

## SELF-DRILLING DOWEL

### TAPERED TIP

The new tapered self-perforating tip minimises insertion times in timber-to-metal connection systems and guarantees applications in hard-to-reach positions (reduced application force).

### GREATER STRENGTH

Higher shear strengths than the previous version.  
The 7.5 mm diameter ensures higher shear strengths than other solutions on the market and enables optimisation of the number of fasteners.

### DOUBLE THREAD

The thread close to the tip ( $b_1$ ) facilitates screwing. The longer under-head thread ( $b_2$ ) allows quick and precise closing of the joint.

### CYLINDRICAL HEAD

It allows the dowel to penetrate beyond the surface of the timber substrate. It ensures an optimal appearance and meets fire-strength requisites.



#### CANADIAN DESIGN VALUES

USA, EU and more design values available online.

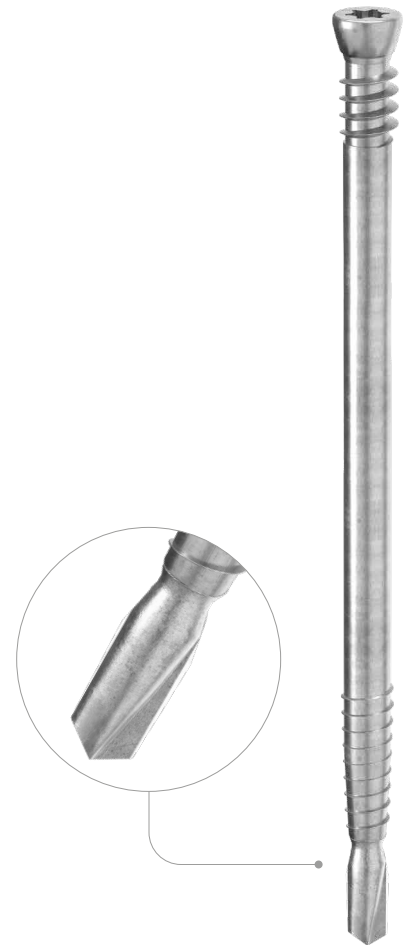


VIDEO

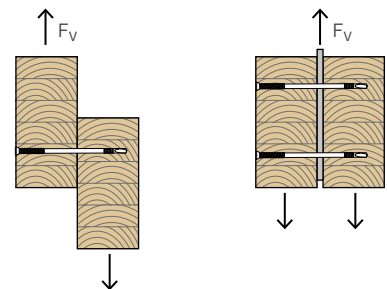


BIT INCLUDED

|                         |                   |                                |
|-------------------------|-------------------|--------------------------------|
| DIAMETER [mm]           | 7,5 (7,5)         | 20                             |
| LENGTH [mm]             | 55 (235)          | 1000                           |
| SERVICE CONDITION       | DRY               |                                |
| ATMOSPHERIC CORROSIVITY | C1 C2             |                                |
| WOOD CORROSIVITY        | T1 T2             |                                |
| MATERIAL                | Zn ELECTRO PLATED | electrogalvanized carbon steel |



### EXTERNAL LOADS



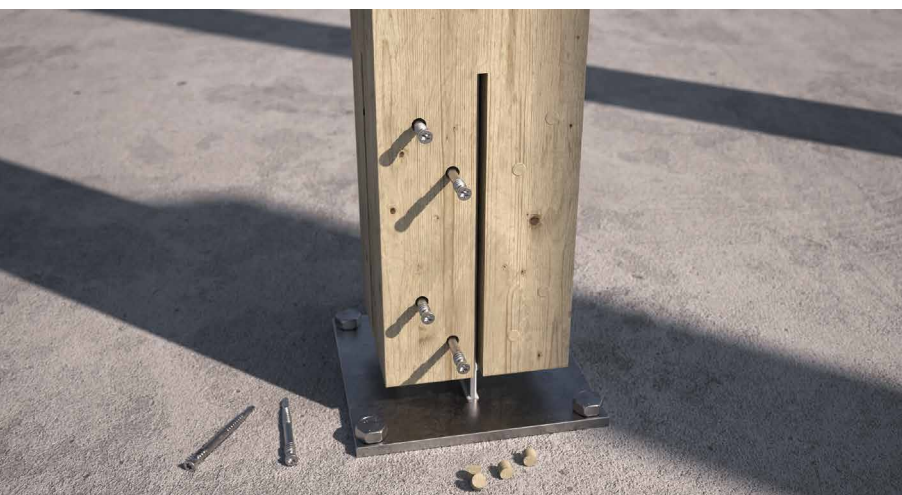
### FIELDS OF USE

Self-drilling system for concealed timber-to-steel joints.

It can be used with screw guns running at 600-2100 rpm, minimum applied force 25 kg, with:

- steel S235  $\leq 10.0$  mm
- steel S275  $\leq 10.0$  mm
- steel S355  $\leq 10.0$  mm
- ALUMINI, ALUMIDI and ALUMAXI brackets





## MOMENT RESTORING

It restores shear and moment forces in concealed centreline joints of large beams.

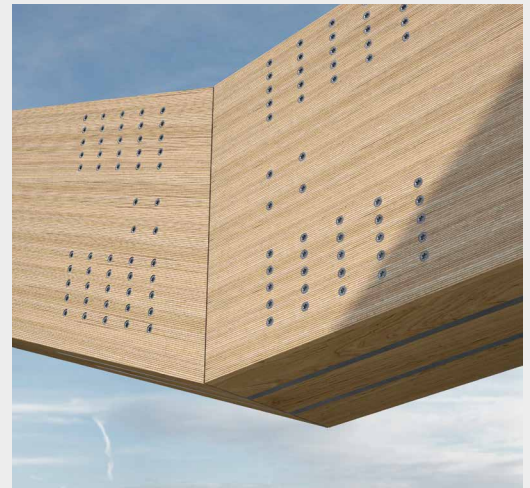
## EXCEPTIONAL SPEED

The only dowel that drills a 5 mm thick S355 plate in 20 seconds (horizontal application with an applied force of 25 kg). No self-drilling dowel exceeds the application speed of the SBD with its new tip.





Fastening of Rothoblaas pillar-holder with internal knife plate F70.



Rigid "knee" joint with double internal plate (LVL).

## CODES AND DIMENSIONS

SBD L ≥ 95 mm

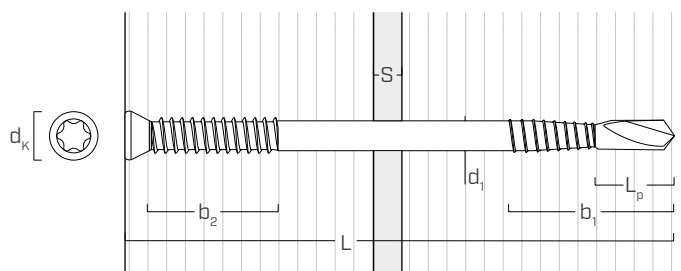
| $d_1$<br>[mm]<br>[in] | CODE     | L<br>[mm] | L<br>[in] | $b_1$<br>[mm] | $b_2$<br>[mm] | pcs |
|-----------------------|----------|-----------|-----------|---------------|---------------|-----|
| 7,5<br>0.30<br>TX 40  | SBD7595  | 95        | 3 3/4     | 40            | 10            | 50  |
|                       | SBD75115 | 115       | 4 1/2     | 40            | 10            | 50  |
|                       | SBD75135 | 135       | 5 5/16    | 40            | 10            | 50  |
|                       | SBD75155 | 155       | 6 1/8     | 40            | 20            | 50  |
|                       | SBD75175 | 175       | 6 7/8     | 40            | 40            | 50  |
|                       | SBD75195 | 195       | 7 11/16   | 40            | 40            | 50  |
|                       | SBD75215 | 215       | 8 7/16    | 40            | 40            | 50  |
|                       | SBD75235 | 235       | 9 1/4     | 40            | 40            | 50  |

SBD L ≤ 75 mm

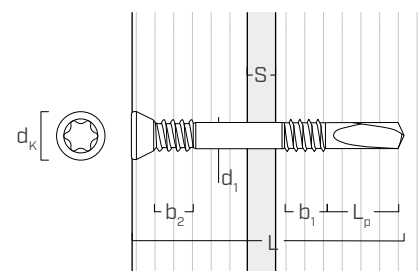
| $d_1$<br>[mm]<br>[in] | CODE    | L<br>[mm] | L<br>[in] | $b_1$<br>[mm] | $b_2$<br>[mm] | pcs |
|-----------------------|---------|-----------|-----------|---------------|---------------|-----|
| 7,5                   | SBD7555 | 55        | 2 3/16    | -             | 10            | 50  |
| 0.30<br>TX 40         | SBD7575 | 75        | 2 15/16   | 8             | 10            | 50  |

## GEOMETRY AND MECHANICAL CHARACTERISTICS

SBD L ≥ 95 mm



SBD L ≤ 75 mm



SBD L ≥ 95 mm

SBD L ≤ 75 mm

| Nominal diameter                 | $d_1$     | [mm]  | 7,5     | 7,5     |
|----------------------------------|-----------|-------|---------|---------|
| Head diameter                    | $d_k$     | [mm]  | 11,00   | 11,00   |
| Tip length                       | $L_p$     | [mm]  | 20,0    | 24,0    |
| Effective length                 | $L_{eff}$ | [mm]  | L-15,0  | L-8,0   |
| Specified bending yield strength | $F_{yb}$  | [psi] | 150,000 | 150,000 |

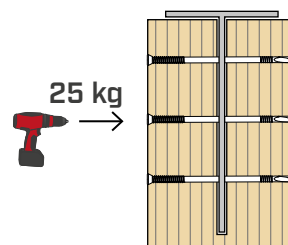
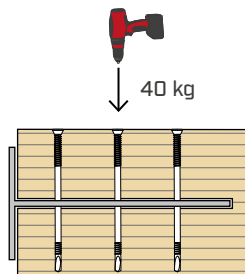
Bending yield strength has been tested and evaluated in accordance with ASTM F1575 and ICC-ES Acceptance Criteria AC233.

NOTES and GENERAL PRINCIPLES on page 10.

## ■ INSTALLATION | ALUMINIUM PLATE

| plate   | single plate<br>[mm] |
|---------|----------------------|
| ALUMINI | 6                    |
| ALUMIDI | 6                    |
| ALUMAXI | 10                   |

It is suggested to have a milling in the wood equal to the thickness of the plate increased by at least 1 mm.



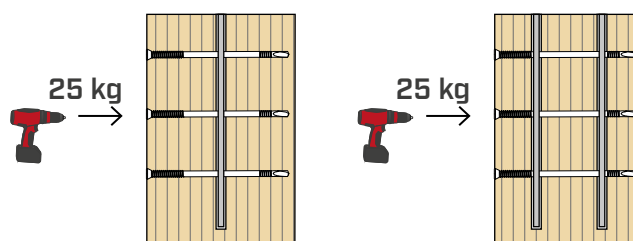
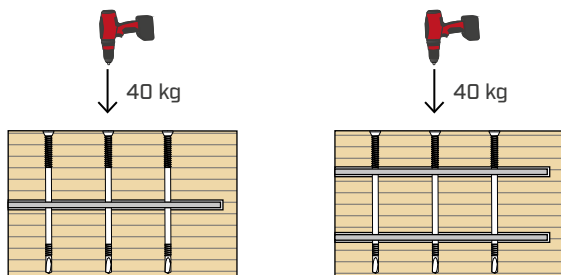
|                         |                                     |
|-------------------------|-------------------------------------|
| pressure to be applied  | 40 kg                               |
| recommended screwdriver | Mafell A 18M BL                     |
| recommended speed       | 1 <sup>st</sup> gear (600-1000 rpm) |

|                         |                                     |
|-------------------------|-------------------------------------|
| pressure to be applied  | 25 kg                               |
| recommended screwdriver | Mafell A 18M BL                     |
| recommended speed       | 1 <sup>st</sup> gear (600-1000 rpm) |

## ■ INSTALLATION | STEEL PLATE

| plate      | single plate<br>[mm] | double plate<br>[mm] |
|------------|----------------------|----------------------|
| S235 steel | 10                   | 8                    |
| S275 steel | 10                   | 6                    |
| S355 steel | 10                   | 5                    |

It is suggested to have a milling in the wood equal to the thickness of the plate increased by at least 1 mm.



|                         |                                      |
|-------------------------|--------------------------------------|
| pressure to be applied  | 40 kg                                |
| recommended screwdriver | Mafell A 18M BL                      |
| recommended speed       | 2 <sup>nd</sup> gear (1000-1500 rpm) |

|                         |                                      |
|-------------------------|--------------------------------------|
| pressure to be applied  | 25 kg                                |
| recommended screwdriver | Mafell A 18M BL                      |
| recommended speed       | 2 <sup>nd</sup> gear (1500-2000 rpm) |

### PLATE HARDNESS

The steel plate hardness can greatly vary the pull-through times of the dowels.

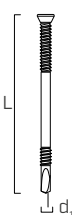
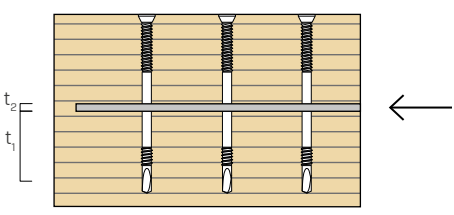
Hardness is in fact defined as the material's strength to drilling or cutting.

In general, the harder the plate, the longer the drilling time.

The hardness of the plate does not always depend on the strength of the steel, it can vary from point to point and is strongly influenced by heat treatments: normalized plates have a medium to low hardness, while the hardening process gives the steel high hardnesses.

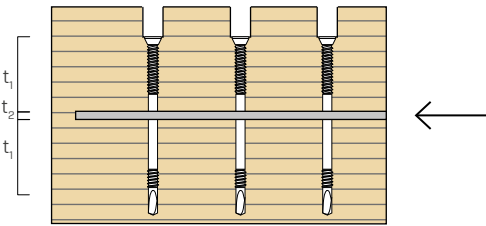


1 INTERNAL PLATE - DOWEL HEAD INSTALLATION DEPTH 0 mm

| geometry                                                                          |                |         | double shear - timber-to-steel-to-timber                                           |      |                                                             |                                                           |      |      |        |      |      |        |      |      |        |      |      |
|-----------------------------------------------------------------------------------|----------------|---------|------------------------------------------------------------------------------------|------|-------------------------------------------------------------|-----------------------------------------------------------|------|------|--------|------|------|--------|------|------|--------|------|------|
|  |                |         |  |      |                                                             |                                                           |      |      |        |      |      |        |      |      |        |      |      |
| d <sub>1</sub><br>[mm]<br>[in]                                                    | L<br>[mm] [in] |         | steel plate<br>thickness = t <sub>2</sub><br>[mm] [in]                             |      | embedment<br>length = t <sub>1</sub> <sup>(2)</sup><br>[mm] | factored lateral resistance N <sub>r</sub> <sup>(1)</sup> |      |      |        |      |      |        |      |      |        |      |      |
|                                                                                   |                |         |                                                                                    |      |                                                             | G=0.35                                                    |      |      | G=0.42 |      |      | G=0.49 |      |      | G=0.55 |      |      |
|                                                                                   |                |         |                                                                                    |      |                                                             | 0°                                                        | 45°  | 90°  | 0°     | 45°  | 90°  | 0°     | 45°  | 90°  | 0°     | 45°  | 90°  |
| 7.5<br>0.30                                                                       | 55             | 2 3/16  | 3,2                                                                                | 1/8  | 15                                                          | 2,82                                                      | 1,72 | 1,24 | 3,38   | 2,07 | 1,49 | 3,94   | 2,41 | 1,74 | 4,43   | 2,70 | 1,95 |
|                                                                                   | 75             | 2 15/16 |                                                                                    |      | 25                                                          | 4,76                                                      | 2,91 | 2,09 | 5,71   | 3,49 | 2,51 | 6,66   | 4,07 | 2,93 | 7,40   | 4,57 | 3,29 |
|                                                                                   | 95             | 3 3/4   |                                                                                    |      | 28                                                          | 5,34                                                      | 3,26 | 2,35 | 6,41   | 3,92 | 2,82 | 7,07   | 4,57 | 3,29 | 7,58   | 5,13 | 3,69 |
|                                                                                   | 115            | 4 1/2   |                                                                                    |      | 33                                                          | 5,99                                                      | 3,86 | 2,78 | 6,69   | 4,63 | 3,33 | 7,35   | 5,40 | 3,89 | 7,89   | 5,84 | 4,37 |
|                                                                                   | 135            | 5 5/16  |                                                                                    |      | 30                                                          | 5,83                                                      | 3,56 | 2,56 | 6,57   | 4,27 | 3,08 | 7,21   | 4,99 | 3,59 | 7,74   | 5,60 | 4,03 |
|                                                                                   | 155            | 6 1/8   |                                                                                    |      | 50                                                          | 6,67                                                      | 4,89 | 4,00 | 7,50   | 5,48 | 4,47 | 8,30   | 6,04 | 4,91 | 8,96   | 6,50 | 5,28 |
|                                                                                   | 175            | 6 7/8   |                                                                                    |      | 50                                                          | 6,67                                                      | 4,89 | 4,00 | 7,50   | 5,48 | 4,47 | 8,30   | 6,04 | 4,91 | 8,96   | 6,50 | 5,28 |
|                                                                                   | 195            | 7 11/16 |                                                                                    |      | 70                                                          | 7,45                                                      | 5,36 | 4,34 | 8,43   | 6,05 | 4,88 | 9,39   | 6,70 | 5,39 | 10,18  | 7,24 | 5,82 |
|                                                                                   | 215            | 8 7/16  |                                                                                    |      | 65                                                          | 7,25                                                      | 5,25 | 4,26 | 8,20   | 5,91 | 4,78 | 9,11   | 6,54 | 5,27 | 9,87   | 7,06 | 5,68 |
|                                                                                   | 235            | 9 1/4   |                                                                                    |      | 85                                                          | 8,03                                                      | 5,72 | 4,60 | 9,13   | 6,47 | 5,19 | 10,20  | 7,20 | 5,75 | 11,09  | 7,80 | 6,22 |
|                                                                                   | 55             | 2 3/16  | 4,8                                                                                | 3/16 | 14                                                          | 2,62                                                      | 1,60 | 1,15 | 3,15   | 1,92 | 1,38 | 3,67   | 2,24 | 1,62 | 4,12   | 2,52 | 1,81 |
|                                                                                   | 75             | 2 15/16 |                                                                                    |      | 24                                                          | 4,56                                                      | 2,79 | 2,01 | 5,48   | 3,35 | 2,41 | 6,39   | 3,91 | 2,81 | 7,17   | 4,38 | 3,16 |
|                                                                                   | 95             | 3 3/4   |                                                                                    |      | 27                                                          | 5,15                                                      | 3,15 | 2,26 | 6,18   | 3,77 | 2,72 | 7,02   | 4,40 | 3,17 | 7,52   | 4,94 | 3,56 |
|                                                                                   | 115            | 4 1/2   |                                                                                    |      | 32                                                          | 5,95                                                      | 3,74 | 2,69 | 6,64   | 4,49 | 3,23 | 7,29   | 5,24 | 3,77 | 7,83   | 5,81 | 4,23 |
|                                                                                   | 135            | 5 5/16  |                                                                                    |      | 29                                                          | 5,63                                                      | 3,44 | 2,48 | 6,52   | 4,13 | 2,97 | 7,16   | 4,82 | 3,47 | 7,67   | 5,41 | 3,89 |
|                                                                                   | 155            | 6 1/8   |                                                                                    |      | 49                                                          | 6,63                                                      | 4,87 | 3,98 | 7,46   | 5,45 | 4,45 | 8,24   | 6,00 | 4,89 | 8,90   | 6,46 | 5,25 |
|                                                                                   | 175            | 6 7/8   |                                                                                    |      | 49                                                          | 6,63                                                      | 4,87 | 3,98 | 7,46   | 5,45 | 4,45 | 8,24   | 6,00 | 4,89 | 8,90   | 6,46 | 5,25 |
|                                                                                   | 195            | 7 11/16 |                                                                                    |      | 69                                                          | 7,41                                                      | 5,34 | 4,32 | 8,39   | 6,02 | 4,86 | 9,33   | 6,67 | 5,37 | 10,12  | 7,21 | 5,79 |
|                                                                                   | 215            | 8 7/16  |                                                                                    |      | 64                                                          | 7,21                                                      | 5,22 | 4,24 | 8,15   | 5,88 | 4,76 | 9,06   | 6,50 | 5,25 | 9,81   | 7,02 | 5,66 |
|                                                                                   | 235            | 9 1/4   |                                                                                    |      | 84                                                          | 7,99                                                      | 5,70 | 4,58 | 9,09   | 6,45 | 5,17 | 10,15  | 7,17 | 5,73 | 11,03  | 7,77 | 6,19 |
|                                                                                   | 55             | 2 3/16  | 6,4                                                                                | 1/4  | 13                                                          | 2,53                                                      | 1,54 | 1,11 | 3,03   | 1,85 | 1,33 | 3,54   | 2,16 | 1,56 | 3,97   | 2,43 | 1,75 |
|                                                                                   | 75             | 2 15/16 |                                                                                    |      | 23                                                          | 4,47                                                      | 2,73 | 1,97 | 5,36   | 3,28 | 2,36 | 6,25   | 3,82 | 2,75 | 7,02   | 4,29 | 3,09 |
|                                                                                   | 95             | 3 3/4   |                                                                                    |      | 26                                                          | 5,05                                                      | 3,09 | 2,22 | 6,06   | 3,70 | 2,67 | 6,99   | 4,32 | 3,11 | 7,49   | 4,85 | 3,49 |
|                                                                                   | 115            | 4 1/2   |                                                                                    |      | 31                                                          | 5,93                                                      | 3,68 | 2,65 | 6,62   | 4,42 | 3,18 | 7,26   | 5,15 | 3,71 | 7,80   | 5,78 | 4,16 |
|                                                                                   | 135            | 5 5/16  |                                                                                    |      | 29                                                          | 5,54                                                      | 3,38 | 2,44 | 6,50   | 4,06 | 2,92 | 7,13   | 4,74 | 3,41 | 7,64   | 5,32 | 3,83 |
|                                                                                   | 155            | 6 1/8   |                                                                                    |      | 49                                                          | 6,61                                                      | 4,85 | 3,97 | 7,43   | 5,44 | 4,44 | 8,22   | 5,99 | 4,88 | 8,87   | 6,44 | 5,24 |
|                                                                                   | 175            | 6 7/8   |                                                                                    |      | 49                                                          | 6,61                                                      | 4,85 | 3,97 | 7,43   | 5,44 | 4,44 | 8,22   | 5,99 | 4,88 | 8,87   | 6,44 | 5,24 |
|                                                                                   | 195            | 7 11/16 |                                                                                    |      | 69                                                          | 7,39                                                      | 5,33 | 4,32 | 8,36   | 6,00 | 4,85 | 9,30   | 6,65 | 5,36 | 10,09  | 7,19 | 5,78 |
|                                                                                   | 215            | 8 7/16  |                                                                                    |      | 64                                                          | 7,19                                                      | 5,21 | 4,23 | 8,13   | 5,86 | 4,75 | 9,03   | 6,49 | 5,24 | 9,78   | 7,00 | 5,64 |
|                                                                                   | 235            | 9 1/4   |                                                                                    |      | 84                                                          | 7,97                                                      | 5,69 | 4,57 | 9,06   | 6,43 | 5,16 | 10,12  | 7,15 | 5,72 | 11,00  | 7,75 | 6,18 |
|                                                                                   | 55             | 2 3/16  | 8                                                                                  | 5/16 | 12                                                          | 2,33                                                      | 1,42 | 1,03 | 2,80   | 1,71 | 1,23 | 3,26   | 1,99 | 1,44 | 3,66   | 2,24 | 1,61 |
|                                                                                   | 75             | 2 15/16 |                                                                                    |      | 22                                                          | 4,27                                                      | 2,61 | 1,88 | 5,13   | 3,13 | 2,26 | 5,98   | 3,66 | 2,63 | 6,72   | 4,10 | 2,95 |
|                                                                                   | 95             | 3 3/4   |                                                                                    |      | 25                                                          | 4,86                                                      | 2,97 | 2,14 | 5,83   | 3,56 | 2,56 | 6,80   | 4,15 | 2,99 | 7,43   | 4,66 | 3,36 |
|                                                                                   | 115            | 4 1/2   |                                                                                    |      | 30                                                          | 5,83                                                      | 3,56 | 2,56 | 6,57   | 4,27 | 3,08 | 7,21   | 4,99 | 3,59 | 7,74   | 5,60 | 4,03 |
|                                                                                   | 135            | 5 5/16  |                                                                                    |      | 28                                                          | 5,34                                                      | 3,26 | 2,35 | 6,41   | 3,92 | 2,82 | 7,07   | 4,57 | 3,29 | 7,58   | 5,13 | 3,69 |
|                                                                                   | 155            | 6 1/8   |                                                                                    |      | 48                                                          | 6,57                                                      | 4,83 | 3,96 | 7,39   | 5,41 | 4,42 | 8,16   | 5,95 | 4,85 | 8,80   | 6,40 | 5,21 |
|                                                                                   | 175            | 6 7/8   |                                                                                    |      | 48                                                          | 6,57                                                      | 4,83 | 3,96 | 7,39   | 5,41 | 4,42 | 8,16   | 5,95 | 4,85 | 8,80   | 6,40 | 5,21 |
|                                                                                   | 195            | 7 11/16 |                                                                                    |      | 68                                                          | 7,35                                                      | 5,31 | 4,30 | 8,32   | 5,98 | 4,83 | 9,25   | 6,62 | 5,33 | 10,03  | 7,15 | 5,75 |
|                                                                                   | 215            | 8 7/16  |                                                                                    |      | 63                                                          | 7,15                                                      | 5,19 | 4,21 | 8,08   | 5,83 | 4,73 | 8,98   | 6,45 | 5,21 | 9,72   | 6,96 | 5,62 |
|                                                                                   | 235            | 9 1/4   |                                                                                    |      | 83                                                          | 7,93                                                      | 5,66 | 4,56 | 9,02   | 6,40 | 5,14 | 10,07  | 7,12 | 5,69 | 10,94  | 7,71 | 6,15 |
|                                                                                   | 55             | 2 3/16  | 9,6                                                                                | 3/8  | 11                                                          | 2,14                                                      | 1,31 | 0,94 | 2,56   | 1,57 | 1,13 | 2,99   | 1,83 | 1,32 | 3,36   | 2,05 | 1,48 |
|                                                                                   | 75             | 2 15/16 |                                                                                    |      | 21                                                          | 4,08                                                      | 2,49 | 1,79 | 4,90   | 2,99 | 2,15 | 5,71   | 3,49 | 2,51 | 6,41   | 3,92 | 2,82 |
|                                                                                   | 95             | 3 3/4   |                                                                                    |      | 24                                                          | 4,66                                                      | 2,85 | 2,05 | 5,59   | 3,42 | 2,46 | 6,53   | 3,99 | 2,87 | 7,33   | 4,48 | 3,22 |
|                                                                                   | 115            | 4 1/2   |                                                                                    |      | 29                                                          | 5,63                                                      | 3,44 | 2,48 | 6,52   | 4,13 | 2,97 | 7,16   | 4,82 | 3,47 | 7,67   | 5,41 | 3,89 |
|                                                                                   | 135            | 5 5/16  |                                                                                    |      | 27                                                          | 5,15                                                      | 3,15 | 2,26 | 6,18   | 3,77 | 2,72 | 7,02   | 4,40 | 3,17 | 7,52   | 4,94 | 3,56 |
|                                                                                   | 155            | 6 1/8   |                                                                                    |      | 47                                                          | 6,53                                                      | 4,81 | 3,94 | 7,34   | 5,38 | 4,40 | 8,11   | 5,92 | 4,83 | 8,74   | 6,37 | 5,19 |
|                                                                                   | 175            | 6 7/8   |                                                                                    |      | 47                                                          | 6,53                                                      | 4,81 | 3,94 | 7,34   | 5,38 | 4,40 | 8,11   | 5,92 | 4,83 | 8,74   | 6,37 | 5,19 |
|                                                                                   | 195            | 7 11/16 |                                                                                    |      | 67                                                          | 7,31                                                      | 5,28 | 4,28 | 8,27   | 5,95 | 4,81 | 9,20   | 6,59 | 5,31 | 9,96   | 7,11 | 5,72 |
|                                                                                   | 215            | 8 7/16  |                                                                                    |      | 62                                                          | 7,12                                                      | 5,16 | 4,20 | 8,04   | 5,81 | 4,71 | 8,92   | 6,42 | 5,19 | 9,66   | 6,93 | 5,59 |
|                                                                                   | 235            | 9 1/4   |                                                                                    |      | 82                                                          | 7,89                                                      | 5,64 | 4,54 | 8,97   | 6,38 | 5,12 | 10,01  | 7,08 | 5,67 | 10,88  | 7,67 | 6,13 |

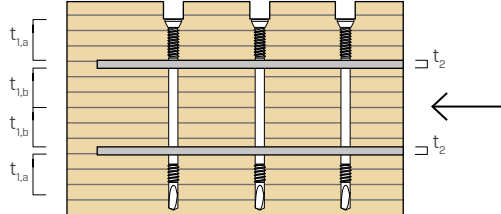
NOTES and GENERAL PRINCIPLES on page 10.

1 INTERNAL PLATE - OPTIMAL EMBEDMENT LENGTH

| geometry                                                                          |              |              | double shear - timber-to-steel-to-timber                                           |      |                                                  |                                                           |      |      |        |      |      |        |      |      |        |      |      |
|-----------------------------------------------------------------------------------|--------------|--------------|------------------------------------------------------------------------------------|------|--------------------------------------------------|-----------------------------------------------------------|------|------|--------|------|------|--------|------|------|--------|------|------|
|  |              |              |  |      |                                                  |                                                           |      |      |        |      |      |        |      |      |        |      |      |
| d <sub>1</sub>                                                                    | L            |              | steel plate thickness = t <sub>2</sub>                                             |      | embedment length = t <sub>1</sub> <sup>(2)</sup> | factored lateral resistance N <sub>r</sub> <sup>(1)</sup> |      |      |        |      |      |        |      |      |        |      |      |
|                                                                                   |              |              |                                                                                    |      |                                                  | G=0.35                                                    |      |      | G=0.42 |      |      | G=0.49 |      |      | G=0.55 |      |      |
|                                                                                   | [mm]<br>[in] | [mm]<br>[in] | [mm]                                                                               | [in] | [mm]                                             | 0°                                                        | 45°  | 90°  | 0°     | 45°  | 90°  | 0°     | 45°  | 90°  | 0°     | 45°  | 90°  |
| 7.5<br>0.30                                                                       | 55           | 2 3/16       | 3,2                                                                                | 1/8  | 21                                               | 4,08                                                      | 2,49 | 1,79 | 4,90   | 2,99 | 2,15 | 5,71   | 3,49 | 2,51 | 6,41   | 3,92 | 2,82 |
|                                                                                   | 75           | 2 15/16      |                                                                                    |      | 31                                               | 5,93                                                      | 3,68 | 2,65 | 6,62   | 4,42 | 3,18 | 7,26   | 5,15 | 3,71 | 7,80   | 5,78 | 4,16 |
|                                                                                   | 95           | 3 3/4        |                                                                                    |      | 38                                               | 6,18                                                      | 4,45 | 3,21 | 6,92   | 5,12 | 3,85 | 7,62   | 5,62 | 4,49 | 8,19   | 6,03 | 4,94 |
|                                                                                   | 115          | 4 1/2        |                                                                                    |      | 48                                               | 6,57                                                      | 4,83 | 3,96 | 7,39   | 5,41 | 4,42 | 8,16   | 5,95 | 4,85 | 8,80   | 6,40 | 5,21 |
|                                                                                   | 135          | 5 5/16       |                                                                                    |      | 58                                               | 6,96                                                      | 5,07 | 4,13 | 7,85   | 5,69 | 4,62 | 8,71   | 6,29 | 5,09 | 9,41   | 6,78 | 5,48 |
|                                                                                   | 155          | 6 1/8        |                                                                                    |      | 68                                               | 7,35                                                      | 5,31 | 4,30 | 8,32   | 5,98 | 4,83 | 9,25   | 6,62 | 5,33 | 10,03  | 7,15 | 5,75 |
|                                                                                   | 175          | 6 7/8        |                                                                                    |      | 78                                               | 7,74                                                      | 5,54 | 4,47 | 8,78   | 6,26 | 5,03 | 9,79   | 6,95 | 5,57 | 10,64  | 7,52 | 6,02 |
|                                                                                   | 195          | 7 11/16      |                                                                                    |      | 88                                               | 8,13                                                      | 5,78 | 4,64 | 9,25   | 6,55 | 5,24 | 10,34  | 7,28 | 5,81 | 11,25  | 7,90 | 6,29 |
|                                                                                   | 215          | 8 7/16       |                                                                                    |      | 98                                               | 8,51                                                      | 6,02 | 4,81 | 9,72   | 6,83 | 5,44 | 10,88  | 7,62 | 6,05 | 11,81  | 8,27 | 6,56 |
|                                                                                   | 235          | 9 1/4        |                                                                                    |      | 108                                              | 8,90                                                      | 6,26 | 4,98 | 10,18  | 7,12 | 5,65 | 11,16  | 7,95 | 6,29 | 11,81  | 8,64 | 6,82 |
|                                                                                   | 55           | 2 3/16       | 4,8                                                                                | 3/16 | 20                                               | 3,89                                                      | 2,37 | 1,71 | 4,66   | 2,85 | 2,05 | 5,44   | 3,32 | 2,39 | 6,11   | 3,73 | 2,69 |
|                                                                                   | 75           | 2 15/16      |                                                                                    |      | 30                                               | 5,83                                                      | 3,56 | 2,56 | 6,57   | 4,27 | 3,08 | 7,21   | 4,99 | 3,59 | 7,74   | 5,60 | 4,03 |
|                                                                                   | 95           | 3 3/4        |                                                                                    |      | 37                                               | 6,14                                                      | 4,33 | 3,12 | 6,87   | 5,09 | 3,74 | 7,56   | 5,59 | 4,37 | 8,13   | 5,99 | 4,90 |
|                                                                                   | 115          | 4 1/2        |                                                                                    |      | 47                                               | 6,53                                                      | 4,81 | 3,94 | 7,34   | 5,38 | 4,40 | 8,11   | 5,92 | 4,83 | 8,74   | 6,37 | 5,19 |
|                                                                                   | 135          | 5 5/16       |                                                                                    |      | 57                                               | 6,92                                                      | 5,04 | 4,11 | 7,80   | 5,66 | 4,60 | 8,65   | 6,25 | 5,07 | 9,35   | 6,74 | 5,45 |
|                                                                                   | 155          | 6 1/8        |                                                                                    |      | 67                                               | 7,31                                                      | 5,28 | 4,28 | 8,27   | 5,95 | 4,81 | 9,20   | 6,59 | 5,31 | 9,96   | 7,11 | 5,72 |
|                                                                                   | 175          | 6 7/8        |                                                                                    |      | 77                                               | 7,70                                                      | 5,52 | 4,45 | 8,74   | 6,23 | 5,01 | 9,74   | 6,92 | 5,55 | 10,57  | 7,49 | 5,99 |
|                                                                                   | 195          | 7 11/16      |                                                                                    |      | 87                                               | 8,09                                                      | 5,76 | 4,62 | 9,20   | 6,52 | 5,22 | 10,28  | 7,25 | 5,79 | 11,18  | 7,86 | 6,26 |
|                                                                                   | 215          | 8 7/16       |                                                                                    |      | 97                                               | 8,47                                                      | 5,99 | 4,79 | 9,67   | 6,80 | 5,42 | 10,83  | 7,58 | 6,03 | 11,80  | 8,23 | 6,53 |
|                                                                                   | 235          | 9 1/4        |                                                                                    |      | 107                                              | 8,86                                                      | 6,23 | 4,97 | 10,14  | 7,09 | 5,63 | 11,16  | 7,91 | 6,27 | 11,81  | 8,61 | 6,80 |
|                                                                                   | 55           | 2 3/16       | 6,4                                                                                | 1/4  | 20                                               | 3,79                                                      | 2,31 | 1,67 | 4,55   | 2,78 | 2,00 | 5,30   | 3,24 | 2,33 | 5,95   | 3,64 | 2,62 |
|                                                                                   | 75           | 2 15/16      |                                                                                    |      | 30                                               | 5,73                                                      | 3,50 | 2,52 | 6,55   | 4,20 | 3,03 | 7,18   | 4,90 | 3,53 | 7,71   | 5,50 | 3,96 |
|                                                                                   | 95           | 3 3/4        |                                                                                    |      | 36                                               | 6,12                                                      | 4,27 | 3,08 | 6,85   | 5,08 | 3,69 | 7,54   | 5,57 | 4,31 | 8,10   | 5,98 | 4,84 |
|                                                                                   | 115          | 4 1/2        |                                                                                    |      | 46                                               | 6,51                                                      | 4,79 | 3,93 | 7,32   | 5,36 | 4,39 | 8,08   | 5,90 | 4,82 | 8,71   | 6,35 | 5,17 |
|                                                                                   | 135          | 5 5/16       |                                                                                    |      | 56                                               | 6,90                                                      | 5,03 | 4,10 | 7,78   | 5,65 | 4,59 | 8,62   | 6,24 | 5,06 | 9,32   | 6,72 | 5,44 |
|                                                                                   | 155          | 6 1/8        |                                                                                    |      | 66                                               | 7,29                                                      | 5,27 | 4,27 | 8,25   | 5,93 | 4,80 | 9,17   | 6,57 | 5,30 | 9,93   | 7,09 | 5,71 |
|                                                                                   | 175          | 6 7/8        |                                                                                    |      | 76                                               | 7,68                                                      | 5,51 | 4,44 | 8,71   | 6,22 | 5,00 | 9,71   | 6,90 | 5,54 | 10,54  | 7,47 | 5,98 |
|                                                                                   | 195          | 7 11/16      |                                                                                    |      | 86                                               | 8,07                                                      | 5,74 | 4,62 | 9,18   | 6,50 | 5,21 | 10,26  | 7,23 | 5,78 | 11,15  | 7,84 | 6,25 |
|                                                                                   | 215          | 8 7/16       |                                                                                    |      | 96                                               | 8,46                                                      | 5,98 | 4,79 | 9,65   | 6,79 | 5,41 | 10,80  | 7,57 | 6,01 | 11,76  | 8,21 | 6,52 |
|                                                                                   | 235          | 9 1/4        |                                                                                    |      | 106                                              | 8,84                                                      | 6,22 | 4,96 | 10,11  | 7,07 | 5,62 | 11,16  | 7,90 | 6,25 | 11,81  | 8,59 | 6,78 |
|                                                                                   | 55           | 2 3/16       | 8                                                                                  | 5/16 | 19                                               | 3,59                                                      | 2,20 | 1,58 | 4,31   | 2,64 | 1,90 | 5,03   | 3,07 | 2,21 | 5,65   | 3,45 | 2,48 |
|                                                                                   | 75           | 2 15/16      |                                                                                    |      | 29                                               | 5,54                                                      | 3,38 | 2,44 | 6,50   | 4,06 | 2,92 | 7,13   | 4,74 | 3,41 | 7,64   | 5,32 | 3,83 |
|                                                                                   | 95           | 3 3/4        |                                                                                    |      | 35                                               | 6,09                                                      | 4,15 | 2,99 | 6,80   | 4,99 | 3,59 | 7,48   | 5,54 | 4,19 | 8,04   | 5,94 | 4,70 |
|                                                                                   | 115          | 4 1/2        |                                                                                    |      | 45                                               | 6,47                                                      | 4,77 | 3,85 | 7,27   | 5,34 | 4,37 | 8,03   | 5,87 | 4,79 | 8,65   | 6,31 | 5,15 |
|                                                                                   | 135          | 5 5/16       |                                                                                    |      | 55                                               | 6,86                                                      | 5,01 | 4,09 | 7,73   | 5,62 | 4,57 | 8,57   | 6,20 | 5,03 | 9,26   | 6,68 | 5,41 |
|                                                                                   | 155          | 6 1/8        |                                                                                    |      | 65                                               | 7,25                                                      | 5,25 | 4,26 | 8,20   | 5,91 | 4,78 | 9,11   | 6,54 | 5,27 | 9,87   | 7,06 | 5,68 |
|                                                                                   | 175          | 6 7/8        |                                                                                    |      | 75                                               | 7,64                                                      | 5,48 | 4,43 | 8,67   | 6,19 | 4,98 | 9,66   | 6,87 | 5,51 | 10,48  | 7,43 | 5,95 |
|                                                                                   | 195          | 7 11/16      |                                                                                    |      | 85                                               | 8,03                                                      | 5,72 | 4,60 | 9,13   | 6,47 | 5,19 | 10,20  | 7,20 | 5,75 | 11,09  | 7,80 | 6,22 |
|                                                                                   | 215          | 8 7/16       |                                                                                    |      | 95                                               | 8,42                                                      | 5,96 | 4,77 | 9,60   | 6,76 | 5,39 | 10,75  | 7,53 | 5,99 | 11,70  | 8,18 | 6,49 |
|                                                                                   | 235          | 9 1/4        |                                                                                    |      | 105                                              | 8,81                                                      | 6,20 | 4,94 | 10,07  | 7,04 | 5,60 | 11,16  | 7,86 | 6,23 | 11,81  | 8,55 | 6,76 |
|                                                                                   | 55           | 2 3/16       | 9,6                                                                                | 3/8  | 18                                               | 3,40                                                      | 2,08 | 1,50 | 4,08   | 2,49 | 1,79 | 4,76   | 2,91 | 2,09 | 5,34   | 3,26 | 2,35 |
|                                                                                   | 75           | 2 15/16      |                                                                                    |      | 28                                               | 5,34                                                      | 3,26 | 2,35 | 6,41   | 3,92 | 2,82 | 7,07   | 4,57 | 3,29 | 7,58   | 5,13 | 3,69 |
|                                                                                   | 95           | 3 3/4        |                                                                                    |      | 34                                               | 6,05                                                      | 4,04 | 2,91 | 6,76   | 4,84 | 3,49 | 7,43   | 5,51 | 4,07 | 7,98   | 5,90 | 4,57 |
|                                                                                   | 115          | 4 1/2        |                                                                                    |      | 44                                               | 6,44                                                      | 4,75 | 3,76 | 7,22   | 5,31 | 4,35 | 7,97   | 5,84 | 4,77 | 8,59   | 6,27 | 5,12 |
|                                                                                   | 135          | 5 5/16       |                                                                                    |      | 54                                               | 6,82                                                      | 4,98 | 4,07 | 7,69   | 5,59 | 4,55 | 8,52   | 6,17 | 5,01 | 9,20   | 6,65 | 5,39 |
|                                                                                   | 155          | 6 1/8        |                                                                                    |      | 64                                               | 7,21                                                      | 5,22 | 4,24 | 8,15   | 5,88 | 4,76 | 9,06   | 6,50 | 5,25 | 9,81   | 7,02 | 5,66 |
|                                                                                   | 175          | 6 7/8        |                                                                                    |      | 74                                               | 7,60                                                      | 5,46 | 4,41 | 8,62   | 6,16 | 4,96 | 9,60   | 6,83 | 5,49 | 10,42  | 7,39 | 5,92 |
|                                                                                   | 195          | 7 11/16      |                                                                                    |      | 84                                               | 7,99                                                      | 5,70 | 4,58 | 9,09   | 6,45 | 5,17 | 10,15  | 7,17 | 5,73 | 11,03  | 7,77 | 6,19 |
|                                                                                   | 215          | 8 7/16       |                                                                                    |      | 94                                               | 8,38                                                      | 5,93 | 4,75 | 9,55   | 6,73 | 5,37 | 10,69  | 7,50 | 5,97 | 11,64  | 8,14 | 6,46 |
|                                                                                   | 235          | 9 1/4        |                                                                                    |      | 104                                              | 8,77                                                      | 6,17 | 4,92 | 10,02  | 7,02 | 5,58 | 11,16  | 7,83 | 6,21 | 11,81  | 8,51 | 6,73 |

NOTES and GENERAL PRINCIPLES on page 10.

2 INTERNAL PLATES - OPTIMAL EMBEDMENT LENGTH

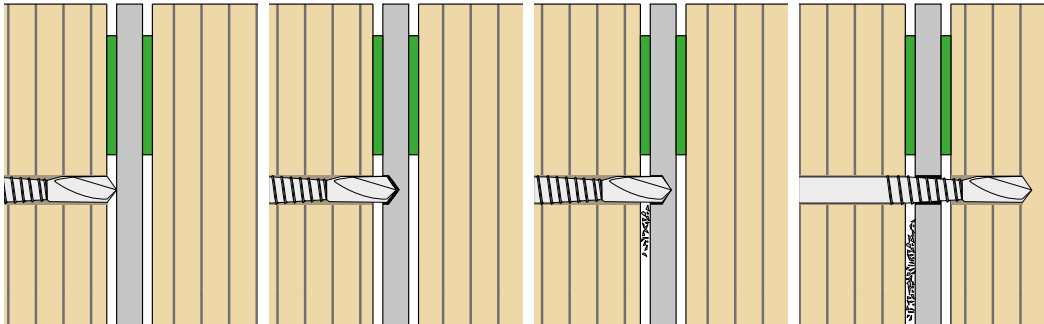
| geometry                                                                          |                |         | double shear - timber-to-steel-to-timber                                           |      |                                                                                  |                                                           |      |      |        |       |      |        |       |      |        |       |       |
|-----------------------------------------------------------------------------------|----------------|---------|------------------------------------------------------------------------------------|------|----------------------------------------------------------------------------------|-----------------------------------------------------------|------|------|--------|-------|------|--------|-------|------|--------|-------|-------|
|  |                |         |  |      |                                                                                  |                                                           |      |      |        |       |      |        |       |      |        |       |       |
| d <sub>1</sub><br>[mm]<br>[in]                                                    | L<br>[mm] [in] |         | steel plate<br>thickness = t <sub>2</sub><br>[mm] [in]                             |      | embedment<br>length = t <sub>1,a</sub> = t <sub>1,b</sub> <sup>(2)</sup><br>[mm] | factored lateral resistance N <sub>r</sub> <sup>(1)</sup> |      |      |        |       |      |        |       |      |        |       |       |
|                                                                                   |                |         |                                                                                    |      |                                                                                  | G=0.35                                                    |      |      | G=0.42 |       |      | G=0.49 |       |      | G=0.55 |       |       |
|                                                                                   |                |         |                                                                                    |      |                                                                                  | 0°                                                        | 45°  | 90°  | 0°     | 45°   | 90°  | 0°     | 45°   | 90°  | 0°     | 45°   | 90°   |
|                                                                                   |                |         |                                                                                    |      |                                                                                  | [kN]                                                      |      |      | [kN]   |       |      | [kN]   |       |      | [kN]   |       |       |
| 7,5<br>0.30                                                                       | 135            | 5 5/16  | 3,2                                                                                | 1/8  | 28                                                                               | 10,68                                                     | 6,53 | 4,70 | 12,82  | 7,83  | 5,64 | 14,15  | 9,14  | 6,58 | 15,17  | 10,26 | 7,39  |
|                                                                                   | 155            | 6 1/8   |                                                                                    |      | 33                                                                               | 11,98                                                     | 7,72 | 5,56 | 13,37  | 9,26  | 6,67 | 14,69  | 10,80 | 7,78 | 15,78  | 11,69 | 8,73  |
|                                                                                   | 175            | 6 7/8   |                                                                                    |      | 34                                                                               | 12,07                                                     | 8,01 | 5,77 | 13,49  | 9,62  | 6,92 | 14,83  | 10,99 | 8,08 | 15,93  | 11,78 | 9,07  |
|                                                                                   | 195            | 7 11/16 |                                                                                    |      | 40                                                                               | 12,54                                                     | 9,30 | 6,80 | 14,05  | 10,37 | 8,16 | 15,49  | 11,40 | 9,34 | 16,67  | 12,23 | 10,01 |
|                                                                                   | 215            | 8 7/16  |                                                                                    |      | 48                                                                               | 13,14                                                     | 9,66 | 7,91 | 14,77  | 10,81 | 8,84 | 16,32  | 11,91 | 9,71 | 17,61  | 12,81 | 10,43 |
|                                                                                   | 235            | 9 1/4   |                                                                                    |      | 53                                                                               | 13,53                                                     | 9,90 | 8,09 | 15,24  | 11,10 | 9,04 | 16,87  | 12,24 | 9,95 | 18,22  | 13,18 | 10,69 |
|                                                                                   | 135            | 5 5/16  | 4,8                                                                                | 3/16 | 27                                                                               | 10,30                                                     | 6,29 | 4,53 | 12,35  | 7,55  | 5,44 | 14,04  | 8,81  | 6,34 | 15,04  | 9,89  | 7,12  |
|                                                                                   | 155            | 6 1/8   |                                                                                    |      | 32                                                                               | 11,90                                                     | 7,48 | 5,38 | 13,28  | 8,97  | 6,46 | 14,58  | 10,47 | 7,54 | 15,65  | 11,61 | 8,46  |
|                                                                                   | 175            | 6 7/8   |                                                                                    |      | 33                                                                               | 12,00                                                     | 7,78 | 5,60 | 13,40  | 9,33  | 6,72 | 14,72  | 10,89 | 7,84 | 15,81  | 11,71 | 8,80  |
|                                                                                   | 195            | 7 11/16 |                                                                                    |      | 39                                                                               | 12,47                                                     | 9,21 | 6,63 | 13,96  | 10,32 | 7,96 | 15,38  | 11,33 | 9,29 | 16,55  | 12,16 | 9,96  |
|                                                                                   | 215            | 8 7/16  |                                                                                    |      | 47                                                                               | 13,06                                                     | 9,61 | 7,88 | 14,68  | 10,76 | 8,79 | 16,22  | 11,84 | 9,66 | 17,49  | 12,73 | 10,37 |
|                                                                                   | 235            | 9 1/4   |                                                                                    |      | 52                                                                               | 13,45                                                     | 9,85 | 8,05 | 15,14  | 11,04 | 9,00 | 16,76  | 12,17 | 9,90 | 18,10  | 13,11 | 10,64 |
|                                                                                   | 135            | 5 5/16  | 6,4                                                                                | 1/4  | 26                                                                               | 10,10                                                     | 6,17 | 4,44 | 12,12  | 7,41  | 5,33 | 13,99  | 8,64  | 6,22 | 14,98  | 9,70  | 6,98  |
|                                                                                   | 155            | 6 1/8   |                                                                                    |      | 31                                                                               | 11,86                                                     | 7,36 | 5,30 | 13,23  | 8,83  | 6,36 | 14,53  | 10,30 | 7,42 | 15,59  | 11,57 | 8,33  |
|                                                                                   | 175            | 6 7/8   |                                                                                    |      | 32                                                                               | 11,96                                                     | 7,66 | 5,51 | 13,35  | 9,19  | 6,62 | 14,66  | 10,72 | 7,72 | 15,75  | 11,67 | 8,66  |
|                                                                                   | 195            | 7 11/16 |                                                                                    |      | 38                                                                               | 12,43                                                     | 9,09 | 6,55 | 13,91  | 10,29 | 7,86 | 15,32  | 11,30 | 9,17 | 16,48  | 12,12 | 9,93  |
|                                                                                   | 215            | 8 7/16  |                                                                                    |      | 46                                                                               | 13,03                                                     | 9,59 | 7,86 | 14,63  | 10,73 | 8,77 | 16,16  | 11,81 | 9,64 | 17,42  | 12,70 | 10,34 |
|                                                                                   | 235            | 9 1/4   |                                                                                    |      | 51                                                                               | 13,41                                                     | 9,83 | 8,03 | 15,10  | 11,01 | 8,98 | 16,70  | 12,14 | 9,88 | 18,04  | 13,07 | 10,61 |
|                                                                                   | 135            | 5 5/16  | 8                                                                                  | 5/16 | 25                                                                               | 9,71                                                      | 5,94 | 4,27 | 11,66  | 7,12  | 5,13 | 13,60  | 8,31  | 5,98 | 14,86  | 9,33  | 6,72  |
|                                                                                   | 155            | 6 1/8   |                                                                                    |      | 30                                                                               | 11,66                                                     | 7,12 | 5,13 | 13,14  | 8,55  | 6,15 | 14,42  | 9,97  | 7,18 | 15,47  | 11,19 | 8,06  |
|                                                                                   | 175            | 6 7/8   |                                                                                    |      | 31                                                                               | 11,88                                                     | 7,42 | 5,34 | 13,26  | 8,90  | 6,41 | 14,56  | 10,39 | 7,48 | 15,62  | 11,60 | 8,39  |
|                                                                                   | 195            | 7 11/16 |                                                                                    |      | 37                                                                               | 12,35                                                     | 8,86 | 6,38 | 13,82  | 10,23 | 7,65 | 15,21  | 11,23 | 8,93 | 16,36  | 12,05 | 9,88  |
|                                                                                   | 215            | 8 7/16  |                                                                                    |      | 45                                                                               | 12,95                                                     | 9,54 | 7,69 | 14,54  | 10,67 | 8,73 | 16,05  | 11,74 | 9,59 | 17,30  | 12,62 | 10,29 |
|                                                                                   | 235            | 9 1/4   |                                                                                    |      | 50                                                                               | 13,34                                                     | 9,78 | 8,00 | 15,00  | 10,96 | 8,94 | 16,60  | 12,07 | 9,83 | 17,91  | 13,00 | 10,56 |
|                                                                                   | 135            | 5 5/16  | 9,6                                                                                | 3/8  | 24                                                                               | 9,32                                                      | 5,70 | 4,10 | 11,19  | 6,84  | 4,92 | 13,05  | 7,98  | 5,74 | 14,65  | 8,95  | 6,45  |
|                                                                                   | 155            | 6 1/8   |                                                                                    |      | 29                                                                               | 11,27                                                     | 6,89 | 4,96 | 13,05  | 8,26  | 5,95 | 14,31  | 9,64  | 6,94 | 15,35  | 10,82 | 7,79  |
|                                                                                   | 175            | 6 7/8   |                                                                                    |      | 30                                                                               | 11,75                                                     | 7,18 | 5,17 | 13,16  | 8,62  | 6,21 | 14,45  | 10,05 | 7,24 | 15,50  | 11,29 | 8,13  |
|                                                                                   | 195            | 7 11/16 |                                                                                    |      | 36                                                                               | 12,27                                                     | 8,62 | 6,21 | 13,73  | 10,18 | 7,45 | 15,11  | 11,16 | 8,69 | 16,24  | 11,97 | 9,75  |
|                                                                                   | 215            | 8 7/16  |                                                                                    |      | 44                                                                               | 12,87                                                     | 9,49 | 7,52 | 14,44  | 10,61 | 8,69 | 15,94  | 11,67 | 9,54 | 17,18  | 12,55 | 10,24 |
|                                                                                   | 235            | 9 1/4   |                                                                                    |      | 49                                                                               | 13,26                                                     | 9,73 | 7,97 | 14,91  | 10,90 | 8,90 | 16,49  | 12,01 | 9,78 | 17,79  | 12,92 | 10,51 |

NOTES and GENERAL PRINCIPLES on page 10.

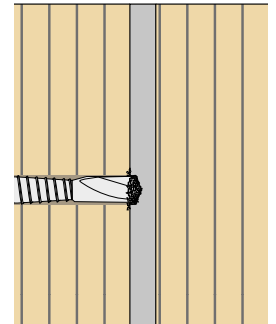
## ■ INSTALLATION

It is suggested to have **a milling in the wood equal to the thickness of the plate, increased by at least 1-2 mm**, placing SHIM spacers between the wood and the plate to centre it in the milling.

In this way, the steel residue from the drilling of the metal has an outlet to escape and does not obstruct the passage of the drill through the plate, thus avoiding overheating of the plate and timber and also preventing the generation of smoke during installation.



Cutter increased by 1 mm on each side.



Shavings obstructing the holes in the steel during drilling (spacers not installed).

To avoid breakage of the tip at the moment of pin-plate contact, it is recommended to **reach the plate slowly, pushing with a lower force until the moment of impact and then increasing it to the recommended value** (40 kg for top-down applications and 25 kg for horizontal installations). Try to keep the dowel as perpendicular as possible to the surface of the timber and the plate.



Intact tip after correct installation of the dowel.



Broken (cut) tip due to excessive force during impact with metal.

If the steel plate is too hard, the dowel tip may shrink significantly or even melt. In this case, it is advisable to check the material certificates for any heat treatment or hardness tests performed. Try decreasing the force applied or alternatively changing the type of plate.



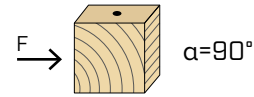
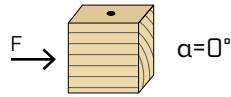
Tip melted during installation on a too hard plate without spacers between timber and plate.



Reduction of the tip when drilling the plate due to the high hardness of the plate.



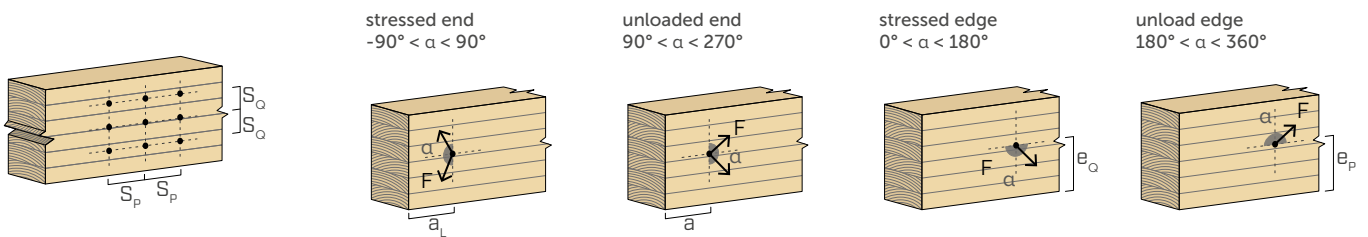
## MINIMUM DISTANCES FOR DOWELS SUBJECT TO SHEAR



| $d_1$ | [mm]<br>[in] | minimum<br>distances           | 7,5<br>0.30   |
|-------|--------------|--------------------------------|---------------|
| $S_p$ | [mm]<br>[in] | $4 \cdot d$                    | 30<br>1 3/16  |
| $S_Q$ | [mm]<br>[in] | $3 \cdot d$                    | 22,5<br>7/8   |
| $a_L$ | [mm]<br>[in] | $\max(5 \cdot d; 50\text{mm})$ | 50<br>1 15/16 |
| $a$   | [mm]<br>[in] | $\max(4 \cdot d; 50\text{mm})$ | 50<br>1 15/16 |
| $e_Q$ | [mm]<br>[in] | $4 \cdot d$                    | 30<br>1 3/16  |
| $e_p$ | [mm]<br>[in] | $\max(1,5 \cdot d; 1/2 S_Q)$   | 11,25<br>7/16 |

| $d_1$ | [mm]<br>[in] | minimum<br>distances           | 7,5<br>0.30   |
|-------|--------------|--------------------------------|---------------|
| $S_p$ | [mm]<br>[in] | $3 \cdot d$                    | 22,5<br>7/8   |
| $S_Q$ | [mm]<br>[in] | $3 \cdot d$                    | 22,5<br>7/8   |
| $a_L$ | [mm]<br>[in] | $\max(4 \cdot d; 50\text{mm})$ | 50<br>1 15/16 |
| $a$   | [mm]<br>[in] | $\max(4 \cdot d; 50\text{mm})$ | 50<br>1 15/16 |
| $e_Q$ | [mm]<br>[in] | $4 \cdot d$                    | 30<br>1 3/16  |
| $e_p$ | [mm]<br>[in] | $1,5 \cdot d$                  | 11,25<br>7/16 |

$\alpha$  = load-to-grain angle  
 $d = d_1$  = nominal dowel diameter



### NOTES

- Minimum distances FOR CONNECTORS SUBJECTED TO SHEAR STRESS in accordance with CSA O86 Clause 12.4.3.

## STRUCTURAL VALUES

### GENERAL PRINCIPLES

- The steel plate is assumed to be 300 W and 350 W with a minimum ultimate tensile strength equal to 65.3 ksi (450 MPa).
- G is the mean relative density according to Table A.11. Most common wood species are assumed such as Northern species (G=0.35), Spruce-Pine-Fir (G=0.42), Douglas Fir (G=0.49), and Southern Pine (G=0.55).
- The effective length is L - 15 mm for SBD L ≥ 95 mm, and L - 8 mm for SBD L ≤ 75 mm.
- The dimension  $b_1$  of the dowel should be positioned at the far right end of the section, after the steel plate. Meanwhile, the head thread  $b_2$  must remain within the wooden part and should not go through the steel plate.
- The dowels must be positioned in accordance with the minimum distances.
- Dimensioning and verification of timber elements and steel plates must be carried out separately.

### NOTES

- The reference factored lateral resistance ( $N_p$ ) has been calculated according to Clause 12.4 as per CSA-O86 2019 and are representative of a single dowel. Listed values are based on standard load duration factor ( $K_D = 1$ ), permanent dry service condition factor ( $K_{SF} = 1$ ), and treatment factor ( $K_T = 1$ ).
- The embedment length is calculated using the following equation:  
 $t_1 = (L_{eff} - t_2 - t_{mill})/2$   
 where  $L_{eff}$  is the effective length of the dowel,  $t_2$  is the thickness of the steel plate, and  $t_{mill}$  is the thickness of the milled cut in the wood section, 2 mm was considered for the tabulated values.  
 For the double shear, the calculated values consider that the steel plate is placed in the cross section so that the SBD has the optimum distance between each shear plane, i.e.,  $t_{1,a} = t_{1,b}$ . In the case of a non-symmetrically dowel, the lowest embedment length was considered.