



# User Information Single-Sided Wall Formwork System SW400 ,SW300

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### **1 - Safety Introduction**

When using the system presented in this manual, requirements of the Safety at Work Ordinance and its regulations should be fulfilled, with emphasis on the Safety at Work Regulations (Construction Work) 1988, as well as requirements of the Israeli Standards with emphasis on SI 904, the general specification, and the S.B.A. Metal Works Ltd. Safety Manual that constitute an integral part of this manual.

The site manager / construction foreman (hereinafter: "the Customer") make sure that all information material provided by S.B.A. Group, including manufacturer's instructions, safety manual, up-to-date drawings, etc. are in their designated places, accessible, and up-to-date.

This manual provides guidelines and rules for maintaining appropriate safety and hygiene conditions to protect the workers at the work sites. Project managers and/or foremen will be in charge of complying with these rules.

This manual shall not be considered as a substitute for a risk assessment of the work site, since the obligation of planning, applying, and updating the risk assessment rests on the customer only.

#### Work Environment

- The Customer is obligated to arrange a safe work environment, including safe approach routes to and from formwork and system components.
- The Customer shall take into account weather conditions, as well as the physical and mental capacity of the workers in the vicinity of the equipment, and the latter's use and storage.
- Sources of fire and devices emitting intense heat should be kept away from formwork and syste components.

#### Use of Equipment

- The Customer will be in charge of arranging an S.B.A. Group Site Instructor visit to give instruction before commencement of work with the system.
- The system/equipment shall be assembled in accordance with and subject to all applicable laws, standards and rules, by people trained in working with it, as described in this manual.
- The Customer will be in charge of visually inspecting the equipment before using it, to make sure it is serviceable. It is forbidden to use any component that is damaged, distorted, or cracked.
- It is forbidden to change or correct any S.B.A. plans and/or drawings and/or products. Changes or corrections shall be made by S.B.A. Group only, or an agent authorized by it. Any change and/or repair not authorized by S.B.A. Group constitutes a safety risk.
- Do not integrate S.B.A. systems with those of other manufacturers, without prior written approval by S.B.A. Group such combinations could constitute safety risks.
- Throughout all stages of work with the system, stability of the system must be monitored and maintained. Make sure there are no deviations from the maximum permitted loads applied to the equipment/system, as noted in this manual and/or S.B.A. working drawings.
- It is absolutely forbidden to weld S.B.A. products.
- Before stepping onto the system's work platforms, make sure they are properly installed, in such a way that prevents them from collapse, full or partial fracture, or a person or object from falling from them
- The foreman shall check all parts of the formwork including the scaffold prior to casting, pursuant to regulations 84(a), 20 in the Safety at Work Regulations (Construction Works) 1988 and Israeli Standard 904 and, in addition, record this in the construction site general book.
- To avoid any risk of overload and system failure, the casting rate noted in this manual should not be exceeded.
- · Formwork shall be dismantled only after the concrete has hardened to a sufficient degree of strength, and under supervision of the constructor, structural designer.
- When dismantling the system, use the proper tools for this purpose.
- Stability of the system should be maintained while being dismantled.

#### Maintenance

- Before each casting, clean the formwork of any concrete, and spread formwork oil on the surfaces.
- Use only original S.B.A. parts as spare parts in the system. Repairs to the system shall be done by S.B.A. Group only.

#### General Comments

- The manual may be used for generic application or to accompany specific planning on site. Do not deviate from the instructions of this manual and/or any application not included in the applications described in this manual, unless written approval has been given by a certified authority in S.B.A. Group.
- The illustrations that appear in this manual are for demonstration purposes only, and do not necessarily include all safety measures. In light of the above, as needed and pursuant to the rules and regulations, appropriate safety accessories should be used.
- The weights shown in this manual are average values for new equipment however, actual weights may be different due to material tolerances, dirt, dampness, etc. In addition, S.B.A. Group reserves the right to make technical changes to its products.
- These guidelines were written by S.B.A., pursuant to the safety laws, regulations, provisions, procedures, and arrangements. This manual contains an assemblage of instructions for working with the system. In any case of contradiction between the instructions of this manual and provisions of the Ministry of Labor, laws, and regulations, regulatory provisions shall prevail.
- All reasonable stresses and measurements have been taken into account in order to ensure the accuracy of the information appearing in this manual. Nevertheless, S.B.A. cannot be held liable for errors or inaccuracy, and therefore reserves the right to make changes from time to time without prior notice to the manual and its characteristics.
- S.B.A. does not assume liability for any losses or damage of any kind, owing to the use of this manual or any of the characteristics associated with it.
- · This manual was checked and approved by Safety Consultant Ilan Carmon.

Symbols in the manual:

Warning of an action that could cause injury

Technical limitation of the equipment that should not be deviated from





### 2 - Loading, Transport, Unloading and Storage

Ensure compliance with all laws and regulations that apply to loading, unloading and working with formwork and scaffolding.

For loading or unloading system components / formwork and/or packagings, customers shall use lifting accessories inspected as required by law.

Shipping and handling of the formwork and packagings (customer's responsibility) shall be performed by certified/ licensed crane, lifting equipment and forklift operators using tested and serviceable lifting and transport equipment as required by law, pursuant to the requirements of regulation 96 - Formwork Suspension Devices - Safety at Work Regulations (Construction Work) 1988.

### Loading the System

- Make sure truck is suitable for the loaded equipment, as far as dimensions, payload capacity, anchor points and securing/fastening accessories are concerned.
- Formwork should be placed from the front of the truck on planks to prevent slipping, in stacks of up to 16 sections, aligned and sorted according to width.
- To prevent slipping, it is recommended to place four plastic spacers between every two formworks.
- Each pile of formwork shall be fastened with at least two metal strap.



#### Loading of Accessories

- System accessories should be placed inside designated accessories cases.
- Cases should be fastened to the truck with standard fastening straps, to prevent sliding.
- · Oil barrels should be placed on wood pallets, in vertical position only. It is forbidden to stack oil barrels.

#### Transport

- Make sure the truck's cargo is properly loaded and fastened, to prevent it from moving during transport...
- · Make sure height and weight of cargo comply with regulation 85 of the Transportation Regulations 1961.

Overall truck weight (kg)	Maximum height from road surface (meter)
Up to 1500	2.5
Up to 3500	3.0
Up to 8000	3.5
Over 8000	4.0

For out of gauge (OOG) cargo, follow the guidelines set forth in the regulation.

#### Unloading Cargo

- The user shall verify the amount of goods he can receive, as well as the place and means of unloading.
- Before unloading the formwork and accessories, check for any loose or freed components.
- Panels and accessories should be unloaded onto a compacted leveled surface, suitable for unloading.

### Storage

- Formwork and system components should be stored on a compacted and leveled surface.
- Accessories should be stored in designated cases, formwork should be laid horizontally with four plastic spacers between every two formworks, to prevent sliding.
- · Formwork and system accessories should not be stored near sources of fire.
- Keep approach routes to the storage area safe and easily accessible.



### 3 - S.S.W. System SW300, SW400

The system consists of formwork, beams, diagonal supports, and anchoring elements.

The system is simple, easy to use, and enable quick assembly and disassembly. The system is suitable for various formwork systems up to 4 m height.



SW400

SW300

### 3.1 - S.S.W. Supporting System



SW300

- 1. Multipurpose Steel Beam 180 L=2980mm
- 2. Multipurpose Steel Beam 180 L=3980mm
- 3. Spindle Strut L=2.48m
- 4. Spindle Strut L=3.6m
- 5. Lower Strut L=1.5m
- 6. Spindle Strut Multipurpose Beam Connector
- 7. Base Connector
- 8. Front Floor Connector 3 m





SW400

- 9. Front Floor Connector 4 m
- 10. Rear Floor Connector 3 m
- 11. Rear Floor Connector 4 m
- 12. Steel Waling L=0.5m
- 13. Nut 120S
- 14. Tie Rod 15/17 L=0.5m
- 15. Pouring Bracket
- 16. Tube and Bolt 3/4" for Lifting Hook

### 3.1.1 - Assembling the Support System

Assembly of the support system is presented in its most common configuration, connected to horizontal Rummy formwork up to 3 meter.

The method of connecting the support system to vertical Rummy formwork or to other systems is described in section 3.2 - Connecting the Support System to various Formwork Systems.

### System Assembly Stages

- The panel (several formworks connected together) should be assembled with Clamp K10 on a leveled surface such as S.B.A. H20 Beams (Item A).
- Connect every two Multipurpose Steel Beams (Item B) to each other with two tubes between them, to keep the distance according to the assembly drawing.
- Place the Multipurpose Steel Beams on the panel while maintaining a 2 cm gap from the bottom of the panel (Item C).
- · Connect and fasten the Multipurpose Steel Beams to the panel with connection accessories according to the formwork system in use (Item D).
- · Place the Multipurpose Steel Beams as follows: one in the center of the panel and two more at a distance of approximately 1 m on each side.



\*See section 3.2 - Connecting the Support System to various Formwork Systems.

· Connect the Multipurpose Steel Beam to the Base Connector (Item E) and the Spindle Strut Multipurpose Beam Connector (Item F) using 3/4" bolts, and suitable nuts and washers.



• Connect the Lower Strut (Item G), with the Swivel Coupler seat facing the upper part of the formwork and the Spindle Strut (Item H) to the system with Pin Ø20mm secured with Pin R. Then, similarly, connect the Rear Floor Connector (Item I) to the Lower and Spindle Strut.





• Connect Steel Tube 1 1/4" (Item O) to the Base Connectors with Swivel Coupler (Item P).



• Connect the Pouring Bracket (Item Q) to the Multipurpose Steel Beams with 3/4" bolts, and suitable washers and nuts.



### 3.1.2 - Lifting the S.S.W. Formwork System

- A Tube 3/4" t=2.2 L= 60mm"
- B Bolt 3/4" L=100mm
- **C** Nut 3/4"



The lifting hook of the crane should be connected ONLY to the designated lifting tube  $\triangle$ on the multipurpose steel beam!

- Lift only one panel with the support system at a time.
- The panel shall have a maximum width of 4m and maximum height of 4m, for all types of formwork.







The maximum permitted load for the lifting hook is 1,000 kg. Lifting of panels / formwork shall be done using a two-legged sling, with the angle between the hoist chain and panel no less than 60 degrees, pursuant to the Work Safety Ordinance 1970.

### 3.1.3 - Anchoring the S.S.W. System

The system should be anchored to a leveled concrete floor, of sufficient thickness to enable firm safe anchoring of the S.S.W. system, according to the screw anchor size and anchoring forces, as detailed in section 5.1 - Anchoring Bolt for S.S.W.. Concrete pressure applied to the system is transferred to the concrete floor through the system components.

Anchoring the system to a concrete floor can be done in two different ways:

- Vertical anchoring of the Front Floor Connector.
- Angular anchoring with a stop anchor / curved anchor.

### **Vertical Anchoring**

Before placing the single-sided wall to be cast and connected to the Front Floor Connectors, the Front Floor Connector should be anchored to the ground according to the location of the support systems in the single-sided wall.

Anchoring the Front Floor Connector to the concrete surface with reusable anchoring bolts (HILTI HUS3-H M14/115 or equivalent product).

- A Front Floor Connector
- **B** Anchoring Bolt
- C Tie Rod 15/17 L=0.5m
- D Steel Waling L=0.5m
- E Nut 120S



Anchoring of Front Floor Connector 3 m (SW300) shall be done with 8 anchoring bolts for each base

Anchoring of Front Floor Connector 4 m (SW400) shall be done with 12 anchoring bolts for each base





#### Angular Anchoring

Angular anchoring is performed by precasting the anchors in the concrete surface.

#### **Angular Anchoring - Stop Anchor**

- A Anchring Bolt with Stop Plate
- B Water Barrier
- **C** Tie Rod 15/17 L=0.5m
- D Steel Waling L=0.5m
- E Nut 120S



### Angular Anchoring - Curved Anchor

The Curved Anchoring Bolt should be cast to a depth of approximately 1/2 m into the concrete surface.

- F Curved Anchoring Bolt
- B Water Barrier



50cm







### **Rear Vertical Anchoring**

Anchoring of the Rear Floor Connector shall be done in cases where the strut cannot be connected with the Lower Strut (for example, when casting a corner – section 4.1.2).

- A Rear Floor Connector (6046000)
- **B** Anchoring Bolt
- C Spindle Strut
- D Pin Ø20mm
- E Pin R



#### Anchoring of Rear Floor Connector 3 m (SW300)

Anchoring of Rear Floor Connector 4 m (SW400)





### 3.1.4 - Connecting the Pouring Bracket

The easily assembled Pouring Bracket enables safe and easy casting.

### Locking the Pouring Bracket's End Rail

The End Rail Post is connected to the Pouring Bracket with Pin Ø14mm and secured with Pin R.



### Connecting the Pouring Bracket to the S.S.W. system

The Pouring Bracket is connected to the holes on the system's Multipurpose Steel Beam with 3/4" bolts, washers and nuts.

- A Pouring Bracket
- E Multipurpose Steel Beam
- F Bolt 3/4" L=40mm
- G Galvanized Washer 3/4"
- H Nut 3/4"
- I Wooden Beams 5x20 cmp
- J Front End Rail Post
- K Front Platform End Rail Connector





Loading equipment on the platform is strictly forbidden. If needed, and according to standard requirements, a front handrail and handrail at the free end shall be installed.















Maximum permitted load 150 kg/m<sup>2</sup>. Maximum distance between two brackets: 2.25 m.

### 3.2 - Connecting the Support System to various Formwork Systems 3.2.1 - Connecting to Rummy Formwork

The connection to Rummy Formwork can be done in two ways:

### A. Vertical Rummy Formworks

The connection between the vertical Rummy Formworks and the Multipurpose Steel Beams is performed with a Fixing Bolt T35 and tightened with a 120S Nut.

A S.S.W. Supporting System shall be connected to each formwork.

### A - Fixing Bolt T35

**B** - Nut 120S





### **B. Horizontal Rummy Formworks**

The connection between the horizontal Rummy Formworks and the Multipurpose Steel Beams is performed with a Single Sided Gripper and tightened with the Nut on the gripper edge.

Place the Multipurpose Steel Beams as follows: one in the center of the panel and two more at a distance of approximately 1 m on each side.



### 3.2.2 - Connecting to Rummy Max Formwork

The connection between the Rummy Max Formworks and the Multipurpose Steel Beams is performed with a Fixing Bolt T35 and tightened with a 120S Nut. Place the Multipurpose Steel Beams as follows: one in the center of the panel and two more at a distance of

Place the Multipurpose Steel Beams as follows: one in th approximately 1 m on each side.

A - Fixing Bolt T35

B - Nut 120S





### 3.2.3 - Connecting to Eitan Formwork

The connection between the Eitan Formworks and the Multipurpose Steel Beams Shall be done with a Tie Rod L=0.5m and tightened with a Nut 120S from both sides of the Multipurpose Steel Beam. Place the Multipurpose Steel Beams as follows: one in the center of the panel and two more at a distance of approximately 1 m on each side.

C - Tie Rod 15/17 L=0.5m

B - Nut 120S











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### 3.2.4 - Connecting to Maze Formwork

The connection between the Maze Formworks and the Multipurpose Steel Beams Shall be done with a Tie Rod L=0.5m and tightened with a Nut 120S from both sides of the Multipurpose Steel Beam.

Place the Multipurpose Steel Beams as follows: one in the center of the panel and two more at a distance of approximately 1 m on each side.

#### **A** - Tie Rod 15/17 L=0.5m

**B** - Nut 120S



### 4 - System Applications

Casting S.S.W.









### 4.1 - Casting S.S.W.

In order to demonstrate the system's applications, a S.S.W. assembled with Rummy formwork is presented.

### 4.1.1 - Straight Wall

Horizontal formwork – formworks can be connected one on top of the other in order to reach the desired height. The panels shall be connected with the Rummy Standard clamp K10.

- A Staight Wall Panel
- B Rummy Standard Clamp K10





### 4.1.2 - Corners

Connecting a S.S.W. System to a Rummy Inside Corner from both sides with K10 clamps.

- A S.S.W. System
- B Rummy Standard Clamp K10
- C Rummy Inside Corner





In cases where the Spindle Strut cannot be connected with the Lower Strut, the Rear Floor Connector of the strut should be anchored using a Rear Floor Connector with 4 holes.





### Casting a corner connecting to a two-sided wall

Casting a single-sided wall and two-sided wall in one stage is done by connecting the Inside Corner formwork on one side of the S.S.W. system and on the other side to straight formworks with clamps K10.

- A Rummy Standard Clamp K10
- **B** Tie Rod 15/17
- **C** Nut 120S



### 4.1.3 - Wall Offset

Change of wall thickness up to 10 cm - using wooden supports.

#### D - Wooden Beam

- E Fixing Bolt C25
- **C** Nut 120S



#### To fix the profile, a Fixing Bolt C25 may be use

The bolt is connected to the Rummy formwork at the designated slot in the formwork profile and fastened with nut 120S.

### 4.1.4 - Wall Stop-End

Solution for casting wall stop-end with wooden board and beams

**F** - Wooden Board and Beams



### 4.2 - Casting Circular S.S.W.

### A. Casting S.S.W. with Vertical Formworks

Casting a circular wall with vertical formworks and trapezoid wooden elements and S.S.W. system suited to all types of modular formworks.

- A S.S.W. System
- B Trapezoid Wooden Elements
- C Rummy Standard Clamp K10







### Casting S.S.W. with Horizontal Formworks

Casting a circular wall with horizontal formworks and trapezoid wooden elements, use of machined wooden slabs and plywood to acheive the desired curve.

- A S.S.W. System
- B Trapezoid Wooden Elements
- C Rummy Standard Clamp K10
- D Curved Plywood





### **5** - Technical Information

### 5.1 - Anchoring Bolt for S.S.W.

Anchoring bolts data are calculated under the limitation of the system's permitted concrete pressure and casting rate, presented in section 5.2 - S.S.W. Casting Rate.

The system can be anchored with anchoring bolts such as HILTI HUS3-H M14\115 or an alternative compatible with the data detailed in the table below.



System Type	Concrete Pressure (kN\m²)	Number of Bolts	Casting Height (m)	Tensile Force on Bolt (kN) N	Shear Force on Bolt (kN) V
			2	2.5	6.87
SW300	00 50	8	2.5	4.93	10.3
			3	8.25	13.75
			3	5.14	8.06
SW400	40 12	12	3.5	7.63	9.9
			4	10.6	11.7

### 5.2 - S.S.W. Casting Rate

During the concrete casting process, a horizontal load is applied to the S.S.W. system, due to the pressure of the fresh concrete.

Several factors affect the amount of concrete pressure applied to the system: type and composition of concrete, height of casting, temperature of fresh concrete, vibration, and rate of casting. The permitted concrete pressure for the SW300 S.S.W. system for casting walls up to 3 m is 50 kN/m<sup>2</sup>. The permitted concrete pressure for the SW400 S.S.W. system for casting walls up to 4 m is 40 kN/m<sup>2</sup>. The concrete casting rate should be matched to the type of system, with consideration for the other factors mentioned above.

Calculation of the casting rate according to Standard SI 904 of the Standards Institution of Israel.

 $P[kN/m^2]$  – Fresh concrete pressure R[m/h] – Concrete puring rate

 $T[^{\circ}C]$  – Concrete temperture

C<sub>w</sub> – Concrete specific gravity coefficient

C<sub>c</sub> – Cement type coefficient

 $W_f [kN/m^3]$  – Specific gravity for fresh concrete

#### Concrete specific gravity coefficient Cw calculation table

Wf [kN/m³]	Cw
Less than - 23.4	0.5[Wf/23.8+1], No less than - 0.8
23.4 - 24.2	1.0
Greater than - 24.2	Wf / 23.8

Calculation Example:

 $P_{max} = 40 [kN/r]$ 

$$R_{max} = \frac{(20 + 1)}{2}$$

· Permitted casting rate vs temperature and cement type (Cc)



\* The calculation presented is merely theoretical, and does not take into account additional parameters such as side load and correction factors that appear in the standard. For calculation in real cases, the standard should be followed.



$$P = C_w C_c \left( 7.5 + \frac{800 R}{T + 18} \right)$$
$$R_{max} = \frac{(T + 18) \left( \frac{P_{max}}{C_w C_c} - 7.5 \right)}{800}$$

#### Cement type coefficient Cc calculation table

Inhibitors and Cement Type	Cc
CEM I, CEM II	1.2
Inhibitors used in large quantity	1.4
For any other cement type	1.4

$$n^{2}$$
];  $T = 20 [^{\circ}C]$ ;  $C_{w} = 1.0$ ;  $C_{c} = 1.2$   
 $3) \left(\frac{40}{1 \cdot 1.2} - 7.5\right) = 1.2 [m/h]$ 

## 6 - List of Items

Description and Dimensions	Weight (kg)	Cat. No.		Description and Dimensions	Weight (kg
Pouring Bracket	12	96100140	lin .	Multipurpose Steel Beam 180 L=2980mm	28.0
				Multipurpose Steel Beam 180 L=3980mm	37.0
Front Floor Connector 3 m	12.6	6046005		Spindle Strut L=2.48m	14.0
				Spindle Strut L=3.6m	20.3
Front Floor Connector 4 m	22.4	6046012		Lower Strut L=1.5m	8.6
Rear Floor Connector 3 m	4.2	6046007		Tube 3/4" t=2.2 L= 60mm	0.1
			00		
Rear Floor Connector 4 m	6.8	6046013		Steel Waling L=0.5m	13.8
			000		
Rear Floor Connector 4 Holes	6.8	6046000		Single Sided Gripper	3.0
Base Connector	14.4	6046003		Nut 120S	1.1
Spindle Strut Multipurpose Beam Connector	5.9	6046001		Nut 70S	0.4





Description and Dimensions	Weight (kg)	Cat. No.	
Rummy Standard Clamp K10	4	5900105	
Rummy Max Standard Clamp K60	4.2	6100200	
Fixing Bolt T25	0.5	5900190	
Fixing Bolt T35	0.8	5900191	() and a second second second
Fixing Bolt C25	0.5	5900192	
Pouring Bracket Shifting Connector	2.5	96100145	
Tie Rod 15/17 L=0.5m	0.7	96200180-1	
			and a second sec
Steel Tube 1¼" L=1 m	2.5	5541000	
Steel Tube 1¼" L=1.5 m	3.8	5541500	
Steel Tube 1¼" L=2 m	5.0	5542000	
Steel Tube 1¼" L=2.5 m	6.3	5542500	
Steel Tube 1¼" L=3 m	7.5	5543000	0
Steel Tube 11/4" L=3.5 m	8.8	5543500	
Steel Tube 1¼" L=4 m	10.0	5544000	
Swivel Coupler	0.6	96500211	ß

Description and Dimensions	Weight (kg)	Cat. No.	
Pin Ø20 mm	0.32	91300140	
			0
Pin Ø14 mm	0.15	91300050	
			0
Pin R	0.01	91300010	
Plastic Cone 1"	0.04	90100090	
Plastic Cone 1¼"	0.05	90100095	
Formwork Plug 22 mm	0.05	90100100	
Water Barrier	0.4	96000070	
			a series and a series of the s
Accessories Case	130	96001000	<b>A</b>
Oil Drum	200	99100300	









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