H20 Wall and Column Formwork

Assembly and Application Guide

BSL Scaffolding Limited

Formwork ▪ Engineering ▪ Services

Product Features

Product Features	2
Product Overview	3
Plan view	4
Components	5-10
Waler Types	11
Pre-assembly of Elements	12
Load Tables	13-14
T-Shaped Wall Arrangement	15
Stopend Arrangement	16
Corner Arrangement	17-18
Element Connection	19
Height Extension	20
Circular Formwork Arrangement	21
Column Formwork Arrangement	22-23
Aligning the Wall Formwork Elements	24
Supporting the Formwork	25
TB Walkway Bracket Arrangement	26
Technical Data and Load Table Guides	27
Element Execution	28-29
Important Product Features and Calculation Fundamentals	30

Important Remarks:

The succeeding assembly and application guide has to be carefully read as it contains detailed information on the proper application and handling of the H20 wall and column formwork system. All instructions concerning technical operation and function have to be observed carefully. Please note that exceptional use of the H20 wall and column formwork system requires a separate design calculation.

In order to ensure a technical and safe use of our product, all relevant national safety rules and regulations and safety instructions of national institutes and/or local authorities have to be observed. In general, only undamaged materials and components must be used.

It is important that damaged components are stored out and removed from the construction site. In case of repairs, only original spare parts of BSL must be used.

The use of BSL Formwork systems combined with other supplier's materials may involve certain dangers and, therefore require an additional inspection and quality check by our formwork specialist.

The basis of the H20 Wall and Column Formwork system is the H20 Timber Beam. The H20 Timber Beam is made of the highest quality with competitive advantages.

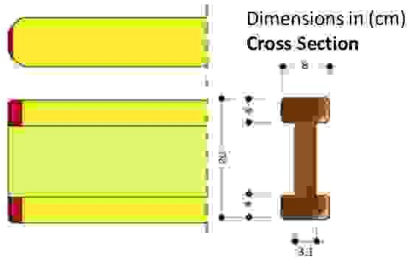
The H20 Timber Beam is sturdy, easy to handle and only weighs 4.80 Kg/m. It provides a high load-bearing capacity even for great distances of Walers. The advantage results to less anchor points. The project oriented design and arrangement of the H20 Timber Beam elements allow choices of various types of plywood sheet. Furthermore, the system allows an optimum and flexible arrangement of tie positions.

The H20 wall formwork elements are assembled quickly and easily by connecting the H20 Timber Beams to the Walers by means of H20 Timber Beam Clamp. Dismantling of elements is done as easily as the erection of the system. The advantage is that the wall formwork system provides a high adaptation and easy re-assembling when ground plans of the structure change frequently.

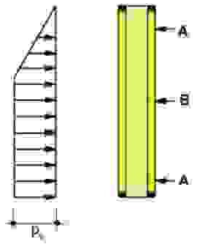
The H20 wall and column formwork system is one of the most economical alternative to steel frame formwork panel system when it comes to complicated designs and numerous non-typical applications with the same wall heights.

The H20 wall and column formwork system is used for all types of walls and columns and has high rigidity and stability at a relatively low weight.

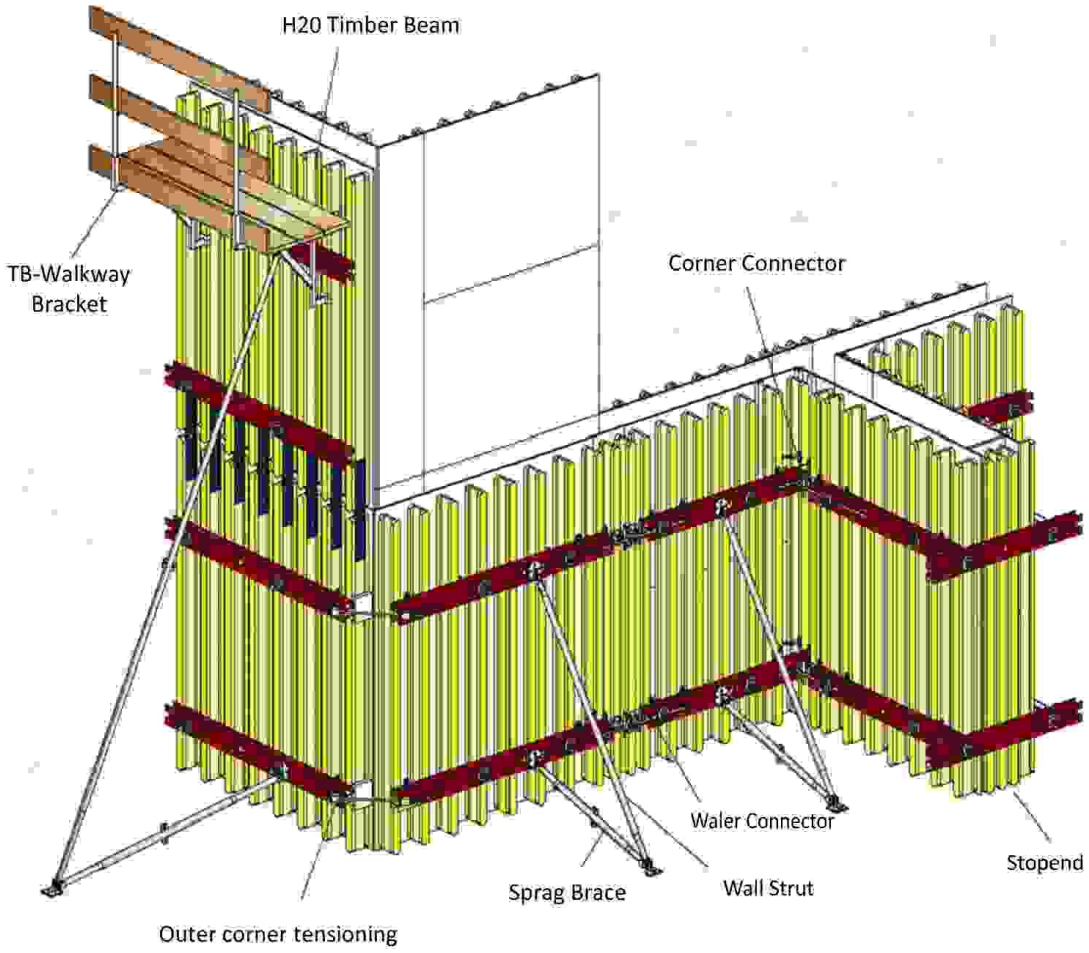
H20 Timber Beam
Beam end protected by plastic bumper



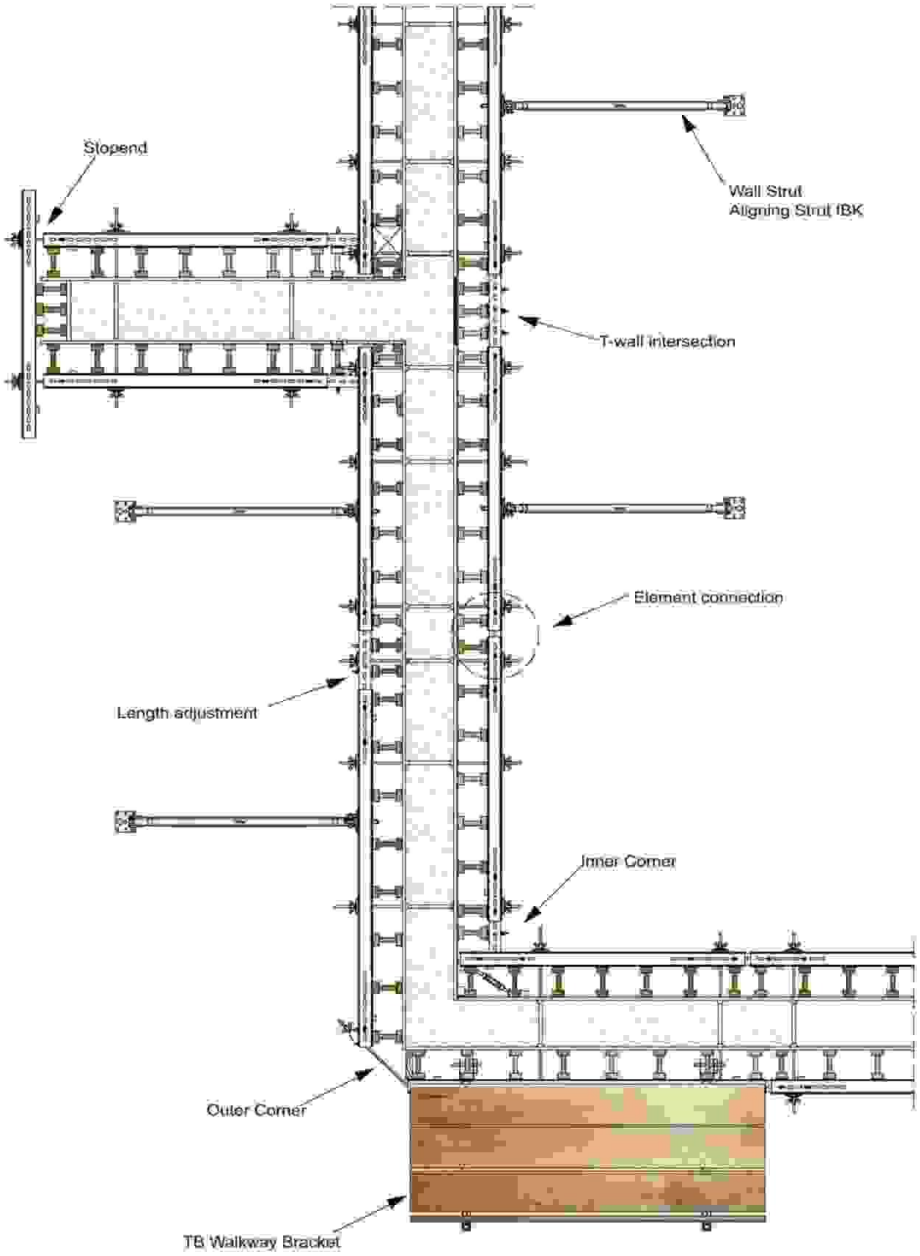
Perm. M = 5 kNm (bending moment)
Perm. Q = 11 kN (shear force)
Max. B = 22 nK (support reaction)
Flectural rigidity:
E x I = 500 knm^2



H20 Wall and Column Formwork



Plan View


Slopend
Wall Strut
Aligning Strut fBK
T-wall intersection
Element connection
Length adjustment
Inner Corner
Outer Corner
TB Walkway Bracket

Components

H20 Timber Beam

	Weight Kg/pc.
H20 Beam 190	*9.50*
H20 Beam 245	*12.25*
H20 Beam 300	*15.00*
H20 Beam 330	*16.50*
H20 Beam 360	*18.00*
H20 Beam 390	*19.50*
H20 Beam 450	*22.50*
H20 Beam 490	*24.50*
H20 Beam 590	*29.50*
H20 Beam in Special length	*5.00*

The H20 Timber Beam serves as a supporting element of the plywood. The distance of the beams from axis to axis and the wall elements depends on the calculated and expected concrete pressure as well as of the chosen type of plywood.

Tested and approved permissible loads:
Max. perm. M = 5.00 kNm
Max. perm, Q = 11.00 kNm
E I = 500 kNm^2 (bending moment)

Walers

	Weight Kg/pc.
Waler 96	*22.5*
Waler 121	*27.9*
Waler 146	*33.4*
Waler 171	*38.9*
Waler 196	*44.3*
Waler 221	*49.7*
Waler 246	*55.0*
Waler 271	*60.0*
Waler 296	*66.2*

Walers are connected by means of Waler Connectors which provides a tension and pressure resistant element connection. The element connections are tight and precisely aligned.

H20 Timber Beam Clamp

This clamp connects the H20 Timber Beam to the Waler at Any desired position.

Weight Kg/pc
0.8

Waler connector 100
Waler connector 165

This clamp connects the H20 Timber Beam to the Waler at Any desired position.

Weight Kg/pc
7.4
13.0

Components

Corner Connector 60 x 60

Used for forming inner corner of 90° in combination with the Joining Wedges.

Weight
Kg/pc
9.0

Corner Connector L24/H20

Alternatively used for forming an Inner corner with length Adjustments in combination with Joining Wedges

Weight
Kg/pc
11.0

Hinged Connector 65 x 65
Double Hinged Connector

Used for the arrangement of Polygonal element connections

Weight
Kg/pc
12.0
12.5

Outer Corner Bearing

To be attached to the Walers by Means of Joining Wedge at the End of the wall element for Bracing and stiffening the outer Corner.

Weight
Kg/pc
1.50

Tension Strap

Used in combination with a joining Wedge for stopends. It is Used for together with Tie Rod 15 mm dia./D & W.

Weight
Kg/pc
1.50

Joining Wedge

Used for various types of Connections.

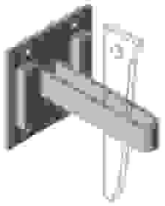
Weight
Kg/pc
0.9

Components

Beam Fixing Device

Used in combination with infill Panels for element length. Adjustment and fixed by nails to the H20 Timber Beams. The Waler Connectors are attached to the Beam Fixing Device by a Wedge.

Weight Kg/pc
1.0



Wedge

Used for securing the Beam Fixing Device to the H20 Timber Beams And attaching Aligning Struts and Wall Braces

Weight Kg/p
0.3

Brackets and Aligning Struts

WB Railing Post

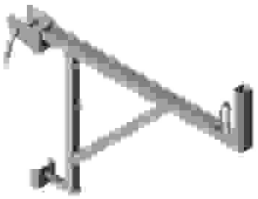
Used in combination with TB Walkway Bracket

Weight Kg/pc
4.5

TB Walkway Bracket

Equipped with upper U-profile where wooden beams on top can be fastened by nails. Furthermore, the bracket is hot dip galvanized and consists of a squared tube for holding the WB Railing Post.

Weight Kg/pc
14.1



Wall Struts with 2 Hinge Plates painted

For erection and aligning of formwork elements, bracing by various sizes of Wall Struts has to be arranged. The Wall struts are attached to the Waler with hinge plate by means of the Strut Wedge Strap and Wedge

		Weight Kg/pc.
Wall Strut 1	(170 - 240 cm)	*19.50*
Wall Strut 2	(220 - 290 cm)	*21.0*
Wall Strut 3	(270 - 340 cm)	*22.0*
Wall Strut 4	(320 - 390 cm)	*24.0*
Wall Strut 5	(420 - 490 cm)	*27.0*
Wall Strut 6	(530 - 590 cm)	*40.0*

Components

Sprag Brace 1

With adjustable lengths between 1.20 – 1.90m, usable for Wall Strut 1 & 2. It is equipped with a hinge Plate for fastening to the lower Waler of the wall element and with A hinge bolt for connecting to the Strut.

SpragBrace 2

With adjustable lengths between 1.70 – 2.40m usable for Wall Strut 3 & 4. It is equipped with a hinge Plate for fixing to the lower waler of The wall element and with a hinge Bolt for connecting to the Wall Strut.

Weight
Kg/pc
16.0
18.0

Strut Wedge Strap

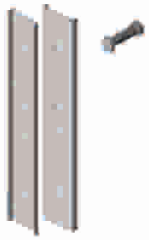
For fixing the hinge plates of the Wall Strut and Sprag Braces to the Walers by means of Wedge.

Weight
Kg/pc
0.9

H20 Extension Piece
Bolt M20 x 80 with Nut

Use for height extension of the Wall formwork elements by fixing the H20 Extension Piece to the web of the H20 Timber Beams. The H20 Extension Piece should be Ordered twice while the Bolt M20 x 80 should be ordered four times.

Weight
Kg/pc
4.5
0.3

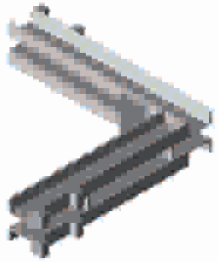


Column Formwork Walers

Column Formwork 72 x 72
Column Formwork 89 x 89
Column Formwork 106 x 106
Column Formwork 123 x 123

For creating right angled formwork elements with various dimensions of columns. Anchoring and tightening of the column formwork elements are made to the welded squared bearing support.

Weight
Kg/pc
35.5
44.3
51.7
60.7



Components

Bearing Bar for Column Waler

Placed in the welded squared Bearing support of the column walers and held by a Tie Rod 15 mm dia./D&W.

Weight Kg/pc 1.9

Wing Nut

For tying wall elements as well as For bracing the corners of the Column walers. With maximum Permissible load of 90 kN.

Weight Kg/pc 0.3

Galvanised Plate 12/12

To be used in connection with the Wing Nut

Weight Kg/pc 1.0

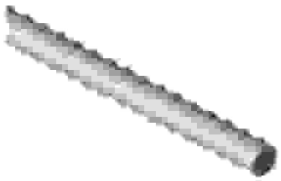
	Weight Kg/pc
Tie Rod 75 15mm dia. /D&W	1.1
Tie Rod 100 15mm dia. /D&W	1.4
Tie Rod 130 15mm dia. /D&W	1.9
Tie Rod 175 15mm dia. /D&W	2.5

Tie rod with max. permissible load of 90 kN

1 bundle of tubular plastic sleeves, 25 pcs. each 2m long.

Package of cones, 200 pcs.	1.5
Package of plugs or sleeve, 500 pcs.	1.6

Plastic sleeves with cones secure the Distance between two opposite wall Formwork elements



Tie Nut 85 15mm dia./D&W

Equipped with base plate and nut and allows an incline of up to 10° with max. permissible load of 90 kN.

Weight Kg/pc 1.2

Tension Nut 15 mm dia./D&W

Used for stopends and other tying And connecting purposes. With a Max. permissible load of 40 kN.

Weight Kg/pc 0.7

Components

Vito Tie Nut

Equipped with a circular base plate Of 130 mm diameter. With a Maximum permissible load of 90 kN.

Weight
Kg/pc
1.3

Tie Nut 230

Equipped with an extremely large Base plate and nut and allows an incline of upto 10° with a permissible load of 90 kN.

Weight
Kg/pc
2.4

Vito Ratchet

Using the Vito Rachet, tie nuts can Be tightened and loosened quickly, comfortably and safely.

Weight
Kg/pc
9.50

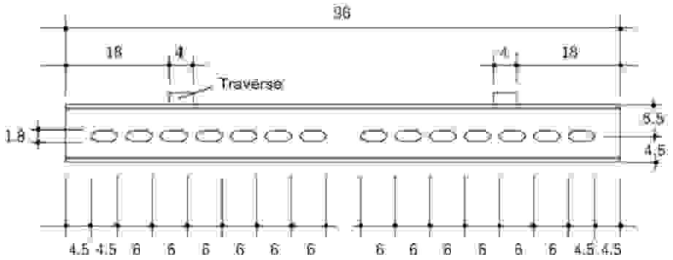
Aligning Struts for Extremely High Shuttering Elements

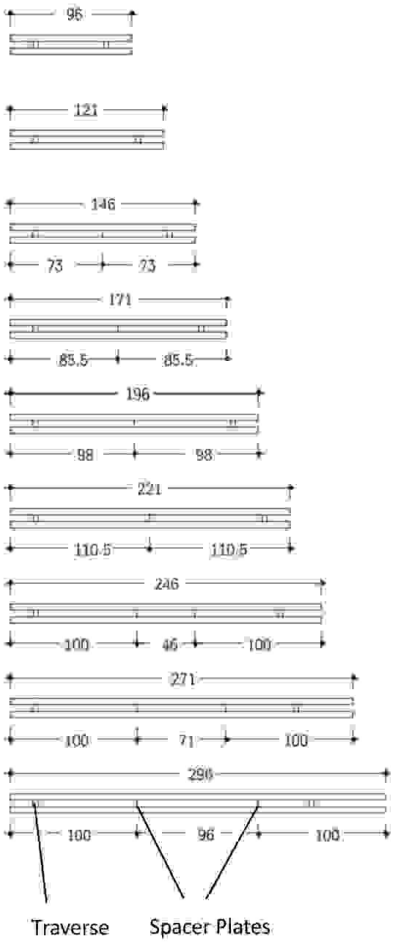
Equipped with base plate and Nut and allows an incline of upto 10°

	Weight Kg/pc
Hingeless End Section	*3.62*
Hingeless End Section	*29.0*
Intermediate Section 240 cm	*44.0*
Intermediate Section 370 cm	*63.0*
Bolt M16 x 60 with nut 4 pcs / joint	*0.2*
Fit Bolt M20 x 80 with nut 1 pc.	*0.4*

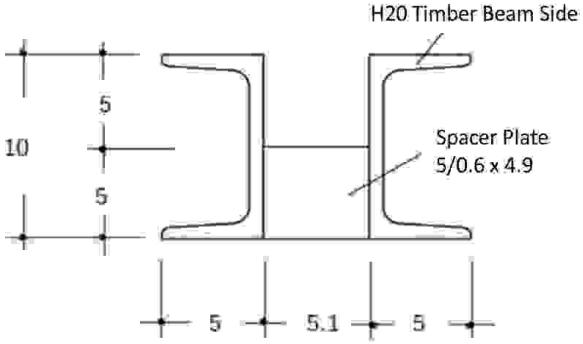
Combinable inclined struts (IBK Aligning Strut).
For aligning extremely high wall Elements, combinable Aligning Strut sections can be arranged for A tension and compression Resistant bracing. The connection of the Aligning Strut to the wall elements is done by means of the Connection Beam CFB230

Waler Types

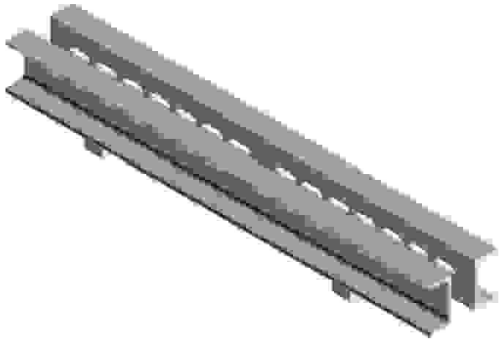




Cross Section F-Steel Waler



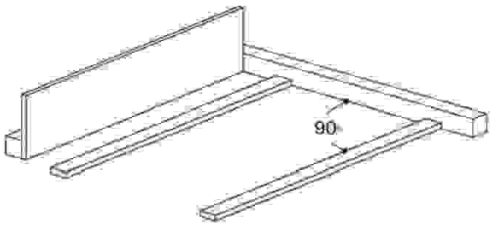
* Spacer Plate from Waler length of 146 cm upwards



Pre-Assembly of Elements

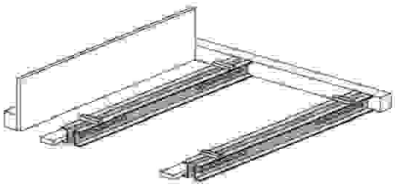
A. Basic Assembly

For basic assembly of the H20 elements, an assembly floor big enough for the largest wall formwork element has to be prepared. To ensure the exact position of the H20 Walers and Timber Beams, stop bars have to be fixed on the ground. The position of the stop bars should correspond to the spacing of the Walers



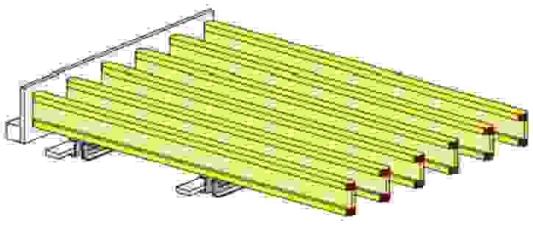
B. Waler Positioning

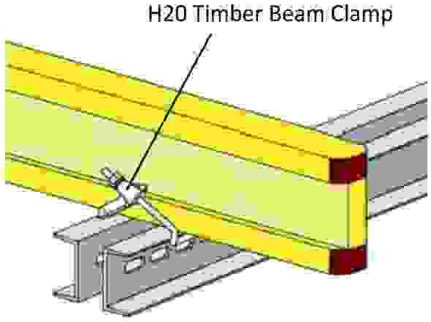
The Walers have to be placed on the assembly ground with the traverse on top facing upward.



C. H20 Timber Beam Positioning

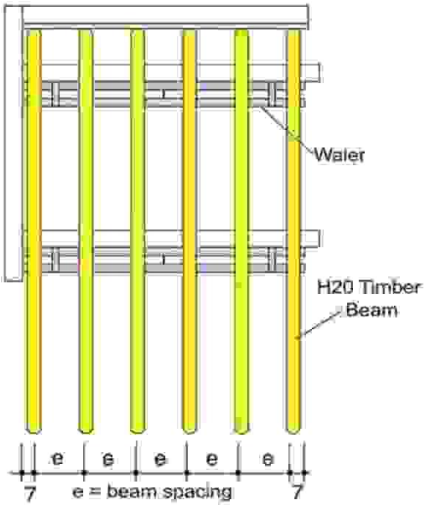
The spacing and positioning of the H20 Timber Beams are arranged based on the statical requirements. The H20 Timber Beam is fixed to the Waler using H20 Timber Beam Clamps.

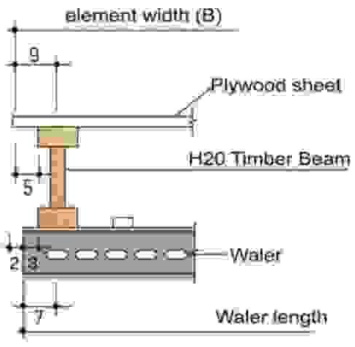




D. Fixing the Plywood Sheet

The Plywood is fixed to the shuttering grid by means of nails, screw nail or Spax Screws.



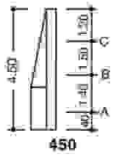
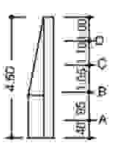
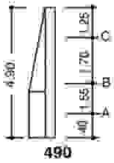
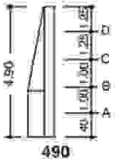


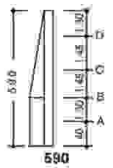
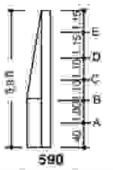
Load Tables

Fresh Concrete Pressure pb (kN/m2)		40	50	60	40	50	60	40	50	60	40	50	60
Wall Element System The wall element's height shown in the statical systems are based on standard H20 Timber Beam lengths between 2.45M and 5.90M. Element widths "**B**" from 1.0M to 3.0M can be used in steps of 25 cm.		(1)			(2)			(3)			(4.1)		
Height of Wall Element (cm)		245			265			290			330		
Perm. Beam distance based on plywood 18 mm(cm)		44	35	30	37	35	30	37	35	30	32	28	24
Perm. beam distance based on H20 values (cm)		59	53	49	49	48	45	40	38	35	32	28	24
Linear Load on Waler (kN/m) at	A	33.7	40.6	43.7	34.8	43	48.2	38.7	48.4	55.6	47.5	59.4	69.4
	B	32.3	31.9	31.3	39.2	39.5	38.8	45.3	46.6	46.4	52.5	55.6	56.6
	C	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-
	E	-	-	-	-	-	-	-	-	-	-	-	-
Relevant Element Number For the execution of wall elements based on Waler length (element width **B**) and concrete pressure.	Element width B (cm) 100	2	2	2	2	2	2	2	2	2	2	2	3
	125	4	5	5	4	5	5	4	5	5	5	5	6
	150	8	8	9	8	8	9	8	8	9	9	9	10
	175	12	12	13	12	12	13	12	12	13	12	13	14
	200	16	17	18	16	17	18	16	17	18	16	17	18
	225	21	21	22	21	21	22	21	21	22	22	23	24
	250	26	26	27	26	26	27	26	26	27	27	28	29
	275	31	32	33	31	31	33	31	32	33	33	34	35
	300	37	38	39	37	37	39	37	38	39	38	40	41

Fresh Concrete Pressure pb (kN/m2)		40	50	60	40	50	60	40	50	60	40	50	60
Wall Element System The wall element's height shown in the statical systems are based on standard H20 Timber Beam lengths between 2.45M and 5.90M. Element widths "**B**" from 1.0M to 3.0M can be used in steps of 25 cm.		(4.2)			(5.1)			(5.2)			(6)		
Height of Wall Element (cm)		330			360			360			390		
Perm. Beam distance based on plywood 18 mm(cm)		37	35	30	28	25	21	37	35	35	37	35	30
Perm. beam distance based on H20 values (cm)		52	49	41	22	20	18	48	42	35	44	39	33
Linear Load on Waler (kN/m) at	A	33.7	42.3	51	50.8	64	75.8	36.9	46	55.3	37.3	46.6	56.2
	B	30	36.3	38.8	61.2	66	68.2	34	42.7	47.8	43.7	54.8	62.5
	C	36.3	36.4	36.3	-	-	-	41.1	41.3	40.9	42.9	43.6	43.3
	C	-	-	-	-	-	-	-	-	-	-	-	-
	E	-	-	-	-	-	-	-	-	-	-	-	-
Relevant Element Number For the execution of wall elements based on Waler length (element width **B**) and concrete pressure.	Element width B (cm) 100	2	2	2	2	3	3	2	2	2	2	2	2
	125	4	5	5	5	6	-	4	5	5	4	5	5
	150	8	8	9	9	10	-	8	8	9	8	8	9
	175	12	12	13	13	14	-	12	12	13	12	12	13
	200	16	17	18	18	19	-	16	17	18	16	17	18
	225	21	21	22	23	24	-	21	21	22	21	21	22
	250	26	26	27	28	29	-	26	26	27	26	26	27
	275	31	32	33	34	35	-	31	32	33	31	32	33
	300	37	38	39	40	41	-	37	38	39	37	38	39

Load Tables

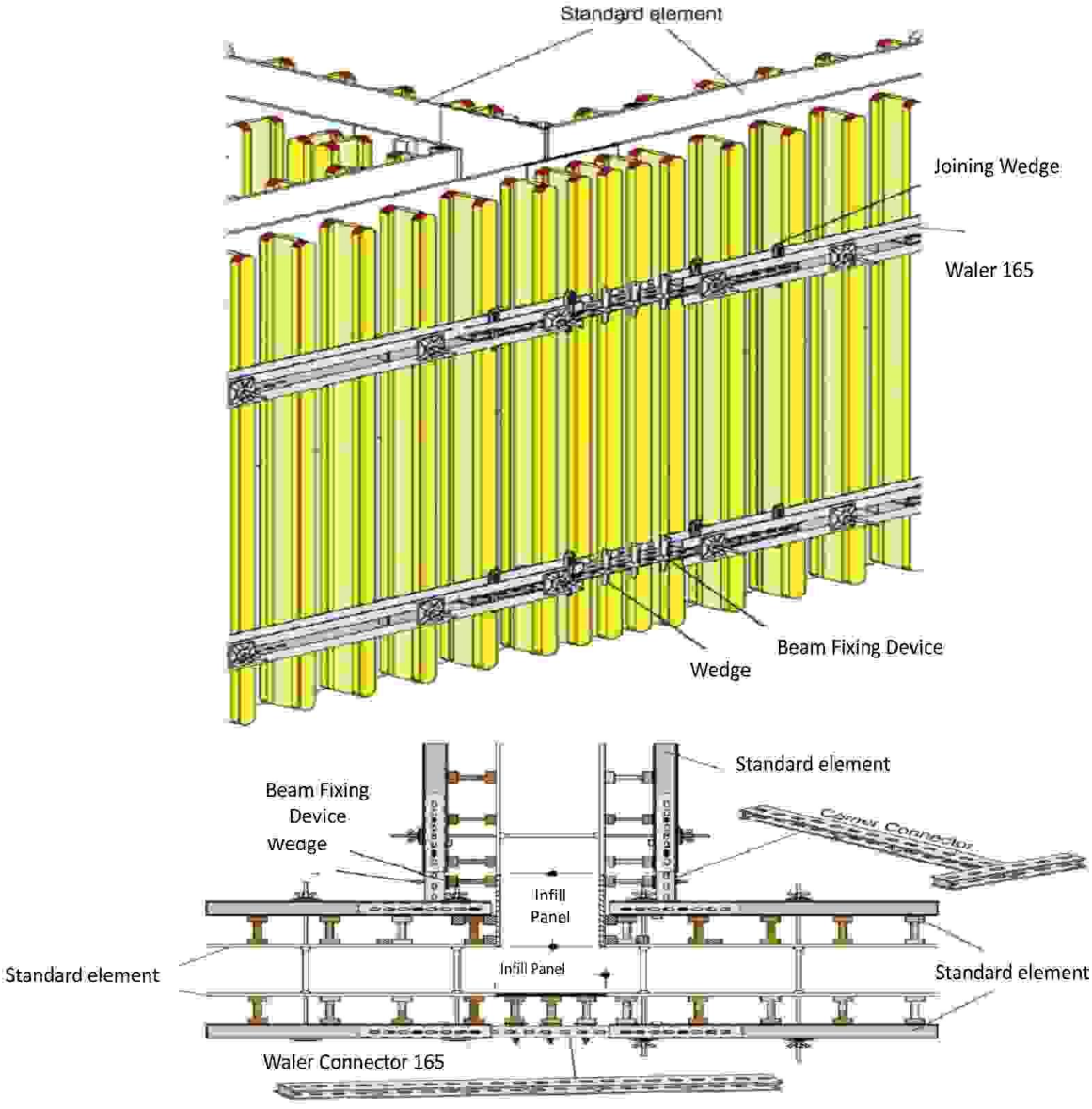
Fresh Concrete Pressure pb (kN/m²)		40	50	60	40	50	60	40	50	60	40	50	60
Wall Element System The wall element's height shown in the statical systems are based on standard H20 Timber Beam lengths between 2.45M and 5.90M. Element widths "**B**" from 1.0M to 3.0M can be used in steps of 25 cm. **Height of Wall Element (cm)**		7.1  450			7.2 			8.1  490			8.2  490		
Perm. Beam distance based on plywood 18 mm(cm)		33	27	22	37	35	30	31	25	21	37	35	30
Perm. beam distance based on H20 values (cm)		33	27	22	51	42	35	31	25	21	40	39	36
Linear Load on Waler (kN/m) at	A	42.9	53.5	64.5	34.9	43.5	52.1	42.4	52.9	63.8	35.9	44.9	53.8
	B	61.5	76.9	89.4	39.7	50.1	60.6	70.8	89	104.7	39.9	49.6	60.1
	C	43.7	44.6	44.1	42.1	50.2	54.5	50.8	53.1	53.6	41.4	52.5	60.2
	C	-	-	-	31.2	31.1	30.8	-	-	-	46.8	48	48
	E	-	-	-	-	-	-	-	-	-	-	-	-
Relevant Element Number For the execution of wall elements based on Waler length (element width **B**) and concrete pressure.	Element width B (cm) 100	2	3	3	2	2	2	2	3	3	2	2	2
	125	5	5	6	4	5	5	5	6	-	4	5	5
	150	8	9	10	8	8	9	9	10	-	8	8	9
	175	12	13	-	12	12	13	13	14	-	12	12	13
	200	17	18	-	16	17	18	17	19	-	16	17	18
	225	22	23	-	21	21	22	22	24	-	21	21	22
	250	27	28	-	26	26	27	27	29	-	26	26	27
	275	32	34	-	31	32	33	33	35	-	31	32	33
	300	38	40	-	37	38	39	39	41	-	37	38	39

Fresh Concrete Pressure pb (kN/m²)		40	50	60	40	50	60	40	50	60	40	50	60
Wall Element System The wall element's height shown in the statical systems are based on standard H20 Timber Beam lengths between 2.45M and 5.90M. Element widths "**B**" from 1.0M to 3.0M can be used in steps of 25 cm. **Height of Wall Element (cm)**		9.1  590			9.2  590								
Perm. Beam distance based on plywood 18 mm(cm)		37	30	25	44	39	32						
Perm. beam distance based on H20 values (cm)		37	30	25	47	39	32						
Linear Load on Waler (kN/m) at	A	39	48.8	58.5	35.5	44.4	53.3						
	B	58.4	72.7	87.6	42	52.5	62.8						
	C	55.6	70.6	82.9	45.1	56.4	68.2						
	C	51	52.8	53	41.7	51.6	57.9						
	E	-	-	-	39.7	40.1	39.8						
Relevant Element Number For the execution of wall elements based on Waler length (element width **B**) and concrete pressure.	Element width B (cm) 100	2	2	3	1	2	2						
	125	4	5	6	4	5	5						
	150	8	9	10	8	8	9						
	175	12	13	14	12	12	13						
	200	16	18	19	16	17	18						
	225	21	22	24	21	21	22						
	250	26	27	29	26	26	27						
	275	31	33	35	31	32	33						
	300	37	39	41	37	38	39						

T-Shaped Wall Arrangement

The arrangement of a T-shaped wall can be done with standard wall formwork elements and an additional infill panel which is fixed by means of Waler Connector 165.

The inner corners are arranged with standard elements as shown and described on page 17.

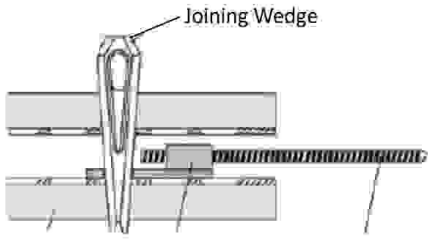


Stopend Arrangement

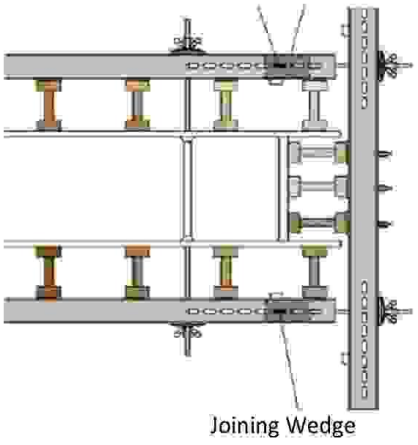
The stopend is arranged at the wall ending, a construction joint or an extension joint.

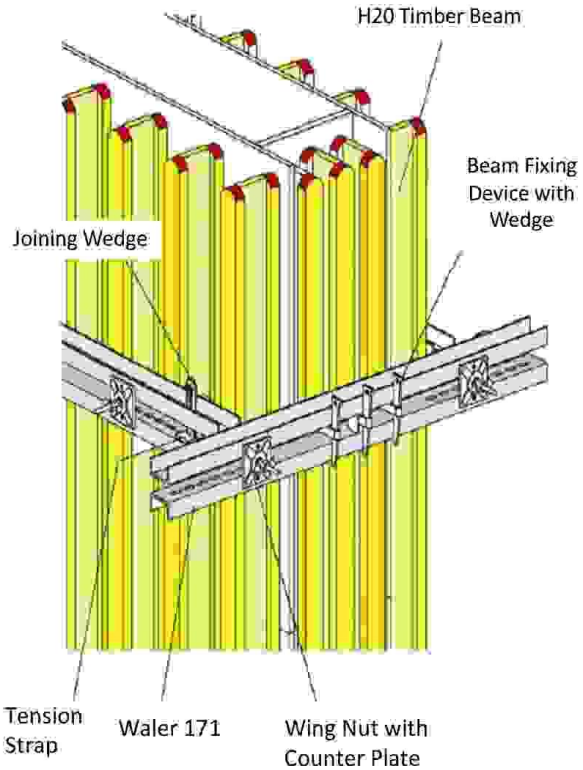
For arranging the stopend element, the Tension strap is fixed between the Walers using a Joining Wedge. The loads from the concrete pressure are transferred by the Tie Rods into the Walers. Wing Nut with Counter Plate or Tie Nut permits a tension resistant connection and exact adjustment.

Depending on wall thickness, at least two H20 Timber Beams or Lattice Girders have to be used as stopend element.



Tension Strap





Required quantities for Stopend
(per waler level)

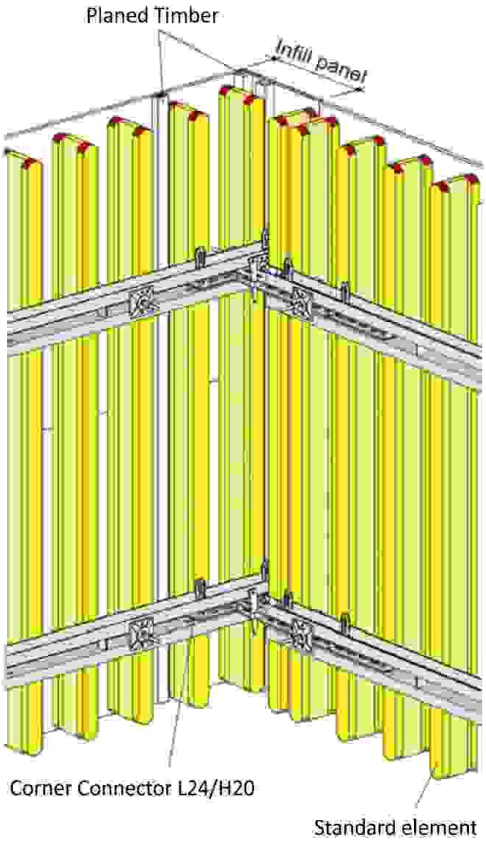
Beam Fixing Device	3 pcs.
Wedge	3 pcs.
Waler 171	1 pc.
Wing Nut	2 pcs.
Counter Plate 12/12	2 pcs.
Tension Strap	2 pcs.
Joining Wedge	2 pcs.
Tie Rod 75 15mm dia./D&W	2 pcs.

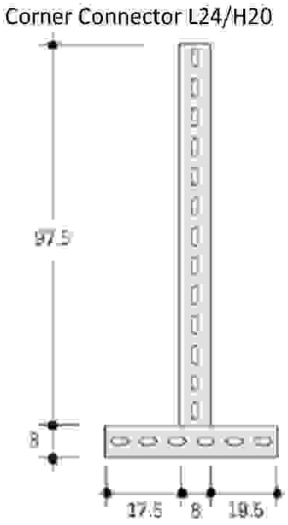
Corner Arrangement

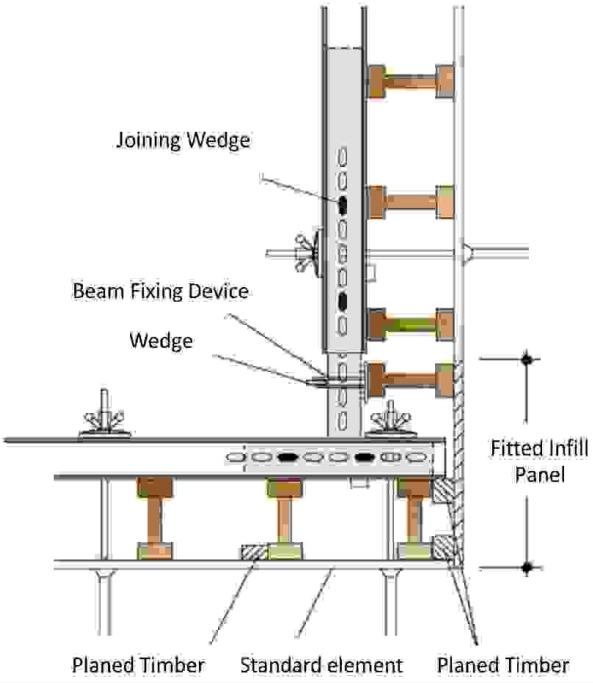
Inner Corner

The erection of an inner corner is also possible by making use of Corner Connector L24 / H20 in combination with Wlaers, H20 Timber Beams or Lattice Girders. The Corner Connector L24 / H20 is fixed to the Waler by means of Joining Wedges.

Please take note that the corner connector's shorter leg should be positioned towards the H20 formwork's inner corner







Required quantities for Inner Corner
(per waler level)

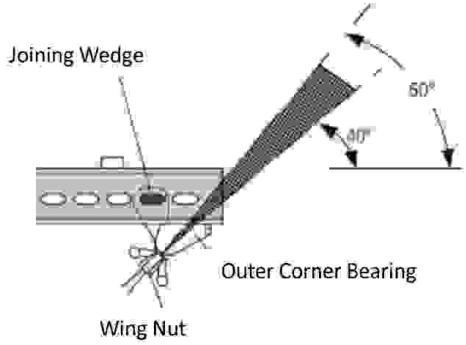
Corner conector L24 / H20	1 pc.
Joining Wedge	4 pc.

Outer Corner

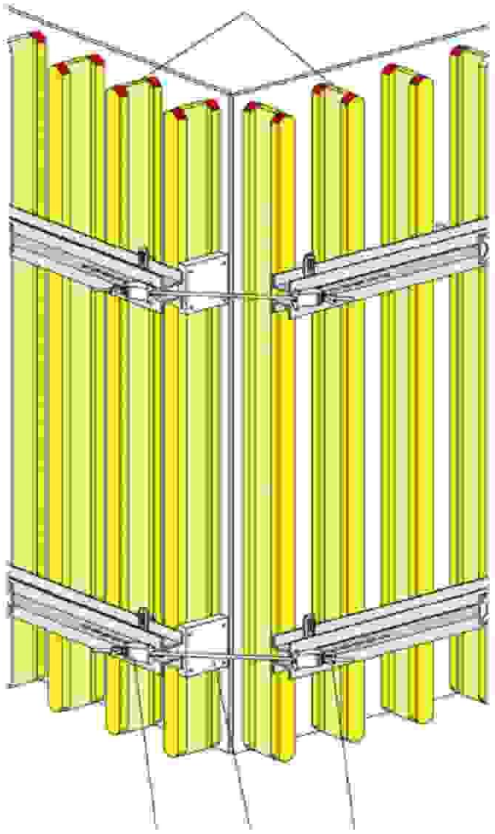
The standard outer corner is comprised of H20 Timber Beams or Lattice Girders. The Outer Corner Bearing is fixed to the Waler by means of a Joining Wedge while the wood cleat is used to prevent the H20 Timber Beams from being misaligned during tightening. Tightening the corner should be done at a 45° angle to the Waler.

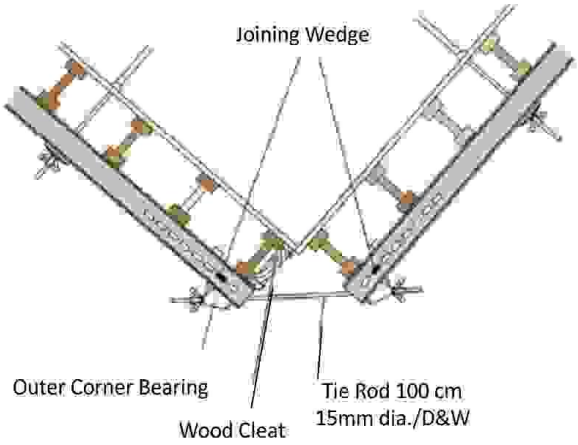
Please note that the application of Outer Corner Bearing must be at a min. of 40° and max. of 50°.

Outer Corner Bearing



Timber Beam





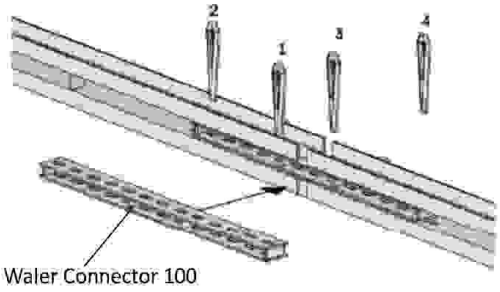
Required quantities for Outer Corner
(per waler level)

Outer Corner Bearing	2 pcs.
Wing Nut	2 pcs.
Joining Wedge	2 pcs.
Tie Rod 100 15mm dia./D&W	1 pc.

Element Connection

Connection ofthe WallElements

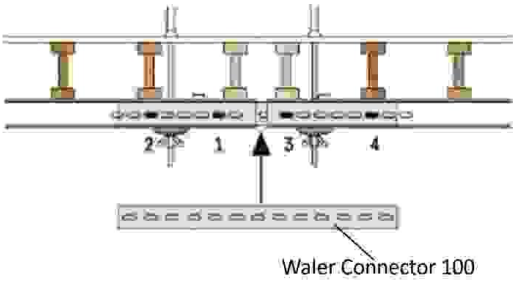
Fixing the wall elements by means of Waler Connector 100/65 and four Joining Wedges provides an aligned tension and compression resistant wall element connection.



Waler connector 165 is used together with length adjustment panels with a maximum width of 80 cm.

A. The center of the Waler Connector 100 has to be placed in between the two adjacent wall elements and secured with Wedge 1.

B. Place Wedge 2 at a maximum distance from Wedge 1 and fasten.

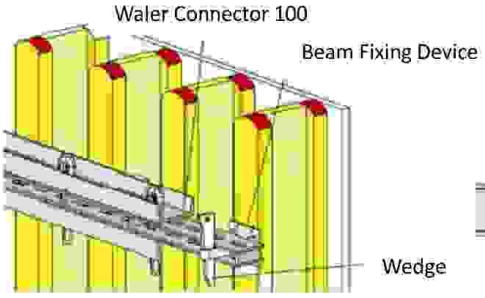


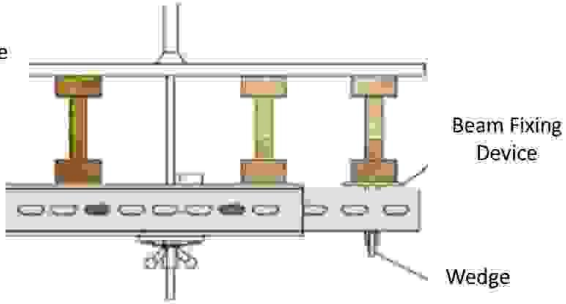
C. Insert Wedge 3 and tighten element joint then fasten Wedge 1 and Wedge 3

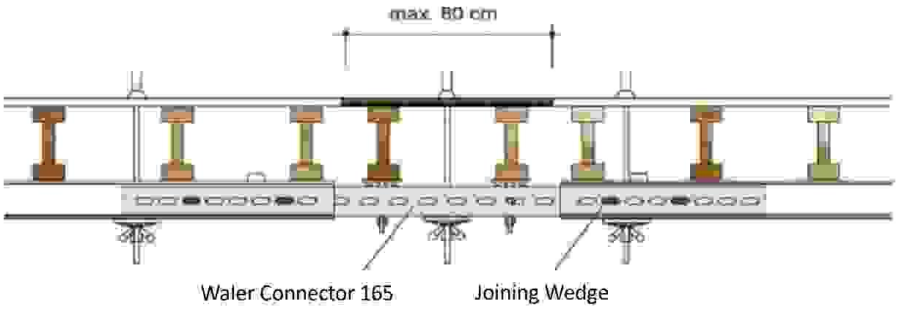
D. Wedge 2 and Wedge 4 have to be tightened as well. The beam Fixing Device has a 6 mm dia. Nail hole

Length Adjustment

For length adjustment, the Waler Connector 100, Beam Fixing Device and corresponding Wedge are to be used and fixed to the H20 Timber Beam.



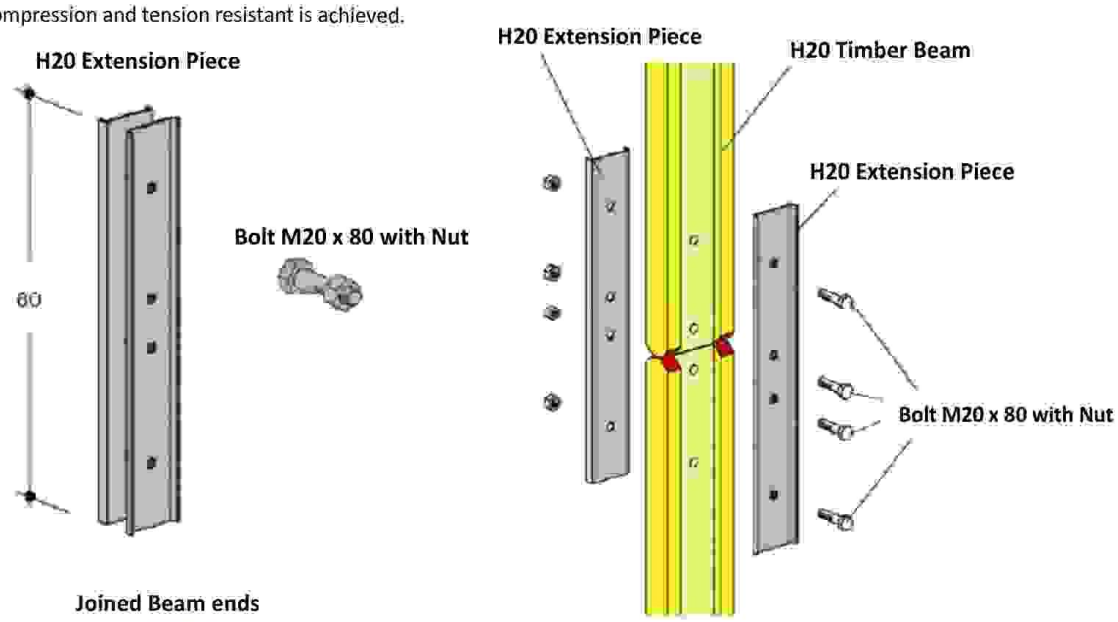


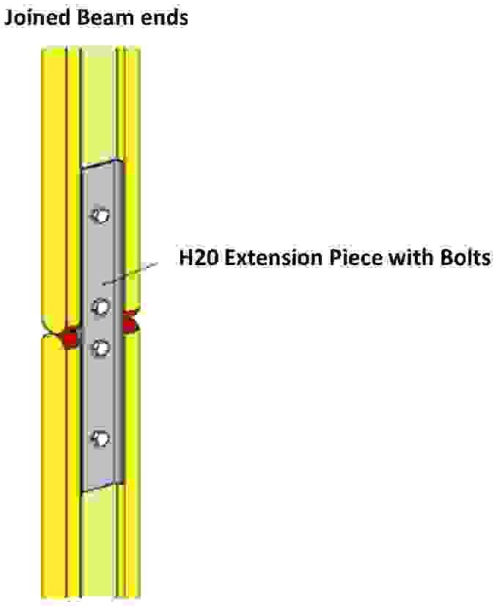


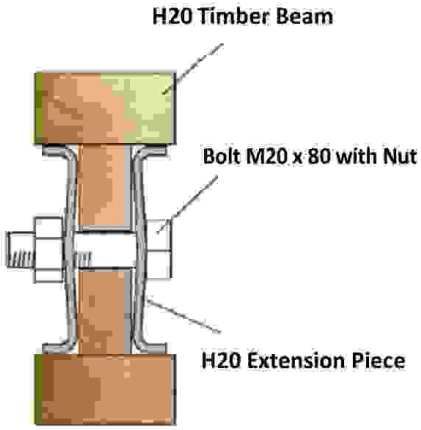
Height Extension

The H20 Extension Piece is used to extend the height of the wall formwork's standard elements. By fixing the H20 Extension Piece to the web of the individual H20 Timber Beams, an aligned and rigid connection which is compression and tension resistant is achieved.

The H20 Extension Piece is fastened to the H20 Timber Beams using two H20 Extension pieces and four Bolts M20 x 80 with nut.



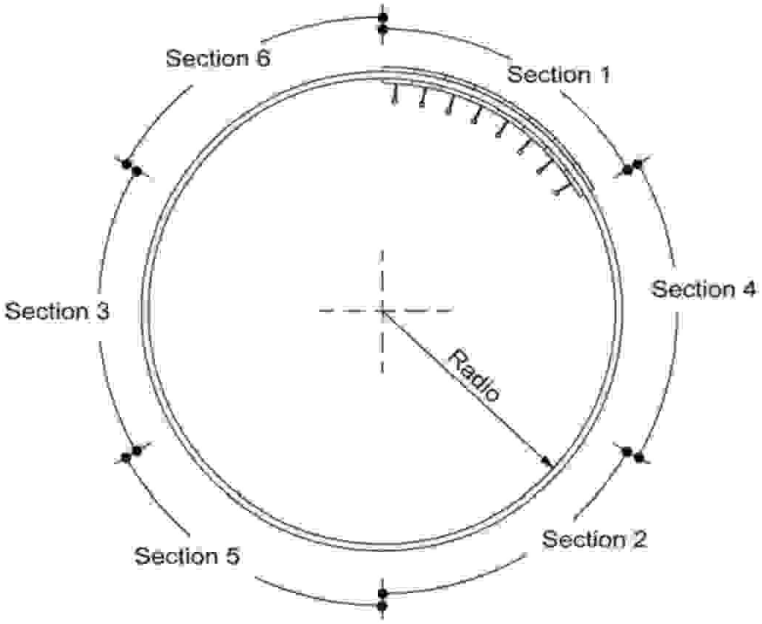




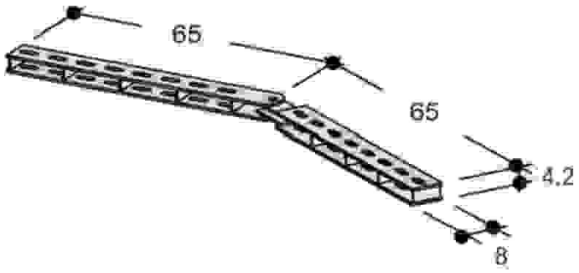
Circular Formwork Arrangement

H20 Timber Beam elements arranged as circular wall shuttering can be connected by means of the Hinged Connector 65x65 secured by inserting the Joining Wedge in the Waler.

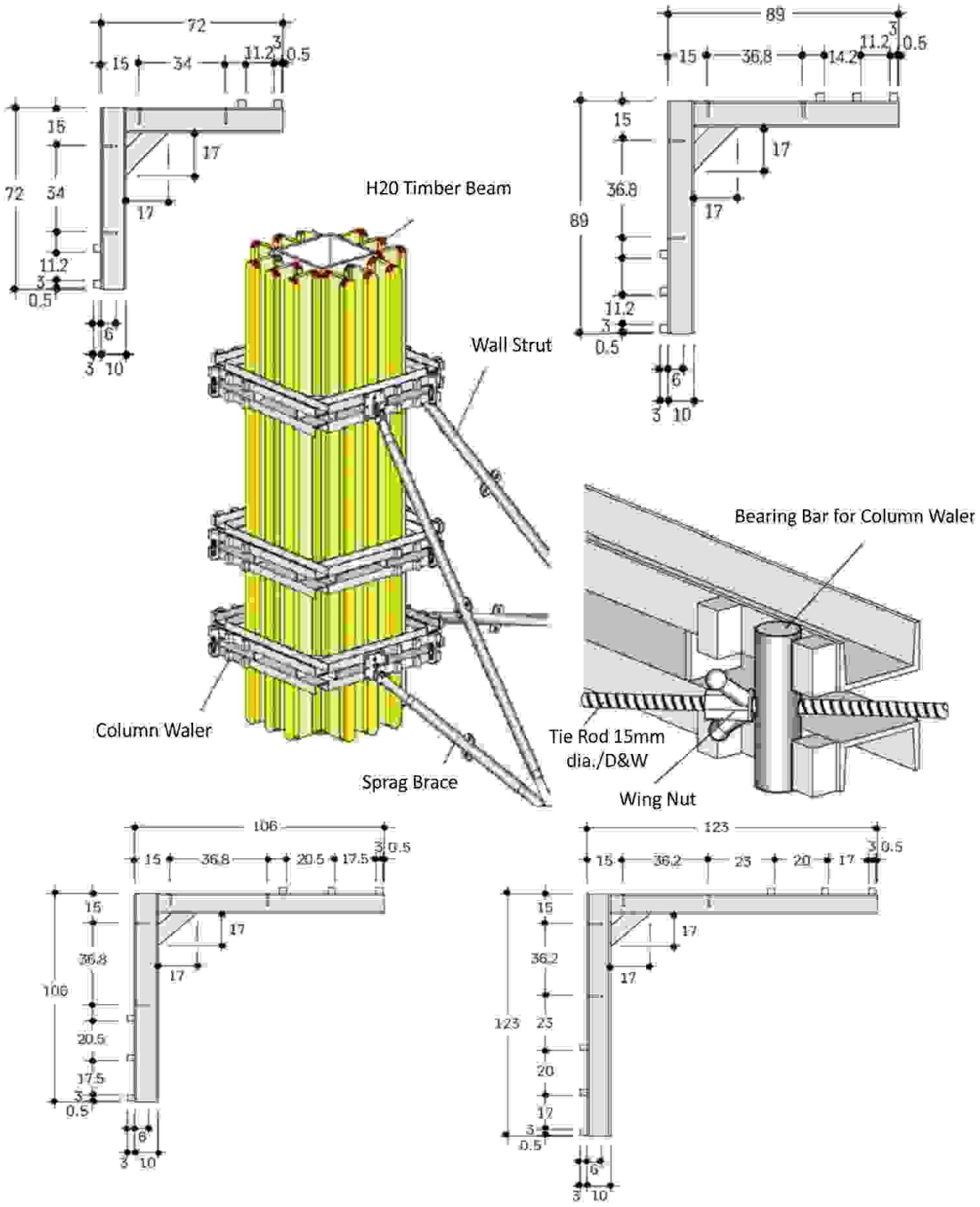
Sample Circular Structure Arrangement



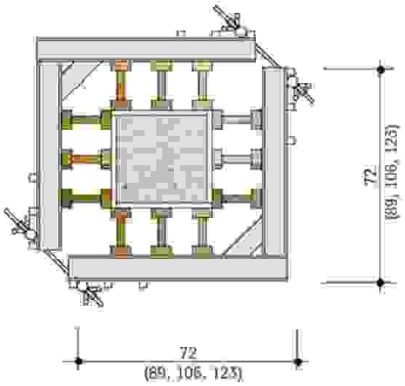
Hinged Connector 65 x 65

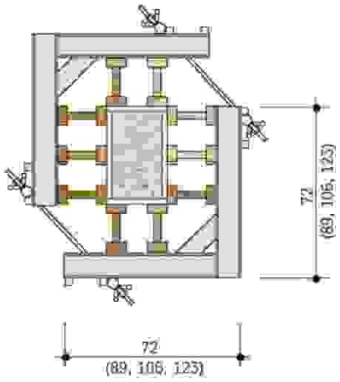


Column Formwork Arrangement



With Column Waler in cm.	Square cross-sections		Rectangular cross-sections	
	from	to	from	to
72/72	20 / 20	36 / 36	20 / 20	20 / 36
89 / 89	37 / 37	53 / 53	20 / 37	20 / 53
106 / 106	54 / 54	70 / 70	20 / 54	20 / 70
123 / 123	71 / 71	87 / 87	20 / 71	20 / 87





The column Walers and H20 Timber Beams are connected by H20 Timber Beam Clamps.

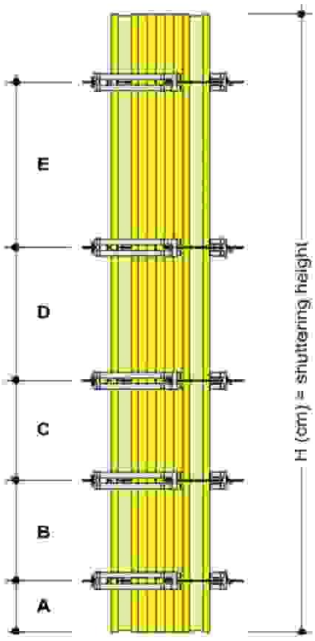


Table for Column Formwork

h	A	B	C	D	E
245	45	130			
265	45	130			
290	30	100	100		
330	30	100	100		
360	30	100	130		
390	30	100	130		
450	30	90	100	130	
490	30	90	100	130	
590	30	90	90	130	130

With a maximum concrete pressure of 80 kN/m^2

Quantity of H20 Timber Beams

Column width in cm.	20	30	40	50	60	70	87
No. of beams per side	2	2	3	3	4	4	5

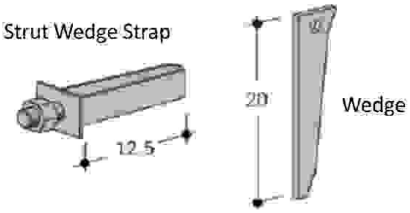
Maximum spacing of H20 Timber Beams is e = 23 cm.

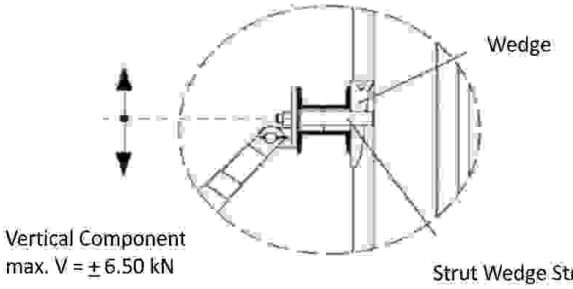
Please note that 18 mm thick plywood must be used for this type of column formwork.

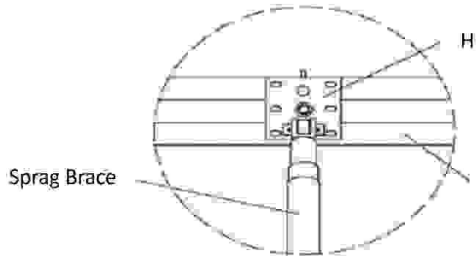
Aligning the Wall Formwork Elements

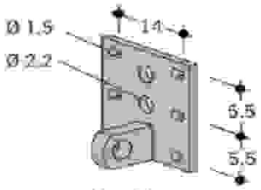
Arrangement of Wall Struts with Sprag Braces

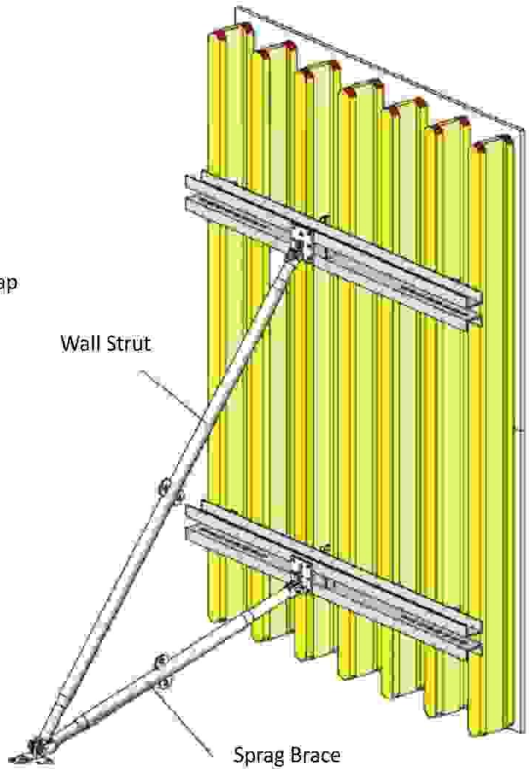
Using the Wall Strut and the Sprag Brace, the wall formwork elements can be properly aligned and supported. During the erection of the wall shuttering, arrangement of the Wall Struts with Sprag Braces is necessary in order to take over the wind loads. The compression and tension resistant connection to the Waler is made by Strut Wedge Strap and Wedge. Please note that the Wall Strut and Sprag Brace are to be ordered separately.











Wall Strut Size Varieties

Wall Strut	Min. L (m)	Perm. F (kN)	Max. L (m)	Perm. F (kN)
Wall Strut 1	1.76	40	2.40	26
Wall Strut 2	2.20	31	2.90	17
Wall Strut 3	2.70	20	3.40	13
Wall Strut 4	3.20	14	3.90	9
Wall Strut 5	4.20	10	4.90	7
Wall Strut 6	5.30	13	5.90	10

Sprag Brace Size Varieties

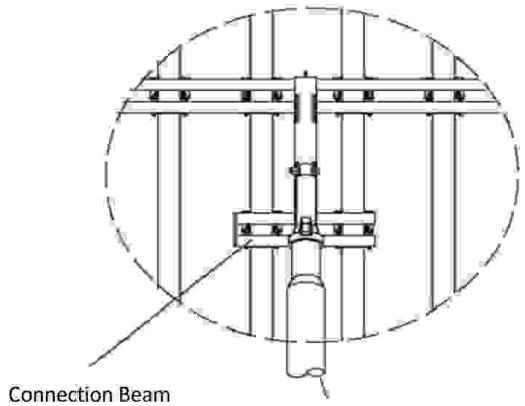
Sprag Brace	Min. L (m)	Perm. F (kN)	Max. L (m)	Perm. F (kN)
Sprag Brace 1	1.15	47	1.65	36
Sprag Brace 2	1.70	40	2.40	26

Supporting the Formwork

Special Aligning Strut Arrangement

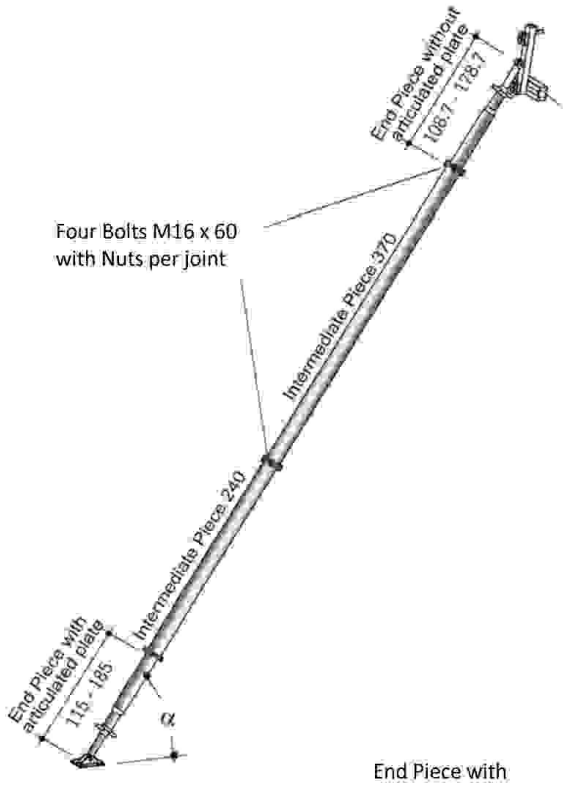
For aligning extremely high wall elements, combinable Aligning Strut IBK sections can be arranged for a tension and compression resistant bracing. The connection of the aligning strut to the wall elements is done by means of the Connection beam CFB230.

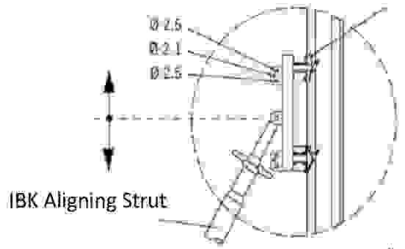
The Aligning Strut IBK is made up of several components which can form numerous combinations as illustrated below:



Connection Beam CFB 230

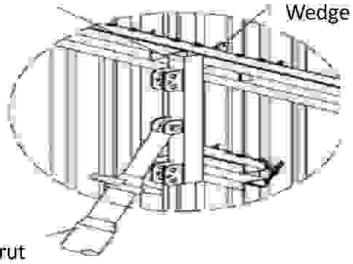
IBK Aligning Strut





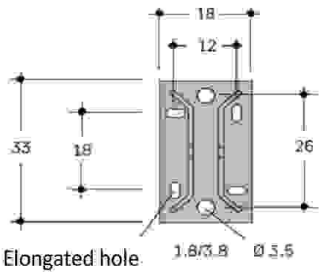
IBK Aligning Strut

CFB 230 Connector Beam



IBK Aligning Strut

End Piece with articulated plate



Technical data of the IBK Aligning Struts

Type	Length in cm. min.	Length in cm. max.	Perm. Load kN Extended fully	Qty. of End Piece With Hinged End Section	Qty. of End Piece Without Hinged End Section	Intermediate Piece qty. 240 cm.	Intermediate Piece qty. 370 cm.
IBK4	703.70	843.70	25	Per 1	Per 2	2	-
IBK5	833.70	973.70	22			1	1
IBK6	963.70	1103.70	17.5			-	2
IBK7	1073.70	1213.70	15			2	1

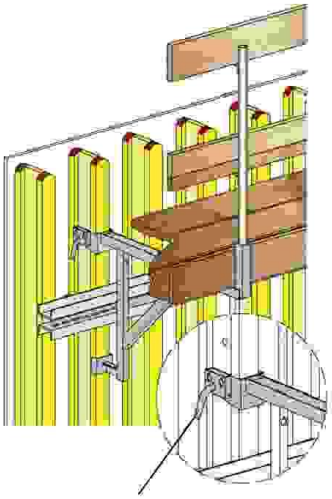
Note:

Vertical Component
Max. V = ≤ 27.5 kN

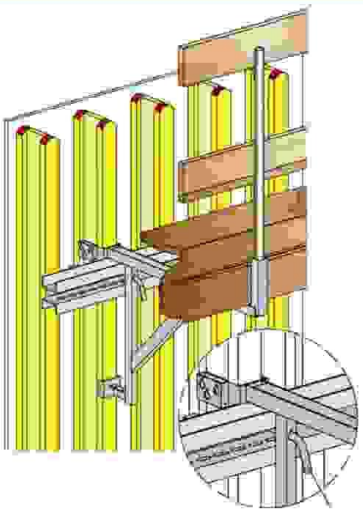
TB Walkway Bracket Arrangement

The TB Walkway Bracket, which can be attached to the formwork is varied ways as described below, is a ready to used bracket which provides a working platform with a width of approximately 90 cm. It is equipped with an additional WB Railing Post which is ordered separately.

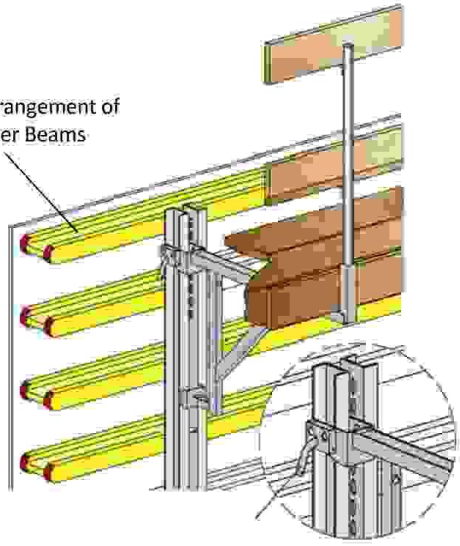
Prior to preassembly of the standard elements, holes with 2 mm diameter have to be drilled in the middle axis of the H20 Timber Beam web. These holes allows fastening of the TB Walkway Bracket using the Safety Pin.



Connecting the brackets to a vertical Waler secured by a Safety Pin



Fastening the horizontal Waler secured by a Safety Pin.

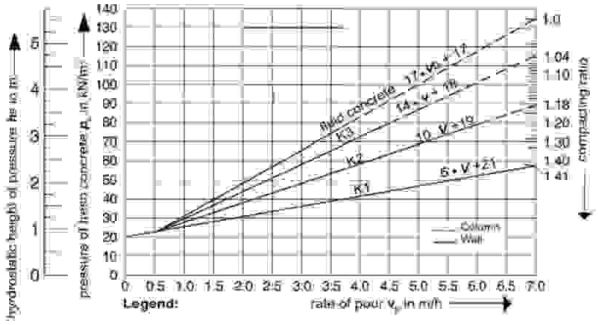


Please note that the board thickness as well as dimension of the planks for the platform and railing should be in line with the specific construction and safety regulations on the site. The maximum distance of two TB Walkway Brackets should not exceed 1.50 m.

Technical Data and Load Tables

Diagram for fresh Concrete Pressure

Diagram for determining the fresh concrete pressure (pb) on formwork in relation to the rate of pour (vb) and consistency " K" of fresh concrete



K3 = KR = smooth concrete
K2 = KP = plastic concrete
K1 = KS = stiff concrete

Assumptions

1. Bulk density of fresh concrete is 25 kN/m^3
2. Setting time of concrete = 5 hrs.
3. Impervious formwork
4. Compaction with internal vibrator
5. Temperature of fresh concrete = 15° C

Load Table Guides

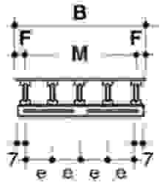
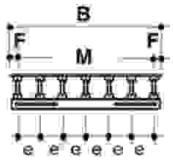
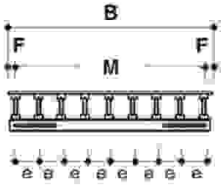
1. The load tables on page 28 and 29 shows three different permissible concrete pressure (40, 50, 60kN/m^2) in combination with the height of the wall formwork element.
2. The height of the wall formwork elements and the corresponding position of the Waler as fixed arrangements are shown as A, B, C, D and E. All dimensions shown on the load table are in centimeters and meters from axis to axis of the H20 Timber Beam. The initial height of each wall formwork element from the bottom to the first Waler is always 40 cm.
3. The H20 wall formwork elements with various heights are defined with element numbers between 1 and 4 and are equipped with an 18 mm thick plywood.
4. There are two rows of figures related to the spacing of the H20 Timber Beams, notably, permissible beam spacing by plywood 18 mm and permissible beam spacing by statical values of H20. For the determination and arrangement of the H20 wall formwork elements, the smaller figures between the two always have to be taken into consideration.
5. The corresponding loading on the Walers and Tie Rods (A, B, C, D, E) are mentioned as linear loads (kN/m).
6. The relevant element numbers 1-4 are mentioned at the bottom of each load table. The element number depends on the allowable concrete pressure and on the 9 various element widths which are based on the length of the 9 Walers.

Arrangement of Elements

1. All important detailed design criterias for the wall formwork elements such as length of Walers, element width, H20 Timber Beam quantity and exact distance of the beams ca n be taken from the table on page 13. The fourth vertical column on page 13 contains the element numbers between 1 and 41 which are also shown on the load tables on page 28-29. The arrangement of the H20 wall formwork elements and fastening of the plywood sheet is based on the details shown on page 12.
2. The typical arrangement of wall ties can be taken from the table on page 14 for each element number. Please note that tying arrangement 1, 3 and 4 are fully symmetrical. When using tying arrangement 2, make sure that tying arrangement for the same length of wall formwork elements has been considered.
3. For tying of wall formwork elements, Tie Rod 15 mm dia./D&W With maximum permissible load of 90 kN per wall tie have to be used.

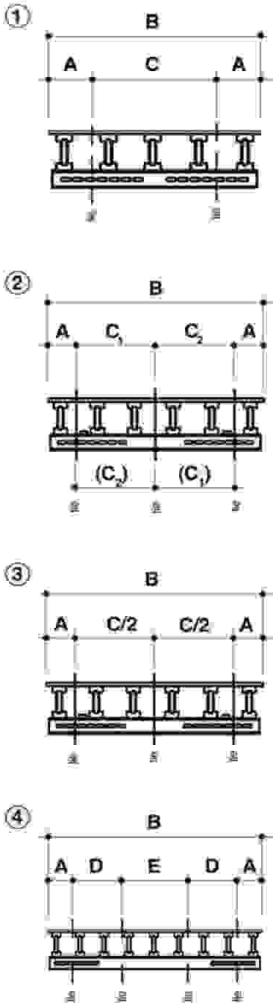
Element Execution

Arrangement and Spacing of H20 Timber Beams
*Spacing only allowed with 18mm thick plywood

Designation and design of elements			Element No.	H20 Qty Per element	F (cm)	H20 distance due to element width **B= F + M + F** **M** = no. of beam gaps x **e** (cm) **M** = Division measure, **e** = beam distance	F (cm)
Waler (cm)	B (cm)	B=total element width Principal element arrangement					
96	100	 F = 9 cm E = beam distance Center to center of H20	1*	3	9	2 x 41	9
			2	4	9	3 x 27.3	9
			3	5	9	4 x 20.5	9
121	125		4	4	9	3 x 35.7	9
			5	5	9	4 x 26.8	9
			6	6	9	5 x 21.4	9
146	150		7*	4	9	3 x 44	9
			8	5	9	4 x 33	9
			9	6	9	5 x 26.2	9
			10	7	9	6 x 22	9
171	175		11*	5	9	4 x 39.3	9
			12	6	9	5 x 31.4	9
			13	7	9	6 x 26.2	9
			14	8	9	7 x 22.4	9
196	200		15*	5	9	4 x 45.5	(9)
			16	6	9	5 x 36.4	9
			17	7	9	6 x 30.3	9
			18	8	9	7 x 26	9
			19	9	9	8 x 22.8	9
221	225		20*	6	9	5 x 41.4	9
			21	7	9	6 x 34.5	9
			22	8	9	7 x 29.6	9
			23	9	9	8 x 25.9	9
			24	10	9	9 x 23.2	9
246	250		25*	7	9	6 x 38.7	9
			26	8	9	7 x 33.1	9
			27	9	9	8 x 29	9
			28	10	9	9 x 25.8	9
			29	11	9	10 x 23.2	9
271	275		30*	7	9	6 x 42.8	9
			31	8	9	7 x 36.7	9
			32	9	9	8 x 32.1	9
			33	10	9	9 x 28.6	9
			34	11	9	10 x 25.7	9
			35	12	9	11 x 23.4	9
296	300		36*	8	9	7 x 40.3	9
			37	9	9	8 x 35.3	9
			38	10	9	9 x 31.3	9
			39	11	9	10 x 28.2	9
			40	12	9	11 x 25.6	9
			41	13	9	12 x 23.5	9

Detailed Tying Arrangement for Wall Formwork Elements

Element	Relevant tying scheme	A [cm]	C [cm]	C/2 [cm]	C_1 [cm]	C_2 [cm]	D [cm]	E [cm]	A [cm]	Tying scheme samples
1	①	25	50	---	---	---	---	---	25	
2	①	25	50	---	---	---	---	---	25	
3	①	19	62	---	---	---	---	---	19	
4	①	25	75	---	---	---	---	---	25	
5	①	25	75	---	---	---	---	---	25	
6	①	19	87	---	---	---	---	---	19	
7	①	33	84	---	---	---	---	---	33	
8	①	33	84	---	---	---	---	---	33	
9	①	28	94	---	---	---	---	---	28	
10	①	40	70	---	---	---	---	---	40	
11	①	40	95	---	---	---	---	---	40	
12	①	33	109	---	---	---	---	---	33	
13	①	44	87	---	---	---	---	---	44	
14	②	19	---	---	67	70	---	---	19	
15	①	45	110	---	---	---	---	---	45	
16	①	38	124	---	---	---	---	---	38	
17	①	48	104	---	---	---	---	---	48	
18	②	27	---	---	71	75	---	---	27	
19	②	40	---	---	52	68	---	---	40	
20	①	43	138	---	---	---	---	---	43	
21	①	52	128	---	---	---	---	---	52	
22	②	32	---	---	79	82	---	---	32	
23	②	43	---	---	61	78	---	---	43	
24	②	40	---	---	71	74	---	---	40	
25	①	56	138	---	---	---	---	---	56	
26	①	56	138	---	---	---	---	---	56	
27	②	46	---	---	71	87	---	---	46	
28	③	43	---	82	---	---	---	---	43	
29	②	41	---	---	76	92	---	---	41	
30	②	44	---	---	85	102	---	---	44	
31	③	39	---	98.5	---	---	---	---	37.5	
32	②	50	---	---	79	96	---	---	50	
33	③	46	---	91.5	---	---	---	---	46	
34	②	45	---	---	84	101	---	---	45	
35	④	42	---	---	---	---	69	53	42	
36	③	42	---	108	---	---	---	---	42	
37	②	37	---	---	105	121	---	---	37	
38	③	50	---	100	---	---	---	---	50	
39	②	46	---	---	96	112	---	---	46	
40	④	45	---	---	---	---	75	60	45	
41	④	41	---	---	---	---	74	70	41	



In case the tie load is more than 90 kN, Tie Rod 20 mm dia./D&W with maximum permissible load of 150 kN should be used.

Important Product Features and Calculation Factors

1. **H20 Timber Beam Technical Approval**
   The H20 Timber Beam has a general approval of the Building Supervisory Board. It is registered under Z-9, 1 – 146 technical approval of DIBt Berlin since 1983 with valid certificate until 2012.

   Competitive advantage:
   The H20 Timber Beam is equipped with a protective cap that is shock resistant and provides protection against splintering, thereby increasing durability.

2. **Basic Assembly**
   The Walers are fastened to the H20 Timber Beam by means of H20 Timber Beam Clamp. Fastening is possible at any section of the Walers.

   Competitive advantage:
   Safe, quick and easy assembly and dismantling.

3. **Element Connection**
   Two wall formwork elements are joined together by Waler Connectors and Joining Wedges.

   Competitive advantage:
   Connections are tension and compression resistant.

4. **Tying**
   Tie Rods have to be positioned according to statical requirements of the designed wall formwork elements and the planned concrete structure. Recommended tying arrangements for standard wall formwork elements are shown in page 14.

   Competitive advantage:
   Easy and flexible tie positioning in case of disturbing sections / areas.

5. **Flexibility**
   Due to high adaptability of H20 Timber Beam Wall formwork elements, arrangement of any floor plan is made possible

   Competitive advantage:
   Optimum adaptation to expected concrete pressure, distributing sections / areas and length adjustments.

6. **Versatility**
   The H20 wall and column formwork system can also be used in combination with Single Sided Support Frames and climbing brackets for climbing formwork as well as for columns.

   Competitive advantage:
   Numerous application possibilities.

7. **Height Extension**
   The wall element's height can be easily extended using H20 Extension Piece. By fastening the H20 Extension Piece to the web of each H20 Timber Beam, a compression and tension resistant connection which is aligned and rigid is achieved.

   Competitive advantage:
   Used for various wall heights.

8. **Supplementary Components**
   All steel parts of the H20 wall and column formwork system are hot-dip galvanized.

   Competitive advantage:
   All steel parts are corrosion resistant.

Calculation Factors

1. **Statical Figures**

H20 Timber Beam	Steel Waler 2 x U-100
Perm. Q = 11 kN	92.2 kN
Perm. M = 5 kNm	11.5 kNm
E · I = 500 kNm^2	865 cm^4
Based on general approval by The Building Supervisory Board	Distance of ties (e) < 1.25 m

2. **Dimensions**

H20 Timber Beam	Steel Waler 2 x U-100
HxW : 20 x 8 cm	10 x 15 cm
Lengths: 1.90M,2.45M,2.65M, 2.90M, 3.30M, 3.60M, 3.90M, 4.50M, 4.90M, 5.90M, 11.90M.	0.96M up to 2.96M in steps of 25 cm. Special lengths available upon request

3. **Weight**
   H20 Timber Beam : approx. 4.80 kg/m
   Waler : approx. 21.2 kg./m
   Element: approx. 60 kg/m^2 with plywood
   Approx. 48 kg/m^2 without plywood

4. **Time Figures for Erection / Dismantling**
   Basic Assembly: approx. 0.25 h/m^2
   Dismantling: approx. 0.15 h/m^2
   Erection and Dismantling: 0.30 to 0.50 h/m

5. **Transport Volume of Components**
   H20 Timber Beam : approx. 0.25 h/m^2
   Waler : approx, 0.018 m^3/m
   Element * : approx. 0.33 to 0.38 m^3/m^2 With plywood
   : approx. 0.24 to 0.31 m^3/m^2 Without plywood

* depending on loading method.

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BSL Scaffolding Limited

A-26, Sector-59, Noida 201301
District Gautambuddh Nagar,
Uttar Pradesh
Phone: +91 - 120 - 4345180-185
Fax: +91 - 11 - 2490368
Email: marketing@bslscaffolding.com
www. bslscaffolding.com

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