CONCRETE FORMWORK USING FILMFACED BIRCH PLYWOOD

The strength of the formwork board depends on the type of plywood used. Based on general design principles, tabulated load resistance values for continuous plate strips with equal spans used as concrete formwork are given in the Tables A & B below. Information is also given whether the bending or shear strength is design governing. Finally, the deflection related to the load resistance is given.

The load resistances and deflections were calculated according to the following assumptions:

$\gamma_q = 1.2$

$\gamma_m = 1.3$

$K_{mod} = 0.70$

$K_{def} = 0.40$

The characteristic load acting in service class 3 and load duration class short-term shall not exceed the tabulated values. For other assumptions the tabulated load resistance values shall be multiplied by a correction factor $k_{load,\,corr}$ given by

$$K_{load,corr} = \frac{K_{mod}}{\gamma_m\ \gamma_q} \cdot \frac{1.3 \cdot 1.2}{0,70}$$

While the tabulated deflection value shall be multiplied by a correction factor $k_{def,\,corr}$ given by

$$K_{def,\,corr} = \frac{1 + K_{def}}{1 + 0.40} \cdot K_{load,corr}$$

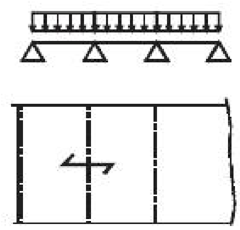
LOAD RESISTANCE q[kN/m2] AND CORRESPONDING DEFLECTION u[mm] VALUES OF FILM FACED BIRCH PLYWOOD TO BE USED IN THE DESIGN OF CONCRETE FORMWORKS

Table A Birch plywood Film Faced

Load resistance for a uniformly distributed load on a continuous plate strip with three equal span lengths. Face grain parallel to span

Span c/c mm	Nominal thickness (mm) 9 q u	12 q u	15 q u	18 q u	21 q u	24 q u
100	123 s 0.3	166 s 0.3	193 s 0.2	234 s 0.2	263 s 0.2	303 s 0.2
150	82 s 0.8	111 s 0.6	129 s 0.4	156 s 0.4	176 s 0.3	202 s 0.3
200	61 s 1.6	83 s 1.1	97 s 0.8	117 s 0.7	132 s 0.6	152 s 0.5
250	46 b 2.7	67 s 2.0	77 s 1.4	94 s 1.1	105 s 0.9	121 s 0.8
300	32 b 3.7	51 b 3.0	64 s 2.2	78 s 1.8	88 s 1.4	101 s 1.2
350	24 b 5.0	38 b 4.0	55 b 3.4	67 s 2.6	75 s 2.1	87 s 1.7
400	18 b 6.4	29 b 5.0	42 b 4.2	58 b 3.7	66 s 2.9	76 s 2.4
500	12 b 9.8	18 b 7.6	27 b 6.4	37 b 5.5	49 b 4.9	61 s 4.3
600	8 b 13.9	13 b 10.8	19 b 8.9	26 b 7.7	34 b 6.8	43 b 6.1

Span c/c mm	Nominal thickness (mm) 27 q u	30 q u	35 q u	40 q u	45 q u	50 q u
100	333 s 0.2	372 s 0.2	441 s 0.2	511 s 0.1	544 s 0.1	613 s 0.1
150	222 s 0.3	248 s 0.3	294 s 0.3	340 s 0.2	363 s 0.2	409 s 0.2
200	167 s 0.5	186 s 0.4	220 s 0.4	255 s 0.4	272 s 0.3	306 s 0.3
250	133 s 0.7	149 s 0.6	176 s 0.6	204 s 0.5	218 s 0.5	245 s 0.5
300	111 s 1.0	124 s 0.9	147 s 0.8	170 s 0.7	181 s 0.7	204 s 0.6
350	95 s 1.5	106 s 1.3	126 s 1.1	146 s 0.9	155 s 0.9	175 s 0.8
400	83 s 2.0	93 s 1.8	110 s 1.4	128 s 1.2	136 s 1.1	153 s 1.0
500	67 s 3.6	74 s 3.1	88 s 2.4	102 s 1.9	109 s 1.8	123 s 1.5
600	54 b 5.6	62 s 4.9	73 s 3.7	85 s 3.0	91 s 2.7	102 s 2.3



Short-term loading

Service Class 3

$k_{mod} = 0.70$

$k_{def} = 0.40$

$\gamma_q = 1.2$

$\gamma_m = 1.3$

q given in kN/m^2

u given in mm

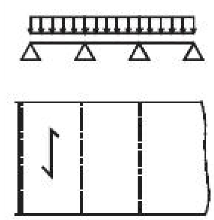
⟷ grain direction of surface veneers

Table B Birch plywood Film Faced

Load resistance for a uniformly distributed load on a continuous plate strip with three equal span lengths. Face grain perpendicular to span

Span c/c mm	Nominal thickness (mm) 9 q u	12 q u	15 q u	18 q u	21 q u	24 q u
100	108 s 0.4	133 s 0.3	176 s 0.2	205 s 0.2	245 s 0.2	276 s 0.2
150	72 s 1.1	89 s 0.7	118 s 0.5	137 s 0.4	163 s 0.4	184 s 0.3
200	51 b 2.3	66 s 1.3	88 s 1.0	103 s 0.8	123 s 0.6	138 s 0.5
250	33 b 3.4	53 s 2.4	71 s 1.7	82 s 1.3	98 s 1.0	111 s 0.9
300	23 b 4.8	40 b 3.6	59 s 2.8	68 s 2.0	82 s 1.6	92 s 1.3
350	17 b 6.4	29 b 4.7	45 b 3.8	59 s 3.0	70 s 2.4	79 s 1.9
400	13 b 8.2	22 b 6.1	35 b 4.9	49 b 4.2	61 s 3.4	69 s 2.7
500	8 b 12.7	14 b 9.2	22 b 7.4	32 b 6.2	43 b 5.4	55 s 4.8
600	6 b 18.2	10 b 13.1	15 b 10.4	22 b 8.7	30 b 7.5	38 b 6.7

Span c/c mm	Nominal thickness (mm) 27 q u	30 q u	35 q u	40 q u	45 q u	50 q u
100	315 s 0.2	346 s 0.2	417 s 0.2	487 s 0.2	525 s 0.1	594 s 0.1
150	210 s 0.3	231 s 0.3	278 s 0.3	324 s 0.2	350 s 0.2	396 s 0.2
200	158 s 0.5	173 s 0.4	208 s 0.4	243 s 0.4	262 s 0.4	297 s 0.3
250	126 s 0.8	138 s 0.7	167 s 0.6	195 s 0.5	210 s 0.5	237 s 0.5
300	105 s 1.1	115 s 1.0	139 s 0.8	162 s 0.7	175 s 0.7	198 s 0.6
350	90 s 1.6	99 s 1.4	119 s 1.1	139 s 0.9	150 s 0.9	170 s 0.8
400	79 s 2.3	87 s 1.9	104 s 1.5	122 s 1.2	131 s 1.2	148 s 1.0
500	63 s 4.0	69 s 3.3	83 s 2.5	97 s 2.0	105 s 1.9	119 s 1.6
600	48 b 6.0	58 s 5.4	69 s 4.0	81 s 3.2	87 s 2.9	99 s 2.4



Short-term loading

Service Class 3

$k_{mod} = 0.70$

$k_{def} = 0.40$

$\gamma_q = 1.2$

$\gamma_m = 1.3$

q given in kN/m^2

u given in mm

⟷ grain direction of surface veneers

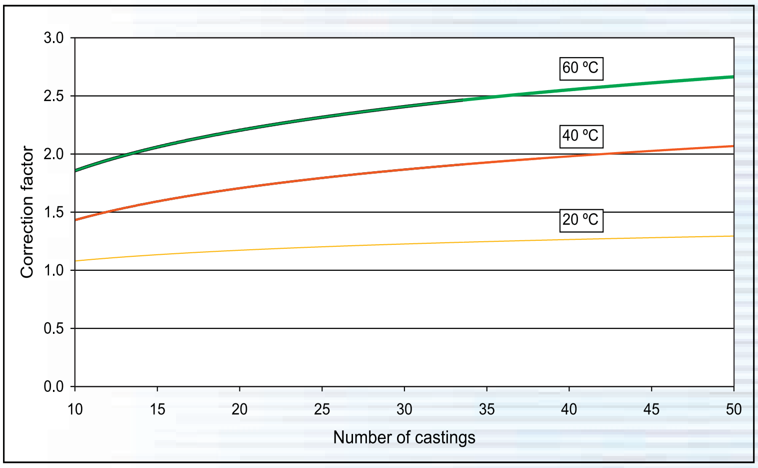
b= bending strength limitation

s= planar shear strength limitation

PLYWOOD FORMWORK IN COLD CONDITIONS

In colder climates it is sometimes necessary to heat concrete formwork when in use to avoid frost problems. When the concrete mass casting temperature is above + 20°C (for example in winter concreting) increased temperature can cause additional deflection of the plywood. The deflection of birch plywood as a function of castings can be calculated using the correction factor $k_{temp,\ corr}$ as shown in the Figure below.

Deflection correction factor ($k_{temp,\ corr}$) for birch plywood in winter concreting



The final deflection u_{fin} in winter concreting is given by
$u_{fin} = u \cdot k_{temp,\ corr}$ where u is the deflection from Tables 4-39 to 4-48.