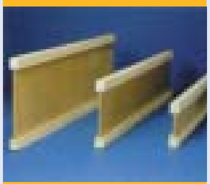
SWELITE®


Technical Manual

- Beams
- Wall Studs
- Top and Sole Plates

- Functional Solutions
- Technical Data

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PRODUCT DATA

Product

Swelite manufactures, distributes and sells customised wood-based beams, studs and sole plates. The flanges in the beams and studs are made of machine stressgraded timber. Webs are made of structural board. The adhesive used in Swelite products is phenolic-resorcinol resin.

Designing

Characteristic capacities according to the table on page 6 and design capacities according to the tables on pages 7-11 apply for designs complying with Eurocode 5.

Wooden flanges of machine stressgraded timber in classes C30+, C24+ and C18 are used in Swelite beams. Classes C30+ and C24+ have been developed especially for Swelite to meet with the very high demands on quality. For design calculations of the flanges other than flexural strength and stiffness of the beams, use the material values specified in EN 338. Values for C30 are used for C30+ and C24 for C24+.

Manufacture

All manufacturing takes place at the Swelite production facility in Rundvik, Sweden.

Inspection

In-process inspection is carried out under the supervision of SP in Borås in compliance with inspection directives. Daily internal inspections of finger joints and glued joints are carried out in our own process laboratory. Strength and stiffness of whole beams are checked weekly in our own beam testing rig.

Supervisory checks are carried out at least twice a year by SP in Borås.

Markings (beam)

Beams are marked with the following data:

- Name of manufacturer
- SITAC accreditation number
- Type designation of product
- Number of type approval certificate
- Serial date of manufacture
- EC certificate number
- ETA number

Markings (package)

Each package is provided with a label containing the following information:

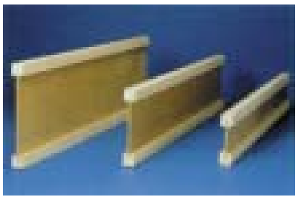
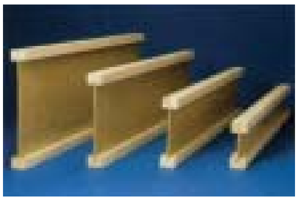
- Product type
- Length
- Quantity
- Order number
- Customer address
- Manufacturer's address

Packaging

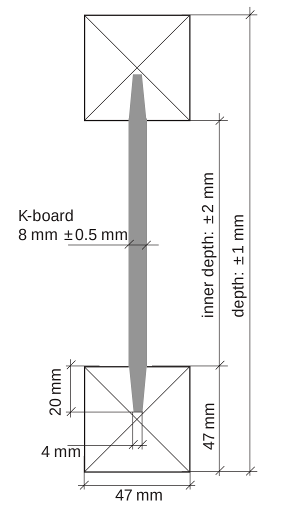
- Wooden bearers for ease of handling.
- Steel or plastic straps to bind together the packages.
- Address label affixed to one long side of the package.
- A User's Guide comes with the package.

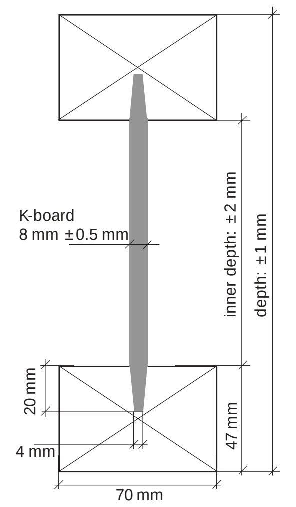
Standard Range

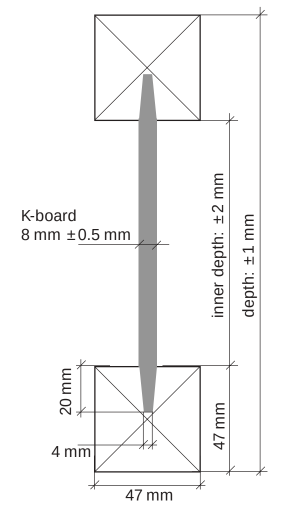
Swelite's standard range of products can be seen in the table below. If the customer wishes, we can supply beams cut true or slanting, insulated and with ready-drilled holes for installations and such. We can also supply strengtheners, gussets and eaves. In some cases, beams can be manufactured with other flange dimensions than the ones shown in the table. They should then be within the framework of our ETA. Please get in touch with our technical department for more information.

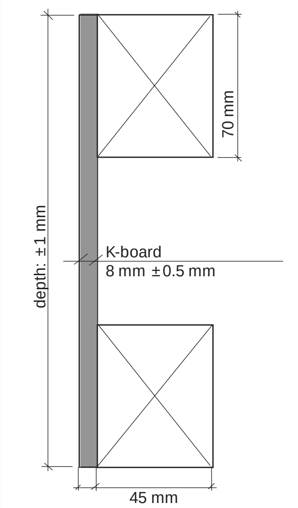



I-BEAMS TYPE H		I-BEAMS TYPE HI		I-STUDS TYPE R		SOLE PLATES TYPE S	
depth [mm]	weight [kg/m]	depth [mm]	weight [kg/m]	depth [mm]	weight [kg/m]	depth [mm]	weight [kg/m]
H 200	3.1	HI 200	4.0	R 170	2.8	S 170	4.2
H 220	3.2	HI 220	4.2	R 200	3.1	S 200	4.5
H 250	3.5	HI 250	4.4	R 220	3.2	S 220	4.6
H 300	3.9	HI 300	4.8	R 240	3.4	S 240	4.8
H 350	4.2	HI 350	5.2	*R 300	3.9	*S 300	5.3
H 400	4.6	HI 400	5.6				
		*HI 450	6.0				
		*HI 500	6.4				
Standard lengths [mm] 6000 / 7500 / 9000 / 12000		Standard lengths [mm] 6000 / 7500 / 9000 / 12000		Standard lengths [mm] 2500 / 5500		Standard lengths [mm] 4000 / 8000	









* Not stock item

Wood quality in flanges:
Beam depth ≤ 250 mm C30+
Beam depth > 250 mm C24+

TECHNICAL DATA

Sectional Data According to Eurocode 5

Designation	Units	Description
I_x	$m^4 10^{-6}$	Moment of inertia in direction of major axis
W_x	$m^3 10^{-6}$	Section modulus in direction of major axis
I_y	$m^4 10^{-6}$	Moment of inertia in direction of minor axis
W_y	$m^3 10^{-6}$	Section modulus in direction of minor axis
i_x	m	Radius of gyration in direction of major axis
A_{flange}	$m^2 10^{-3}$	Flange area
A_{beam}	$m^2 10^{-3}$	Total beam/stud area (axial forces)
A_{web}	$m^2 10^{-3}$	Web area (shear calculation)

Type	I_x [m^4*10^{-6}]	W_x [m^3 *10^{-6}]	I_y [m^4*10^{-6}]	W_y [m^3 *10^{-6}]	A_{flange} [m^2 *10^{-3}]	A_{beam} [m^2 *10^{-3}]	A_{web} [m^2 *10^{-3}]	i_x [m]
H 200	26.35	264	0.81	34.6	4.18	4.56	1.09	0.076
H 220	33.54	305	0.81	34.6	4.18	4.62	1.25	0.085
H 250	46.05	368	0.81	34.6	4.18	4.70	1.49	0.099
H 300	72.20	481	0.81	34.6	4.18	4.97	1.89	0.121
H 350	104.27	596	0.81	34.6	4.18	5.13	2.29	0.143
H 400	142.77	714	0.81	34.6	4.18	5.30	2.69	0.164
HI 200	39.40	394	2.69	76.8	6.34	6.72	1.09	0.077
HI 220	50.11	456	2.69	76.8	6.34	6.78	1.25	0.086
HI 250	68.72	550	2.69	76.8	6.34	6.87	1.49	0.100
HI 300	107.19	715	2.69	76.8	6.34	7.13	1.89	0.123
HI 350	154.29	882	2.69	76.8	6.34	7.30	2.29	0.145
HI 400	210.52	1053	2.69	76.8	6.34	7.46	2.69	0.168
HI 450	276.07	1227	2.69	76.8	6.34	7.63	3.09	0.190
HI 500	351.16	1405	2.69	76.8	6.34	7.80	3.49	0.212
R 170	17.41	205	0.81	34.6	4.18	4.61	0.85	0.061
R 200	26.62	266	0.81	34.6	4.18	4.73	1.09	0.075
R 220	33.94	309	0.81	34.6	4.18	4.82	1.25	0.084
R 240	42.22	352	0.81	34.6	4.18	4.90	1.41	0.093
R 300	73.02	487	0.81	34.6	4.18	5.14	1.89	0.119

Characteristic Capacities According to Eurocode 5

Designation	Units	Description
N_{ck}	kN	Char. load capacity
N_{tk}	kN	Char. tensile capacity
V_k	kN	Char. shear capacity
M_{xk}	kNm	Char. moment capacity in direction of major axis
$E_k I_x$	kNm^2	Char. stiffness capacity in direction of major axis
GA_k	kN	Char. shear capacity in direction of major axis (A = web area)

Type	N_{ck} [kN]	N_{tk} [kN]	V_k [kN]	M_{xd} [kNm]	$E_k I_x$ [kNm^2]	GA_k [kN]
H 200	132.3	91.3	18.9	7.9	343	2067
H 220	134.0	92.4	19.7	8.9	436	2371
H 250	136.4	94.1	20.9	10.4	599	2827
H 300	114.3	79.5	22.9	10.6	794	3587
H 350	118.1	82.2	24.9	12.6	1147	4347
H 400	121.9	84.8	26.8	14.6	1570	5107
HI 200	195.0	134.5	18.9	11.8	512	2067
HI 220	196.7	135.6	19.7	13.3	651	2371
HI 250	199.1	137.3	20.9	15.5	893	2827
HI 300	164.0	114.1	22.9	15.7	1179	3587
HI 350	167.8	116.7	24.9	18.7	1697	4347
HI 400	171.7	119.4	26.8	21.5	2316	5107
HI 450	175.5	122.1	28.8	24.4	3037	5867
HI 500	179.4	124.8	30.8	27.2	3863	6627
R 170	78.4	50.7	17.7	4.2	157	1611
R 200	80.5	52.1	18.9	5.3	240	2067
R 220	81.9	53.0	19.7	6.0	305	2371
R 240	83.3	53.9	20.5	6.7	380	2675
R 300	87.4	56.6	22.9	8.8	657	3587

Design Capacities According to Eurocode 5 (Sweden)

Load Duration Class: Permanent

Service class 1

Note! The values below are calculated using the Swedish application codes for Eurocode 5 and must be adjusted to the specific values for the country in question.

Depth [mm]	Type	Flange material	N_{cd} [kN]	N_{td} [kN]	V_d [kN]	M_{xd} [kNm]	E_dI_x [kNm^2]	GA_d [kN]
200	**H**	C30+	66.2	45.6	4.7	3.9	214	636
220	**H**	C30+	67.0	46.2	4.9	4.4	272	730
250	**H**	C30+	68.2	47.0	5.2	5.2	374	870
300	**H**	C24+	57.1	39.7	5.7	5.3	496	1104
350	**H**	C24+	59.1	41.1	6.2	6.3	717	1338
400	**H**	C24+	61.0	42.4	6.7	7.3	982	1571
200	**HI**	C30+	97.5	67.2	4.7	5.9	320	636
220	**HI**	C30+	98.3	67.8	4.9	6.6	407	730
250	**HI**	C30+	99.6	68.7	5.2	7.8	558	870
300	**HI**	C24+	82.0	57.0	5.7	7.9	737	1104
350	**HI**	C24+	83.9	58.4	6.2	9.3	1061	1338
400	**HI**	C24+	85.8	59.7	6.7	10.8	1447	1571
450	**HI**	C24+	87.8	61.1	7.2	12.2	1898	1805
500	**HI**	C24+	89.7	62.4	7.7	13.6	2414	2039
170	**R**	C18	39.2	25.4	4.4	2.1	98	496
200	**R**	C18	40.2	26.0	4.7	2.7	150	636
220	**R**	C18	40.9	26.5	4.9	3.0	191	730
240	**R**	C18	41.6	26.9	5.1	3.3	238	823
300	**R**	C18	43.7	28.3	5.7	4.4	411	1104

N_{cd} Design compression capacity
N_{td} Design tensile capacity
V_d Design shear capacity

M_{xd} Design moment capacity in rigid direction
E_dI_x Design stiffness capacity in rigid direction (serviceability limit state)
GA_d Design shear capacity in rigid direction (serviceability limit state) (A=web area)

Design Capacities According to Eurocode 5 (Sweden)

Load Duration Class: Long

Service class 1

Note! The values below are calculated using the Swedish application codes for Eurocode 5 and must be adjusted to the specific values for the country in question.

Depth [mm]	Type	Flange material	N_{cd} [kN]	N_{td} [kN]	V_d [kN]	M_{xd} [kNm]	E_dI_x [kNm²]	GA_d [kN]
200	**H**	C30+	77.2	53.2	7.1	4.6	228	827
220	**H**	C30+	78.1	53.9	7.4	5.2	291	948
250	**H**	C30+	79.6	54.9	7.8	6.1	399	1131
300	**H**	C24+	66.6	46.4	8.6	6.2	529	1435
350	**H**	C24+	68.9	47.9	9.3	7.4	765	1739
400	**H**	C24+	71.1	49.5	10.1	8.5	1047	2043
200	**HI**	C30+	113.8	78.5	7.1	6.9	341	827
220	**HI**	C30+	114.7	79.1	7.4	7.8	434	948
250	**HI**	C30+	116.2	80.1	7.8	9.1	596	1131
300	**HI**	C24+	95.7	66.5	8.6	9.2	786	1435
350	**HI**	C24+	97.9	68.1	9.3	10.9	1131	1739
400	**HI**	C24+	100.1	69.7	10.1	12.6	1544	2043
450	**HI**	C24+	102.4	71.2	10.8	14.2	2025	2347
500	**HI**	C24+	104.6	72.8	11.6	15.9	2575	2651
170	**R**	C18	45.7	29.6	6.6	2.5	104	644
200	**R**	C18	46.9	30.4	7.1	3.1	160	827
220	**R**	C18	47.8	30.9	7.4	3.5	204	948
240	**R**	C18	48.6	31.4	7.7	3.9	253	1070
300	**R**	C18	51.0	33.0	8.6	5.1	438	1435

N_{cd} Design compression capacity
N_{td} Design tensile capacity
V_d Design shear capacity

M_{xd} Design moment capacity in rigid direction
E_dI_x Design stiffness capacity in rigid direction (serviceability limit state)
GA_d Design shear capacity in rigid direction (serviceability limit state) (A=web area)

Design Capacities According to Eurocode 5 (Sweden)

Load Duration Class: Medium

Service class 1

Note! The values below are calculated using the Swedish application codes for Eurocode 5 and must be adjusted to the specific values for the country in question.

Depth [mm]	Type	Flange material	N_{cd} [kN]	N_{td} [kN]	V_d [kN]	M_{xd} [kNm]	E_dI_x [kNm²]	GA_d [kN]
200	H	C30+	88.2	60.8	10.2	5.2	274	1181
220	H	C30+	89.3	61.6	10.7	5.9	349	1355
250	H	C30+	91.0	62.7	11.3	6.9	479	1616
300	H	C24+	76.2	53.0	12.4	7.1	635	2050
350	H	C24+	78.7	54.8	13.5	8.4	918	2484
400	H	C24+	81.3	56.6	14.5	9.7	1256	2918
200	HI	C30+	130.0	89.7	10.2	7.8	410	1181
220	HI	C30+	131.1	90.4	10.7	8.9	521	1355
250	HI	C30+	132.8	91.6	11.3	10.4	715	1616
300	HI	C24+	109.3	76.0	12.4	10.5	943	2050
350	HI	C24+	111.9	77.8	13.5	12.4	1358	2484
400	HI	C24+	114.4	79.6	14.5	14.4	1853	2918
450	HI	C24+	117.0	81.4	15.6	16.3	2429	3353
500	HI	C24+	119.6	83.2	16.7	18.1	3090	3787
170	R	C18	52.3	33.8	9.6	2.8	125	921
200	R	C18	53.7	34.7	10.2	3.5	192	1181
220	R	C18	54.6	35.3	10.7	4.0	244	1355
240	R	C18	55.5	35.9	11.1	4.5	304	1529
300	R	C18	58.3	37.7	12.4	5.8	526	2050

N_{cd} Design compression capacity
N_{td} Design tensile capacity
V_d Design shear capacity

M_{xd} Design moment capacity in rigid direction
E_dI_x Design stiffness capacity in rigid direction (serviceability limit state)
GA_d Design shear capacity in rigid direction (serviceability limit state) (A = web area)

Design Capacities According to Eurocode 5 (Sweden)

Load Duration Class: Short

Service class 1

Note! The values below are calculated using the Swedish application codes for Eurocode 5 and must be adjusted to the specific values for the country in question.

Depth [mm]	Type	Flange material	N_{cd} [kN]	N_{td} [kN]	V_d [kN]	M_{xd} [kNm]	E_dI_x [kNm^2]	GA_d [kN]
200	**H**	C30+	99.2	68.4	13.4	5.9	343	2067
220	**H**	C30+	100.5	69.3	14.0	6.7	436	2371
250	**H**	C30+	102.3	70.6	14.8	7.8	599	2827
300	**H**	C24+	85.7	59.6	16.2	7.9	794	3587
350	**H**	C24+	88.6	61.6	17.6	9.5	1147	4347
400	**H**	C24+	91.5	63.6	19.0	11.0	1570	5107
200	**HI**	C30+	146.3	100.9	13.4	8.8	512	2067
220	**HI**	C30+	147.5	101.7	14.0	10.0	651	2371
250	**HI**	C30+	149.3	103.0	14.8	11.7	893	2827
300	**HI**	C24+	123.0	85.6	16.2	11.8	1179	3587
350	**HI**	C24+	125.9	87.6	17.6	14.0	1697	4347
400	**HI**	C24+	128.8	89.6	19.0	16.2	2316	5107
450	**HI**	C24+	131.6	91.6	20.4	18.3	3037	5867
500	**HI**	C24+	134.5	93.6	21.8	20.4	3863	6627
170	**R**	C18	58.8	38.0	12.6	3.2	157	1611
200	**R**	C18	60.4	39.1	13.4	4.0	240	2067
220	**R**	C18	61.4	39.7	14.0	4.5	305	2371
240	**R**	C18	62.4	40.4	14.5	5.0	380	2675
300	**R**	C18	65.6	42.4	16.2	6.6	657	3587

N_{cd} Design compression capacity
N_{td} Design tensile capacity
V_d Design shear capacity

M_{xd} Design moment capacity in rigid direction
E_dI_x Design stiffness capacity in rigid direction (serviceability limit state)
GA_d Design shear capacity in rigid direction (serviceability limit state) (A=web area)

Design Capacities According to Eurocode 5 (Sweden)

Load Duration Class: Instantaneous

Service class 1

Note! The values below are calculated using the Swedish application codes for Eurocode 5 and must be adjusted to the specific values for the country in question.

Depth [mm]	Type	Flange material	N_{cd} [kN]	N_{td} [kN]	V_d [kN]	M_{xd} [kNm]
200	**H**	C30+	121.3	83.7	17.3	7.2
220	**H**	C30+	122.8	84.7	18.1	8.2
250	**H**	C30+	125.1	86.2	19.2	9.5
300	**H**	C24+	104.7	72.9	21.0	9.7
350	**H**	C24+	108.3	75.3	22.8	11.6
400	**H**	C24+	111.8	77.8	24.6	13.4
200	**HI**	C30+	178.8	123.3	17.3	10.8
220	**HI**	C30+	180.3	124.3	18.1	12.2
250	**HI**	C30+	182.5	125.9	19.2	14.2
300	**HI**	C24+	150.3	104.6	21.0	14.4
350	**HI**	C24+	153.8	107.0	22.8	17.1
400	**HI**	C24+	157.4	109.5	24.6	19.8
450	**HI**	C24+	160.9	111.9	26.4	22.4
500	**HI**	C24+	164.4	114.4	28.2	24.9
170	**R**	C18	71.9	46.5	16.3	3.9
200	**R**	C18	73.8	47.7	17.3	4.9
220	**R**	C18	75.0	48.6	18.1	5.5
240	**R**	C18	76.3	49.4	18.8	6.1
300	**R**	C18	80.1	51.9	21.0	8.0

N_{cd} Design compression capacity
N_{td} Design tensile capacity
V_d Design shear capacity
M_{xd} Design moment capacity in rigid direction

FUNCTIONAL SOLUTIONS

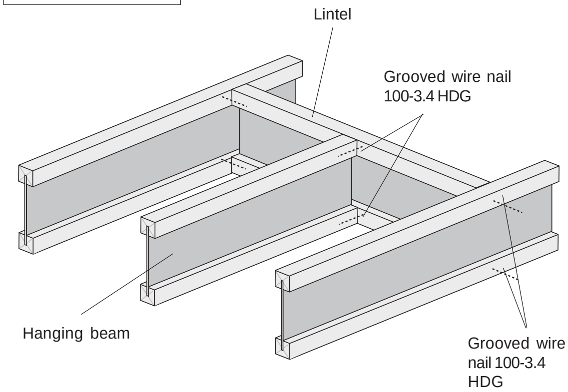
Load Capacities - Lintels

Below are various solutions for lintels in floor structures. For lintels without hangers, the design load capacity (V_{des}) for each respective solution is shown. The manufacturer's capacities apply to lintels with hangers. The design capacity V_{des} is calculated for safety class 2, load type B and service class 1.

Lintels without hangers

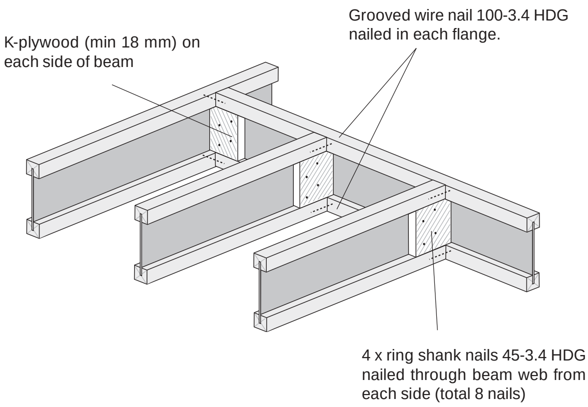
V_{des} = 1.5 kN

G1



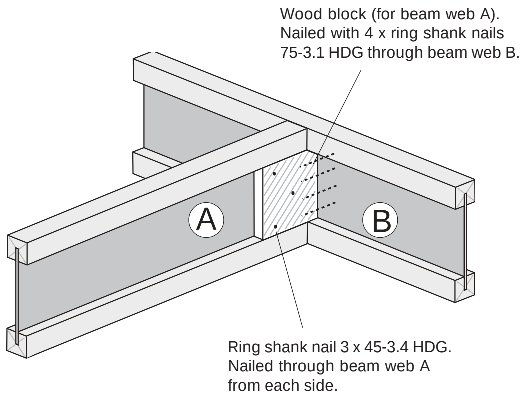
V_{des} = 6.7 kN

G2



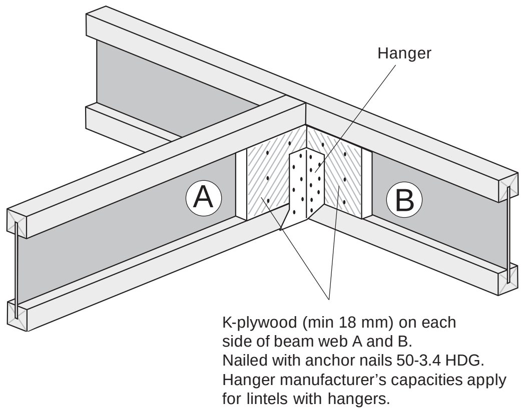
V_{des} = 8.0 kN

G3

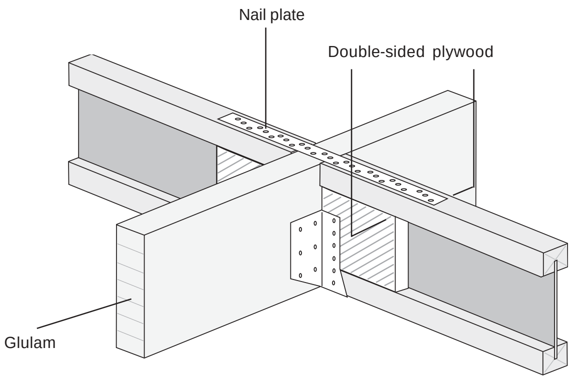


Lintels with hangers

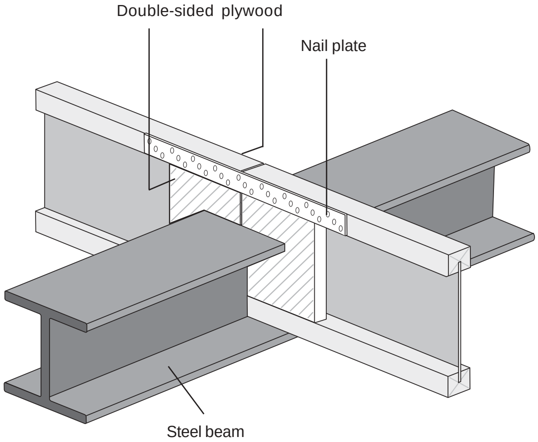
G4



G5

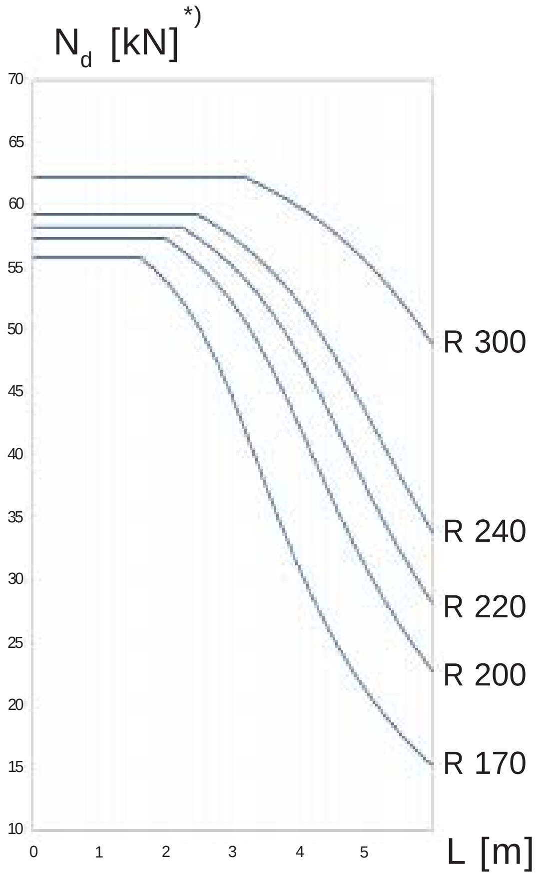


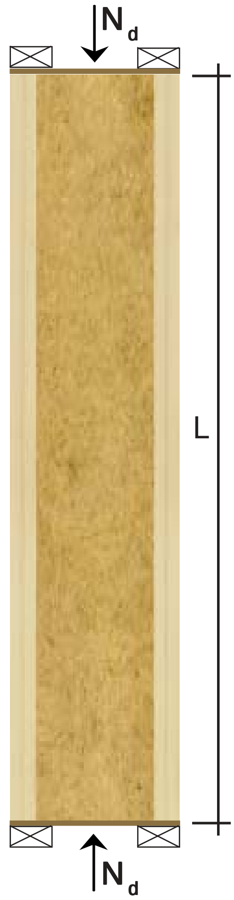
G6



Wall Loads

The permitted load forces N_d before buckling in the rigid direction can be read in the following diagram for various lengths of stud. Normal stiffening with standard board material is assumed in the direction of minor axis.



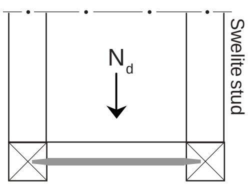
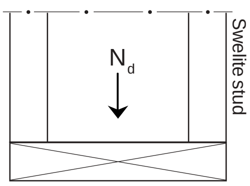
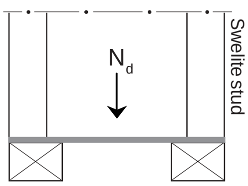
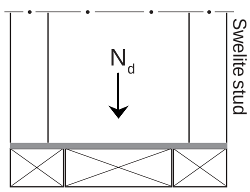


*) The design capacity N_d is calculated for safety class 2, load type B and climate class 1.

Contact Pressure

The load bearing capacity of a wall is often limited by the contact pressure of the wall studs on the sole plate at the bottom. Some of the most most common designs and their load capacity N_d for different stud and sole plate widths are shown below.

Design Capacity N_d [kN] *)

Sole plate type	 Swelite stud	 Wooden sole plate	 Swelite sole plate	 Swelite sole plate + guide stud
Width [mm]	N_d	N_d	N_d	N_d
S170	32	38	53	59
S200	32	40	53	65
S220	32	42	53	70
S240	32	43	53	74
S300	32	48	53	86

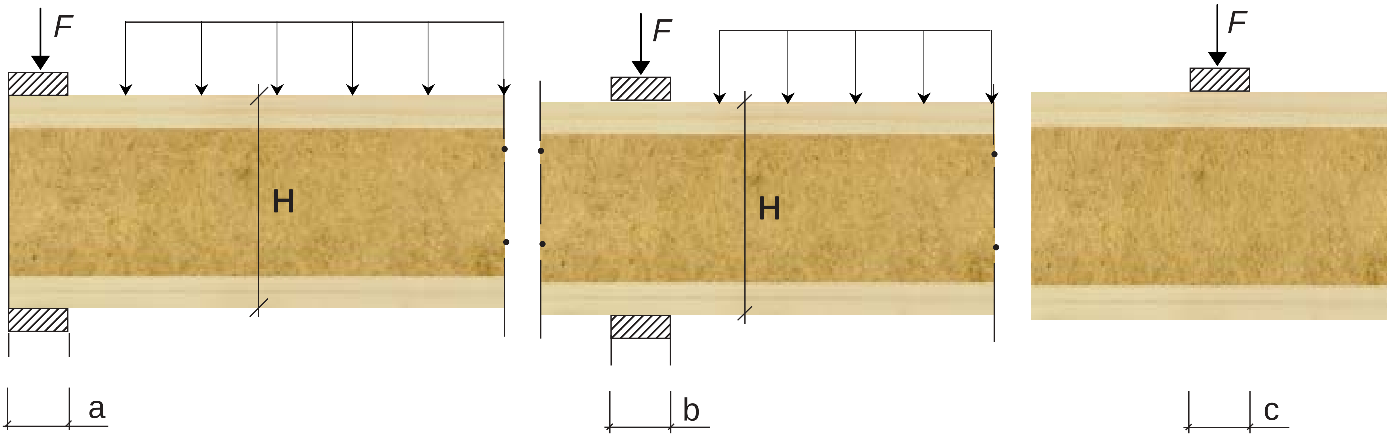
*) The design capacity N_d is calculated for safety class 1, load type B and service class 1.

Directions for Load Bearing

Characteristic values in table A should be used for the load bearing F. Linear interpolation should be used for beam sizes or bearing lengths not shown in the table. The spread of the bearing should be at least 45 mm in the longitudinal direction of the beam. Bearing lengths in excess of 145 mm should not be taken into consideration. The width of the bearing must be at least equal to the width of the flange.

Without Web Filler

Beam end — Inner bearing — Centre point



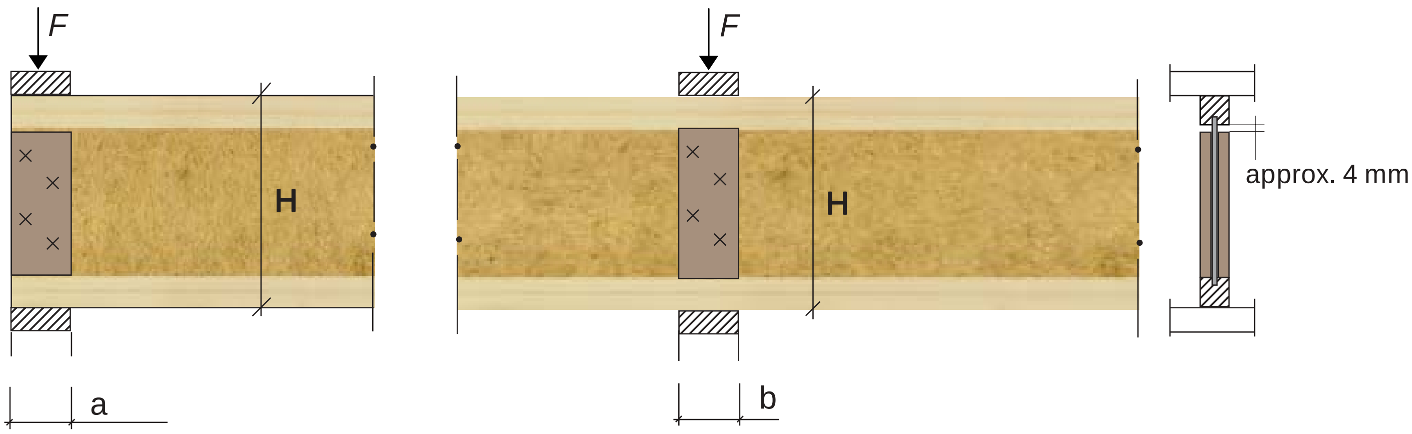
The specified concentrated load on end of beam and inner bearing is permitted in addition to the design loads that are otherwise allowed for the beam. The characteristic table values must be recalculated for each load type, service class and safety class.

Beams without web filler under concentrated load

For beams of depth ≤250 mm and flanges of C24+, the values in table A must be multiplied by 0.95.
For beams of depth >250 mm, the values in table A are used for C24+ and C30+ flanges.

With Web Filler

Beam end — Inner bearing



For concentrated loads higher than allowed for beams without web filler, the beam is strengthened with blocks of 18 mm plywood on both sides of the beam web. The plywood dimensions (a and b) must be equal to the bearing width or at least 100 mm. Stiffeners are nailed with wire nails 75x2.8 or equivalent (4 x nails per block and side). A distance of approximately 4 mm should be left between the top of the stiffeners and the top flange of the beam.

Beams with web filler under concentrated load

Flange material C24+:
Use values in Table A for depths ≤250 mm multiplied by 0.95.
Use values in Table A for depths >250 mm.

Flange material C30+:
Use values in Table A for depths ≤250 mm.
Use values in Table A for depths >250 mm multiplied by 1.05.

Characteristic Load Bearing

Table A below shows the characteristic values to be used for load bearing.

Table A: Characteristic load bearing (kN)

		Bearing on beam end (a)				Inner bearing (b)		Centre point (c)
		Without web filler		With web filler		Without web filler	With web filler	Without web filler
Flanges ≥ 47x47 mm		min 45 mm	min 145 mm	min 45 mm	min 145 mm	min 70 mm	min 70 mm	min 70 mm
Depth	Quality							
200	C30+	8.6	15.5	8.6	16.2	18.5	20.6	18.4
220	C30+	9.5	16.0	9.5	16.5	19.6	21.4	19.2
250	C30+	10.9	16.7	10.9	17.0	21.3	22.6	20.4
300	C24+	11.2	13.3	11.2	16.7	18.2	21.0	20.4
350	C24+	10.5	12.4	11.1	16.7	18.2	20.7	19.6
400	C24+	9.7	11.6	11.2	16.6	18.2	20.4	18.9
450	C24+	8.8	10.7	11.2	16.6	18.2	20.1	18.1
500	C24+	8.0	9.8	9.8	16.5	18.2	19.8	17.3

Holes

With regard to strength, certain regulations must be followed concerning the size of hole, minimum distance between holes and minimum distance to supports.

Distance to support (X_U): $X_U \geq H$

Distance between holes (X_c): $X_C \geq H$

Hole diameter (D): $D \leq H - 2h_f$

Design shear capacity, $V_{d,hole}$, in the cross section of a beam with hole in the web can be calculated as follows:

$V_{d,hole} = V_d k$ where

$V_{d,hole}$ = Design shear capacity, beam with hole
V_d = Design shear capacity, beam without hole
k = Reduction factor as below

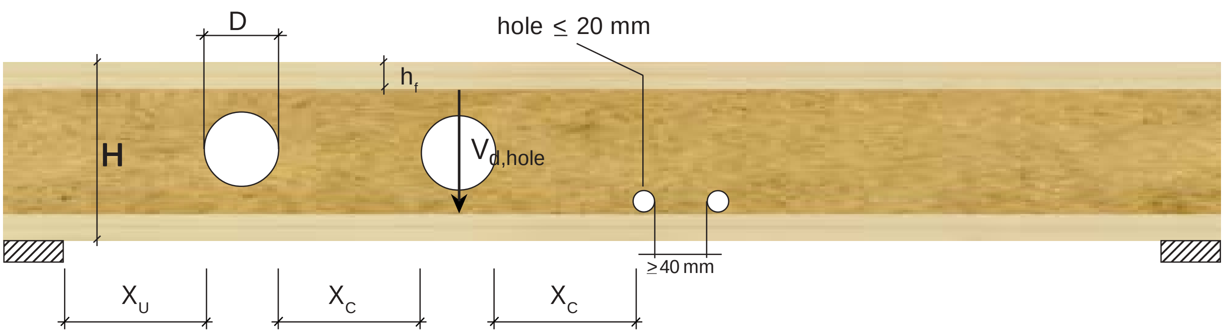
Reduction factor k is determined as:

$$k = \frac{H - h_f - 0.9D}{H - h_f}$$

where

H = Beam depth
D = Hole diameter
h_f = Flange depth

Location of holes must be in agreement with the figure below. All holes must be located centrally in line with the depth of the beam web. Restrictions apply to holes exceeding 20 mm in size. Holes with smaller diameter can be located anywhere in the web but with at least 40 mm between hole edges.

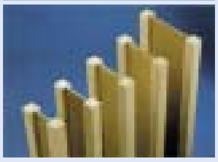


Swelite Building System

A Modern System for Demanding Building Projects

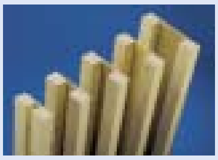
Swelite I-beams

For floor/ceiling and roof constructions, light separating floors and roof trusses. Used as secondary bearer in larger buildings where primary systems are made of other materials, for example steel.



Swelite Stud

For load-bearing exterior walls and studwork.



Swelite Top and Sole Plates

Top and sole plates for use in wall structures and as noggings above/below windows.

Structural Board

For linking together structures made of Swelite I-beams and studs, for instance in roof trusses and for reinforcing I-beams under high concentrated loads.

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