.3
140x35	2.7		3.0	3.0	2.5	2.7	2.8	2.4	2.6	2.7	2.3	2.6	2.6	2.2	2.4	2.4
150x35	2.9		3.2	3.3	2.7	2.9	3.0	2.6	2.8	2.9	2.5	2.8	2.8	2.3	2.6	2.6
170x35	3.3		3.6	3.7	3.0	3.3	3.4	2.9	3.2	3.3	2.8	3.1	3.2	2.6	2.9	3.0
190x35	3.7		4.0	4.1	3.4	3.7	3.8	3.2	3.5	3.6	3.2	3.5	3.6	2.9	3.2	3.3
<b>200x35</b>	<b>3.9</b>		<b>4.3</b>	<b>4.3</b>	<b>3.5</b>	<b>3.9</b>	<b>4.0</b>	<b>3.4</b>	<b>3.7</b>	<b>3.8</b>	<b>3.3</b>	<b>3.7</b>	<b>3.7</b>	<b>3.1</b>	<b>3.4</b>	<b>3.5</b>
225x35	4.3		4.7	4.8	4.0	4.4	4.5	3.8	4.2	4.3	3.7	4.1	4.2	3.5	3.8	3.9
240x35	4.6		4.9	5.0	4.2	4.6	4.7	4.1	4.5	4.5	4.0	4.4	4.5	3.7	4.1	4.2
241x35	4.6		4.9	5.0	4.2	4.6	4.7	4.1	4.5	4.6	4.0	4.4	4.5	3.7	4.1	4.2
290x35	5.2		5.6	5.7	4.9	5.3	5.4	4.8	5.1	5.2	4.7	5.1	5.1	4.5	4.8	4.9
300x35	5.4		5.8	5.9	5.0	5.4	5.5	4.9	5.3	5.4	4.8	5.2	5.3	4.6	4.9	5.0
302x35	5.4		5.8	5.9	5.1	5.4	5.5	4.9	5.3	5.4	4.9	5.2	5.3	4.6	5.0	5.0
90x45	1.9		2.1	2.1	1.7	1.9	1.9	1.7	1.8	1.9	1.6	1.8	1.8	1.5	1.7	1.7
120x45	2.5		2.8	2.8	2.3	2.5	2.6	2.2	2.4	2.5	2.2	2.4	2.4	2.0	2.2	2.3
130x45	2.7		3.0	3.1	2.5	2.7	2.8	2.4	2.6	2.7	2.4	2.6	2.6	2.2	2.4	2.5
140x45	2.9		3.2	3.3	2.7	3.0	3.0	2.6	2.8	2.9	2.5	2.8	2.8	2.4	2.6	2.6
150x45	3.1		3.5	3.5	2.9	3.2	3.2	2.8	3.0	3.1	2.7	3.0	3.0	2.5	2.8	2.8
170x45	3.6		3.9	4.0	3.3	3.6	3.7	3.1	3.5	3.5	3.1	3.4	3.5	2.9	3.2	3.2
190x45	4.0		4.4	4.5	3.6	4.0	4.1	3.5	3.9	3.9	3.4	3.8	3.9	3.2	3.5	3.6
200x45	4.2		4.6	4.6	3.8	4.2	4.3	3.7	4.1	4.1	3.6	4.0	4.1	3.4	3.7	3.8
225x45	4.6		5.0	5.0	4.3	4.7	4.7	4.1	4.5	4.6	4.1	4.5	4.5	3.8	4.2	4.2
240x45	4.8		5.2	5.3	4.5	4.9	4.9	4.4	4.7	4.8	4.3	4.7	4.7	4.0	4.4	4.5
241x45	4.8		5.2	5.3	4.5	4.9	5.0	4.4	4.8	4.8	4.3	4.7	4.8	4.0	4.5	4.5
290x45	5.5		6.0	6.0	5.2	5.6	5.7	5.1	5.5	5.5	5.0	5.4	5.5	4.7	5.1	5.2
300x45	5.7		6.1	6.2	5.3	5.7	5.8	5.2	5.6	5.7	5.1	5.5	5.6	4.9	5.2	5.3
302x45	5.7		6.1	6.2	5.3	5.8	5.8	5.2	5.6	5.7	5.1	5.5	5.6	4.9	5.3	5.3
356x45	6.4		6.9	7.0	6.0	6.5	6.6	5.9	6.3	6.4	5.8	6.2	6.3	5.5	5.9	6.0
360x45	6.4		7.0	7.1	6.1	6.5	6.6	5.9	6.4	6.5	5.8	6.3	6.4	5.6	6.0	6.1

**CONTINUOUS SPAN - MAXIMUM ALLOWABLE SPANS (m)**

	Joist Size (mm)	300			400			450			480			600		
		E10	E13	E14	E10	E13	E14	E10	E13	E14	E10	E13	E14	E10	E13	E14
		Tile Floor 100 kg/m <sup>2</sup> Dead Load	90x35	2.4	2.6	2.0	2.2	2.4	1.8	1.9	2.1	1.7	1.9	2.1	1.7	1.7
120x35	3.2		3.4	2.6	2.9	3.2	2.4	2.8	3.1	2.3	2.7	3.0	2.2	2.5	2.8	2.1
130x35	3.4		3.7	2.8	3.1	3.4	2.6	3.0	3.3	2.5	3.0	3.2	2.4	2.7	3.0	2.3
140x35	3.6		3.9	3.0	3.4	3.6	2.8	3.3	3.5	2.7	3.2	3.4	2.6	3.0	3.2	2.4
150x35	3.8		4.1	3.3	3.5	3.8	3.0	3.4	3.7	2.9	3.4	3.6	2.8	3.2	3.4	2.6
170x35	4.2		4.5	3.7	3.9	4.2	3.4	3.8	4.0	3.3	3.7	4.0	3.2	3.5	3.8	3.0
190x35	4.6		4.9	4.1	4.2	4.5	3.8	4.1	4.4	3.6	4.0	4.3	3.6	3.8	4.1	3.3
200x35	4.7		5.1	4.3	4.4	4.7	4.0	4.3	4.6	3.8	4.2	4.5	3.7	4.0	4.3	3.5
225x35	5.2		5.5	4.8	4.8	5.2	4.5	4.7	5.0	4.3	4.6	4.9	4.2	4.3	4.7	3.9
240x35	5.4		5.8	5.0	5.1	5.4	4.7	4.9	5.3	4.5	4.8	5.2	4.5	4.6	4.9	4.2
241x35	5.5		5.8	5.0	5.1	5.4	4.7	4.9	5.3	4.6	4.8	5.2	4.5	4.6	4.9	4.2
290x35	6.3		6.7	5.7	5.8	6.3	5.4	5.7	6.1	5.2	5.6	6.0	5.1	5.3	5.6	4.9
300x35	6.4		6.9	5.9	6.0	6.4	5.5	5.8	6.2	5.4	5.7	6.1	5.3	5.4	5.8	5.0
302x35	6.5		6.9	5.9	6.0	6.4	5.5	5.8	6.3	5.4	5.7	6.2	5.3	5.4	5.8	5.0
90x45	2.6		2.8	2.1	2.4	2.6	1.9	2.1	2.4	1.9	2.1	2.3	1.8	1.9	2.1	1.7
120x45	3.4		3.7	2.8	3.1	3.4	2.6	3.0	3.3	2.5	3.0	3.3	2.4	2.7	3.0	2.3
130x45	3.6		3.9	3.1	3.4	3.6	2.8	3.3	3.5	2.7	3.2	3.5	2.6	3.0	3.3	2.5
140x45	3.8		4.1	3.3	3.6	3.8	3.0	3.5	3.7	2.9	3.4	3.7	2.8	3.2	3.5	2.6
150x45	4.1		4.3	3.5	3.8	4.0	3.2	3.7	3.9	3.1	3.6	3.9	3.0	3.4	3.6	2.8
170x45	4.5		4.8	4.0	4.1	4.4	3.7	4.0	4.3	3.5	4.0	4.2	3.5	3.7	4.0	3.2
190x45	4.8		5.2	4.5	4.5	4.8	4.1	4.4	4.7	3.9	4.3	4.6	3.9	4.1	4.4	3.6
200x45	5.0		5.4	4.6	4.7	5.0	4.3	4.5	4.9	4.1	4.5	4.8	4.1	4.2	4.5	3.8
225x45	5.5		5.9	5.0	5.1	5.5	4.7	5.0	5.3	4.6	4.9	5.2	4.5	4.6	5.0	4.2
240x45	5.8		6.2	5.3	5.4	5.8	4.9	5.2	5.6	4.8	5.1	5.5	4.7	4.9	5.2	4.5
241x45	5.8		6.2	5.3	5.4	5.8	5.0	5.2	5.6	4.8	5.2	5.5	4.8	4.9	5.2	4.5
290x45	6.7		7.2	6.0	6.2	6.7	5.7	6.0	6.5	5.5	5.9	6.4	5.5	5.6	6.0	5.2
300x45	6.8		7.3	6.2	6.4	6.8	5.8	6.2	6.6	5.7	6.1	6.5	5.6	5.8	6.2	5.3
302x45	6.9		7.4	6.2	6.4	6.9	5.8	6.2	6.7	5.7	6.1	6.6	5.6	5.8	6.2	5.3
356x45	7.8		8.4	7.0	7.2	7.8	6.6	7.0	7.5	6.4	6.9	7.4	6.3	6.5	7.0	6.0
360x45	7.9		8.4	7.1	7.3	7.8	6.6	7.1	7.6	6.5	7.0	7.5	6.4	6.6	7.1	6.1

**NOTES:**

1. See page 7 for Usage, Design Assumptions and General Notes.