BERTOUR

Erection Manual

Shoring system

v2015/07en

scafom·rux

INDEX

1 Introduction

In this manual you are introduced to the prefabricated, modular support scaffold system of Scafom-Rux, called Bertour which will provide you:

The system has been designed in order to be a very flexible and strong supporting system based on heavy duty shoring capabilities with the following advantages:

- Minimum number of components to be required.
- All components are designed to be robust.
- All components are hot dip galvanized applying a protective zinc coating to prevent rusting.
- Fully systemized for a quick erection.
- Simple and efficient interconnection of frames, entrance and ladder frames, and/or braces.
- All frames produced from high grade steel.
- High safe working loads.
- Assortment of various frames to make different grid sizes and to allow maximum capacity of leg load.
- System diagonals and ladder/entrance frames for accurate erection and bracing, easy to assemble and dismantle.

Bertour has been designed and manufactured under rigorous control according to the product standard “NF P93-5501, ……”. This manual is furthermore based on:

- Load tests at various tower models by CEBTP.

1.1 Considerations

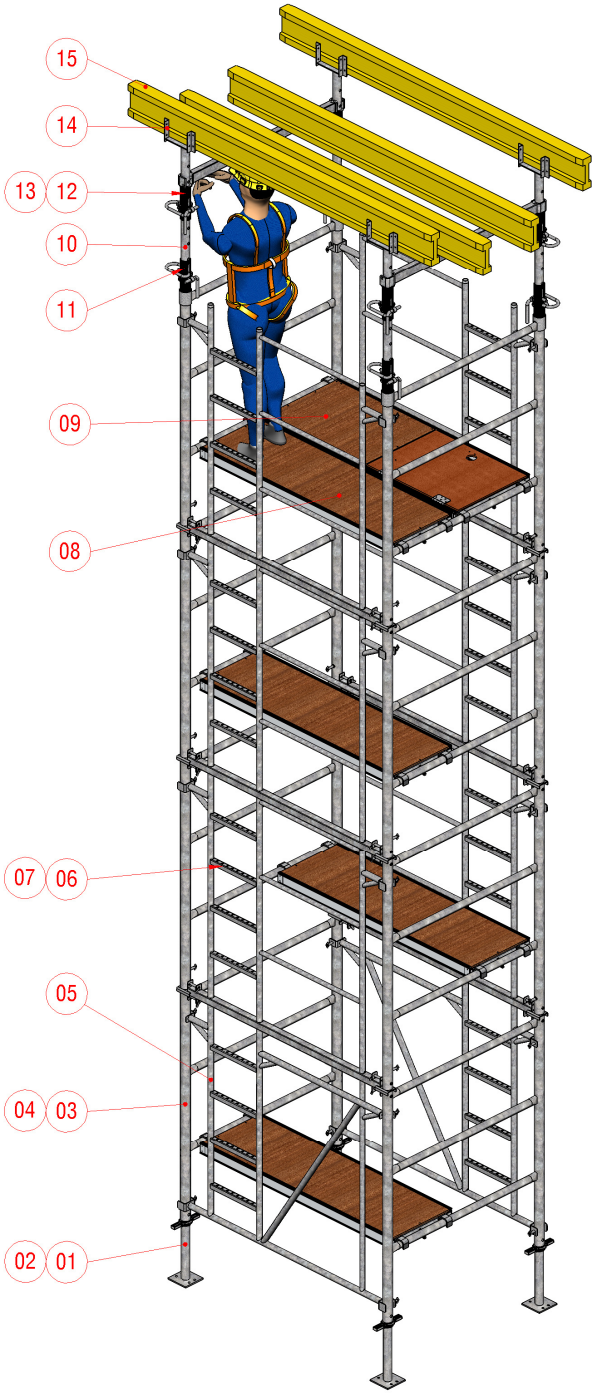
The design of the shoring system as well as the formwork support system needs to be done by a competent engineer, taking into account all the loads that need to be supported, the load bearing capacity of the several components and the assembled structure.

The erection and application instructions included in this manual are the recommended methods to be used for the original Bertour system. Therefore, and besides the relevant project drawings, the technical instructions need to be accurately followed to achieve the correct performance.

Any deviation from the recommended principles, shown in this manual, may require a separate verification by a competent engineer. The illustrations and pictures in this manual, however, are guidelines only. The erection and dismantling of the support system needs to be done by trained and skilled people. The Bertour system needs to be set up with original Bertpur components that are free from damages. Before starting to build a support system it is therefore necessary that all components are checked on good functionality. Damaged parts need to be immediately separated from good parts. Never use damaged parts into a supporting system.

2 Bertour components

Bertour provides a complete shoring solution with the following components:

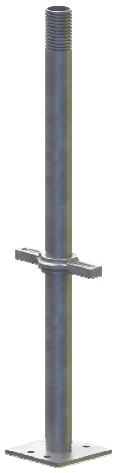


Pos. 01	Base Jack	2.1
Pos. 02	Base Plate(optional)	2.2
Pos. 03	Frame 1.50x1.20m	2.3
Pos. 04	Frame 0.925x1.20m (optional)	2.4
Pos. 05	Entrance Frame 1.50mx(1.60m)	2.5
Pos. 06	Ladder Frame 1.50mx(1.60m)	2.6
Pos. 07	Ladder Frame 0.925x(1.60m)	2.7
Pos. 08	Platform 0.48x(1.60m)	2.8
Pos. 09	Platform/lid 0.71x(1.60m)	2.9
Pos. 10	Innertube 1.658m	2.10
Pos. 11	Adaptor with pin	2.11
Pos. 12	Adaptor with pin (optional)	2.12
Pos. 13	Intermediate support (optional)	2.13
Pos. 14	4-Way Forkhead	2.14
Pos. 15	Alu/Timber/Steel beam (optional)	2.15

On the next pages, the various components are shown in detail.

Picture 2.1: Assembly of all Bertour components.

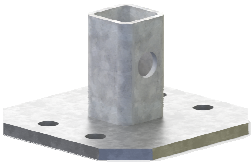
2.1 Base Jack



Product number	Description	Weight (kg)
E02SF0001	Base jack	5.5

The base jack is constructed from a base plate and the threaded tube, with a nut to be able to regulate the correct height and level the shoring system.

2.2 Base Plate



Product number	Description	Weight (kg)
E05SF0034	Base Plate	1.9

The base plate can be used if the underground is level enough and where there is no need for adjustment.

2.3 Bertour Frame 1.500m

Product number	Description	Weight (kg)
E05SF0009	Bertour Frame 1.50m	19.2

The basic component for the Bertour tower is the frame 1.500m. In the most simple version of the tower, the frames are interconnected with diagonals.

2.4 Bertour Frame 0.925m

Product number	Description	Weight (kg)
E05SF0008	Bertour Frame 0.925m	12.3

If the design height of the tower can't be reached properly by using frames E05SF0009 the frame 0.925 can be mounted as adjustment.

2.5 Entrance Frame 1.50m

Product number	Description	Weight (kg)
E05SF0073	Entrance Frame 1.50x1.60m	15.7

The bottom Frames are interconnected with two Entrance frames. The triangle shaped openings are big enough to enter the tower and to climb the ladder on the inside of the tower.

2.6 Ladder Frame 1.50m

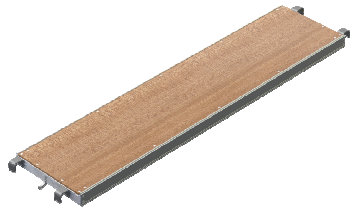
Product number	Description	Weight (kg)
E05SF0074	Ladder Frame 1.50x1.60m	20.1

The Ladder frame connects the frames above the bottom lift.

2.7 Ladder Frame 0.925m

Product number	Description	Weight (kg)
E05SF....	Ladder Frame 0.925x1.60m	

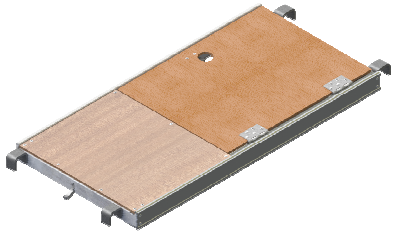
2.8 Platform



Product number	Description	Weight (kg)
E05SF0062	Platform 0.48×1.60m	12.6

Platforms are used to make a erection/dismantling work floors and final top work floor.

2.9 Platform with lid



Product number	Description	Weight (kg)
E05SF0059	Platform 0.71x1.60m	23.4

Climbing the ladder of the entrance/ladder frames, the work floor can be entered trough the lid.

2.10 Inner tube

2.11 Adaptor and pin

Product number	Description	Weight (kg)
E05SF0028	Innertube with adaptor and pin 1.170m	8.4
E05SF0036	Innertube with adaptor and pin 1.658m	10.2
E05SF0043	Innertube with adaptor and pin 1.798m	10.7
E05SF0045	Innertube with adaptor and pin 2.188m	12.2

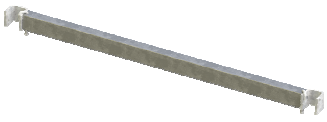
The Innertube is mounted on the frames. With the pin and the nut the height is stepless adjustable for the desired height. On top of the topplate a forkhead can be mounted.

2.12 Innertube with adaptor and pin and secondary adaptor and pin

Product number	Description	Weight (kg)
E05SF0046	Innertube with 2x adaptor and 2x pin 1.658m	11.9
E05SF0047	Innertube with 2x adaptor and 2x pin 1.798m	12.4
E05SF0048	Innertube with 2x adaptor and 2x pin 2.188m	13.9

As 2.11 with extra adaptor and pin to accommodate the intermediate support 2.13.

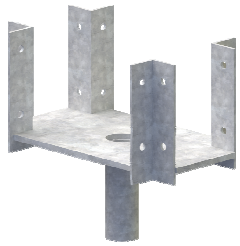
2.13 Intermediate support beam



Product number	Description	Weight (kg)
E05SF0044	Intermediate support 1.20m	6.7

Support for the concrete beam formwork in an integrated concrete floor/ beam formwork.

2.14 Forkhead



Product number	Description	Weight (kg)
E01AA0030	2-Way Forkhead	2.6

Mounted on the innertube the forkhead supports one or two timber, steel or aluminium beams.

2.15 Timber beam

Product number	Description	Weight (kg)
E05AA0005	H20 Timber beam 1.80m	9.2
E05AA0006	H20 Timber beam2.40m	12.6
E05AA0008	H20 Timber beam 3.60m	18.5
E05AA0011	H20 Timber beam 4.90m	25.5

On top of the forkhead the beam supports the form work.

2.16 Jack Lock

Product number	Description	Weight (kg)
E05SF0018	Jack Lock	0.4

The Jack Lock is used to fix the base jack to the tower. Especially useful when the tower must be hoisted and moved.

2.17 Diagonal

Product number	Description	Weight (kg)
E05ST0004	Diagonal 1.60x1.50m	5.0

The diagonal is used to built a most simple tower, or to make a 6 or more legged tower.

3 Bertour erection guide

3.1 General prior to erection

- The arrangement of the Bertour tower grid will be determined by the formwork design and will be shown on the design drawing. This drawing needs to be the base guideline of setting out the structure.

- The ground must be assessed and verified to ensure it is capable of carrying the loads to be transferred to it. The ground must also be checked prior to erection to ensure construction processes have not changed the conditions since the formwork design was done.

- Position and length of the base jacks to be defined during work preparation and detailed on project drawing.

- The precise grid arrangement is critical to the support of the loads, the design may not be deviated from except by written agreement with the formwork designer.

- The erection and dismantling of the support system may only be done by trained and skilled people.

- The Bertour system needs to be set up with components that are free from damages. Before starting the erection all components therefore need to be checked on good functionality.

IMPORTANT: Damaged parts may never be used into the supporting system.

3.2 Height of support structure

The height of the support structure is determined by the total number of frames (1.500m), and the length taken up by the base jack (0-500mm) at the bottom and the top jack or innertube (with forkhead and beams) located at the top of the structure (250-2000mm). Note that the loading capacity will increase if both base jack and topjack are spindled out to a minimum.

If both concrete beams and flour slab have to be poured in one run, the Innertube with two adaptors and intermediate support beam may be used.

The 0.925m Frame could be used to bring down the spindle length.

Note that the top Frame will always be a 1.500m frame to accommodate the Jack or Innertube.

The height of the tower can be made with various combinations of Frames and Jacks or Innertube.
Four types of towers can be erected (apart from the height):

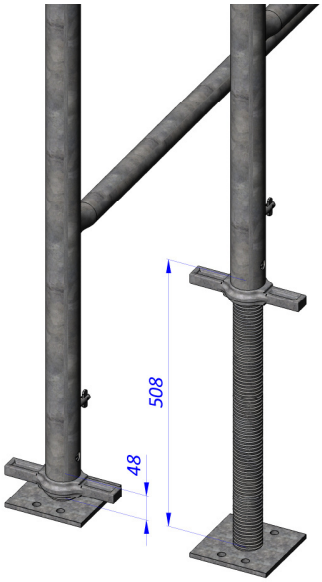
A Type A: baseplate at the bottom, innertube at the top.
B Type B: base jack at the bottom, innertube at the top.
C Type C: basejack at the bottom, basejack at the top.
D Type D: baseplate at the bottom, basejack at the top.

Picture 2.1 above is a type B support tower.

Note the towers can and should be interconnected with tube and couplers, according to the design and calculation of the Engineer.

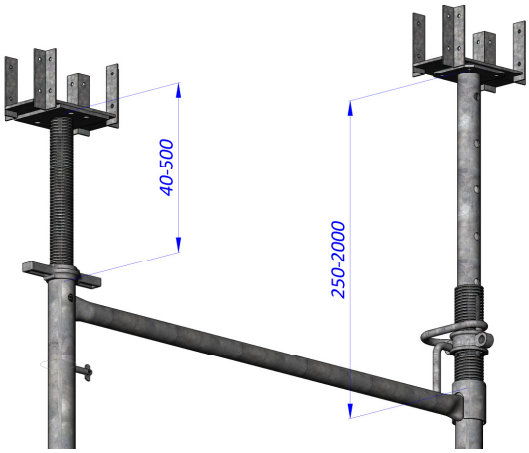
During erecting and dismantling the tower ladders should be climbed on the inside of the tower. The top platform must be complete, intermediate platforms may be half covering: distance should be 1.500m max. If the platforms are 2.000m apart they should be complete covering the inner space.

3.3 Base jack height adjustment



The adjustment of the base jack is between 40 and 660mm. However, it must be considered the maximum spindle distance between bottom plate and nut should be less than ca 500mm.

3.4 Top jack height adjustment



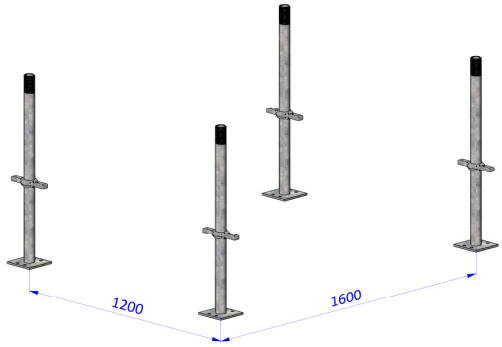
The adjustment of the top jack is also between 40 and 500mm. For the innertube the hole pattern will be the limitation factor. Note that the load capacity depends on the spindle height for jacks or extension height for innertubes.

3.5 Extra elements

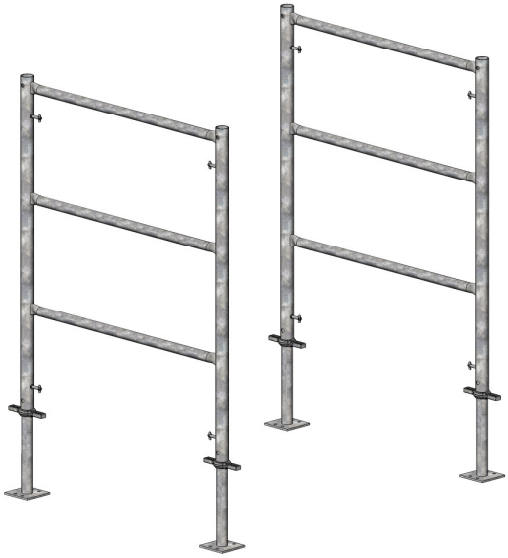
The secudairy adaptor can be adjusted independant from the standard adaptor, to be able to support two different levels. Particulary interesting when a concrete slab with integrated beams have to be supported.

4 Bertour erection sequence

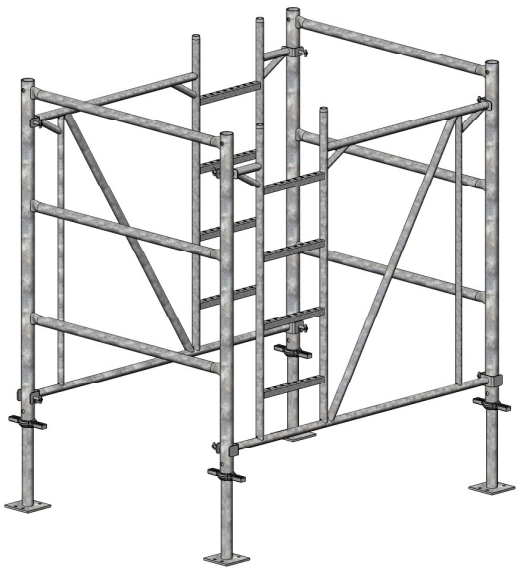
In this chapter the erection sequence is shown, based on a flat ground surface. Other kind of surfaces, slopes and obstacles may show up during assembly. Check with the Engineer and the drawings for the best solution.



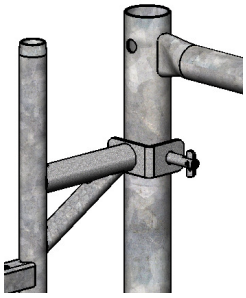
1 Set out according to the design drawing the Baseplates or Basejacks and set the Nut to the required height (not more then 500mm spindled out).



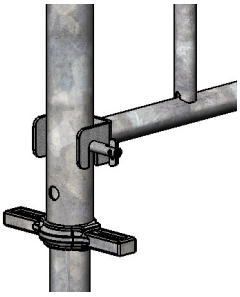
2 Mount two Frames 1.50m on the Basejacks. Check the level of both Frames and check whether the Frames are on the same height.



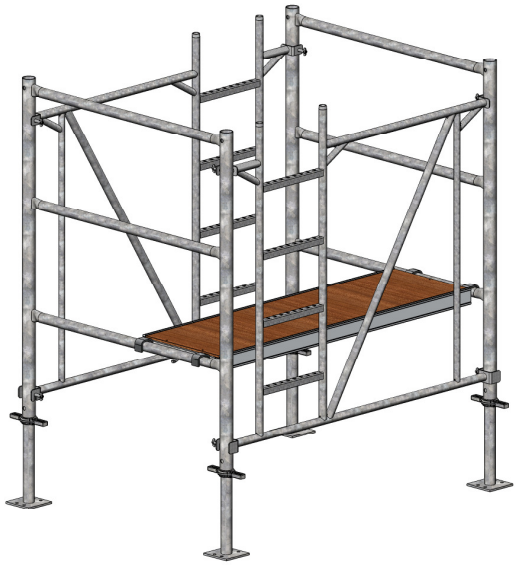
3 The Entranceframes can be mounted on the snap-locks of the Frames, by sliding the bottom bracket slotted hole over the bottom snap-lock and turning the top bracket over the top snap-lock. The tower will be stable now.



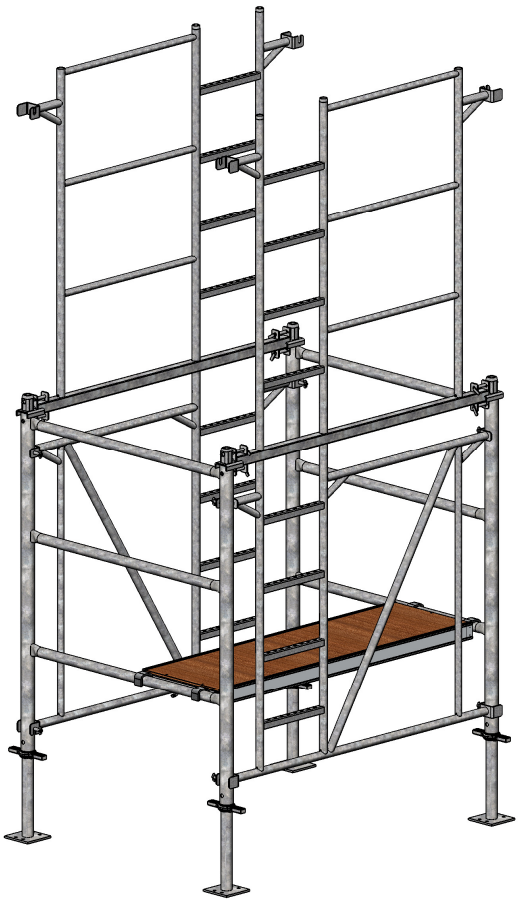
Detail Top



Detail Bottom



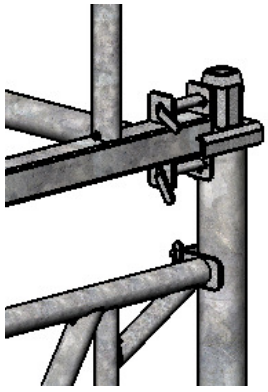
4 A Platform or Platform with lid may be mounted to ease erecting the next frames.



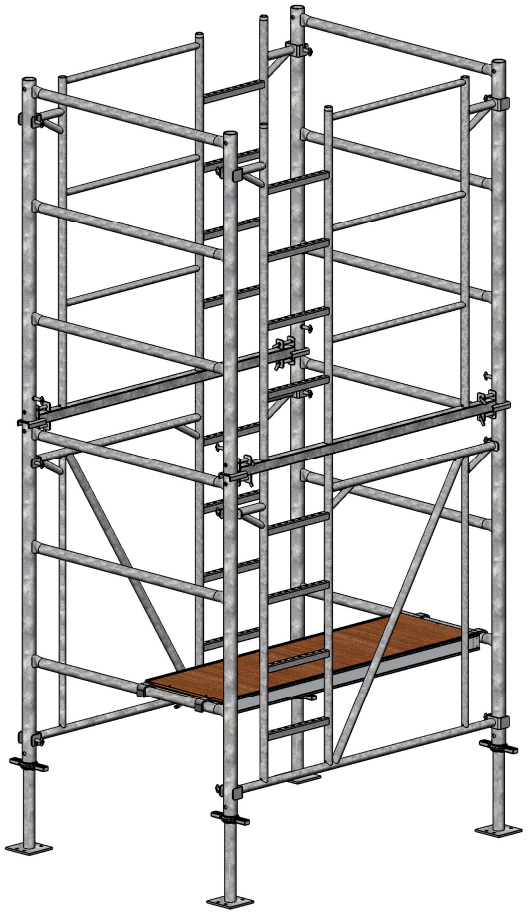
5 Two Ladderframes are mounted on top of the Frames underneath.

The ladder posts of the Entranceframe should line up with the ladder posts of the Ladderframes.

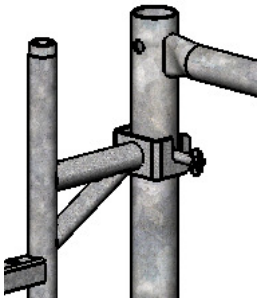
The lock pins must be set in position to lock Frames and Ladderframes. The superior lock pin must be set back to be able to mount the next Frames.



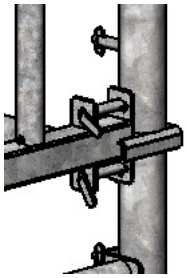
Detail Lock Pins



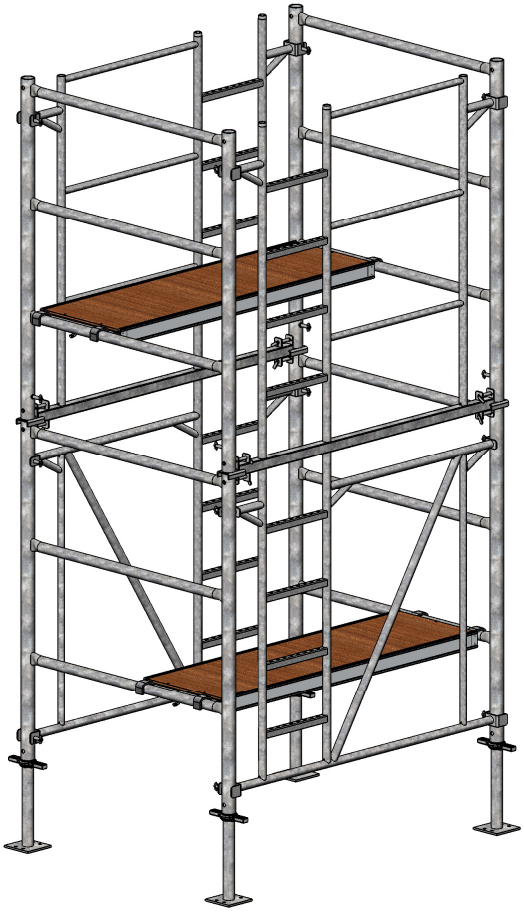
6 The next Frames can be mounted by sliding the snap-lock in the slotted hole of the top bracket and the frames verticals on the connector. The snap-locks at the top and the lock pins at the bottom will secure the Frames.



Detail Top

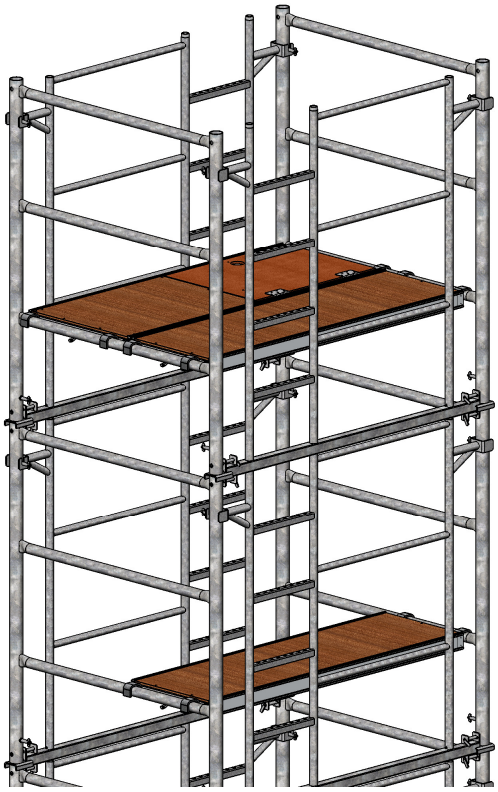


Detail Bottom



7 A Platform or Platform with lid is mounted to be able to build the next level.

Note that the guardrail of ca 1m above working level is always present building the tower in this way. The tower can be climbed easily and safely on the inside of the tower.



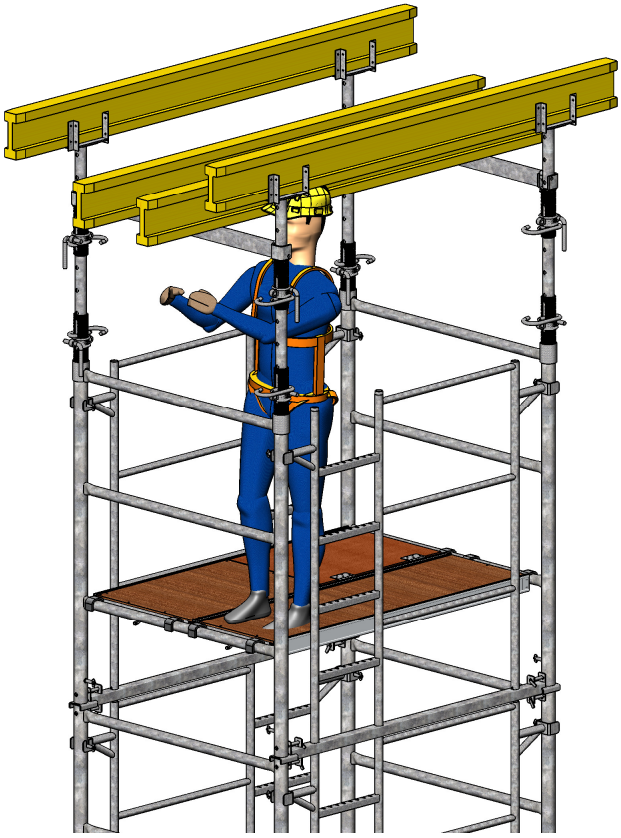
8 Repeating step 5-6-7 the tower can be erected to reach the top level.

Building in this way the tower will have every 1.5m a half covering worklevel.

Alternatively it is allowed to build the tower with full covering worklevels every 2.0m.

The top level (1m below the top of the frames must be covered completely to have a safe working space.

From this level the formwork support can be built: innertubes or jacks, forkheads and beams.

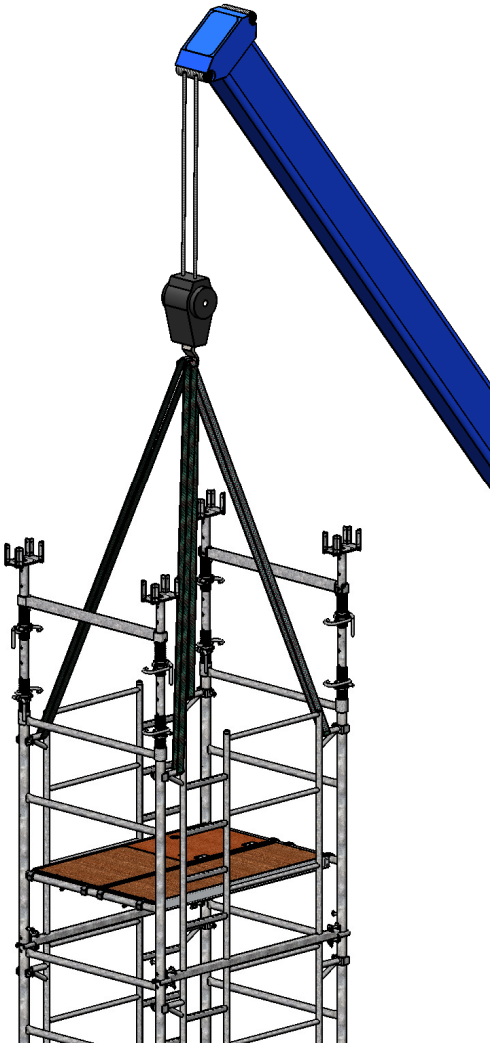


9 The finished support tower. Workmen can bring the beams, standing safe on the top platform, to the correct height.

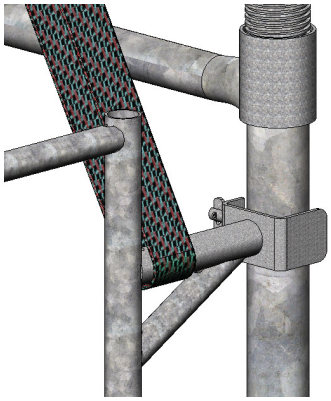
Workmen can climb the tower and enter the top platform through the platform lid safely.

Normally the formwork support consists of more than one tower. The towers should be interconnected with tubes and couplers according the design drawings.

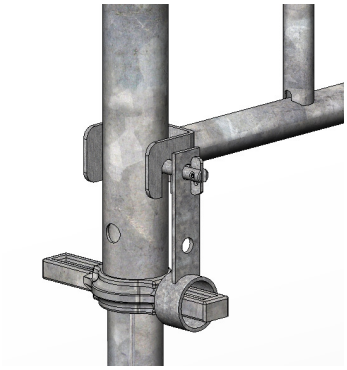
10 Dismantling the tower can be done in the opposite direction in the same safe way.



11 For hoisting and moving the tower four slings can be tied trough the tubes forming the bracket support.
The base jack can be secured with the Jack-lock.



Detail Hoist lug



Detail Jack-lock

5 Safety procedures for erection Bertour

Wearing an harness while working on a scaffold or formwork support is mandatory. The erecting and dismantling personnel on a Bertour tower support are working within the tower and as explained in the erecting sequence have always a guardrail ca 1.0m above the workfloor for protection. Therefore it is not mandatory to wear the harnass attached to the structure with a lanyard while erecting or dismantling the Bertour Tower. It is recomended however to do so working on the formwork support at the top platform.

The way the tower is set up, with Frames 1.50m of height, it is sensible and allowed to half cover every 1.5m lift alternating left and right. In this way there will always be a guardrail ca 1.0m above platform level.
When fully covering every 2.0m lift it will be necessary to rearrange the platforms during erecting and dismantling the tower to keep the 1.0m advanced guardrail effective.

6 Bertour dismantling

After the concrete has hardened, the supporting system can be released by lowering the adjustable jacks or the nuts on the innertube adaptor on the top of the shoring system.

Dismantling the support structure needs to be done in the opposite order of erection. Starting with dismantling the formwork, then the top jacks or innertubes with forkheads, the top platform, Frames and Ladderframes, going down until finally the adjustable bases. Always dismantle in levels starting at the top, never start removing material from bottom.

Take measures to ensure the stability during dismantling of the support structure.

Components must be passed down from hand to hand or by hoisting and not dropped or thrown down onto the ground as this practice can cause injury to personnel and damage to the components.

For advice on other dismantling methods, please check your supplier.

During erection as well as during dismantling, the personnel need to be sure they do their job safely by using safety harnesses and creating safe working floors at every lift.

7 Bracing and Anchoring

The Bertour Tower is adequately braced in itself, building the tower according to this manual. However, to prevent buckling of the tower as a unit, and taking into account a shoring system is mostly built with several towers, the towers should be interconnected and anchored to stable structures.

In general this horizontal bracing should be done every 4m, alternating direction.

Exact position and number of braces must be verified by strength calculation.

Picture below presents a sample solution.

IMPORTANT: In case adverse weather conditions are forecasted the anchor system may be partially increased or reinforced.

8 Safe working loads

The load carrying capacity of any support structure is dependent upon several influencing factors which need to be taken into account.

Every Bertour support structure must be designed to meet these prevailing site conditions:

- Slab weight and live load
- Spacing between and size of the support towers
- Height from ground to formwork level
- Required jack and innertube extension
- Ground conditions

The load carrying capacity of the Bertour support system, assembled according to the guidelines in this manual, can be found in table below.

Tower Type	Safe Working Load [kN]*	Height [m]**
A Base plate/Innertube	40	6
B Base jack/Innertube	40	6
C Base jack/Top jack	60	6
D Base plate/Top jack	60	6

* Safety factor 1,65, load per leg
** Height between ground and top formwork

Please contact your Engineer or supplier for other configurations.

The loading capacity is also based on a maximum eccentricity (E) of the loads on the forkheads. The eccentricity is the distance between the primary beam axis and the forkhead axis. These axis ideally should be coincidence but in any case the E must not exceed of 5mm.

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