

RSTEEL[®]



RSK-E Wall Shoe

Technical manual

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Index

1. DESCRIPTION OF THE SYSTEM.....	3
2. MATERIALS AND DIMENSIONS	4
3. MANUFACTURING AND TOLERANCES.....	6
3.1. Manufacturing method.....	6
3.2. Manufacturing tolerances	6
3.3. Quality control.....	6
3.4. Markings.....	6
4. RESISTANCES.....	7
5. USER INSTRUCTIONS	7
5.1. Limits of Use.....	7
5.2. Design Guidance.....	8
5.3. Reinforcement instructions.....	9
6. INSTALLATION	16
6.1. Inspection instructions for installation of the base bolts.....	17
6.2. Inspection instructions for installation of the column	17
TECHNICAL MANUAL REVISIONS.....	18
SUPPORT MATERIAL.....	20

1. DESCRIPTION OF THE SYSTEM

RSK-E wall shoes are fastening components that are used with RPP-E base bolts to create tension resisting connections across joints between two precast wall elements or between precast wall element and a cast-in-situ structure. Compression stresses are transferred directly across the grout filled joint. Shear stresses along the joint are transferred by friction or by additional installed shear studs for this purpose.

Tension stresses developed at the joint are transferred within the wall, via reinforcement, to the next wall joint above and below. The RSK-E wall shoes are designed with matching design tension resistance of the associated RPP-E base bolts.

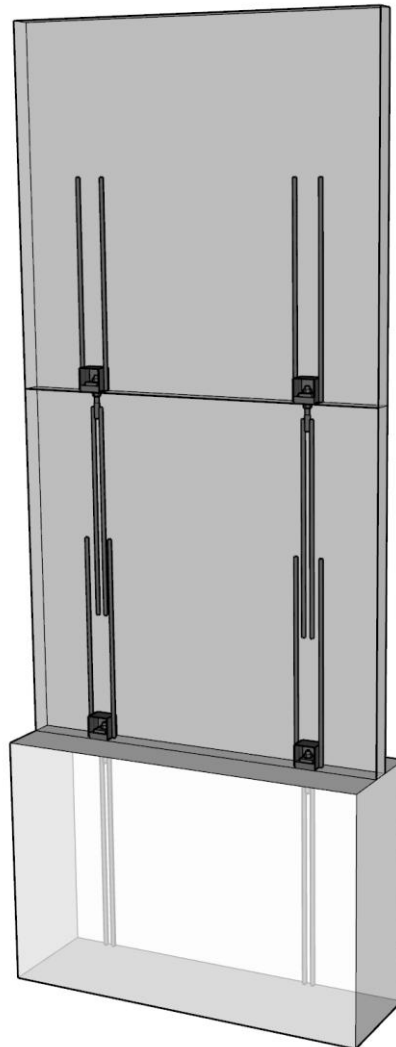


Figure 1. Example of using wall shoes

2. MATERIALS AND DIMENSIONS

Table 1. Materials and standards of RSK-E wall shoe

Part	Material	Standard
Plates	S355J2	EN 10025
	S355J2+N	EN 10025
Rebars	B500B	EN 10080 (SFS 1268)

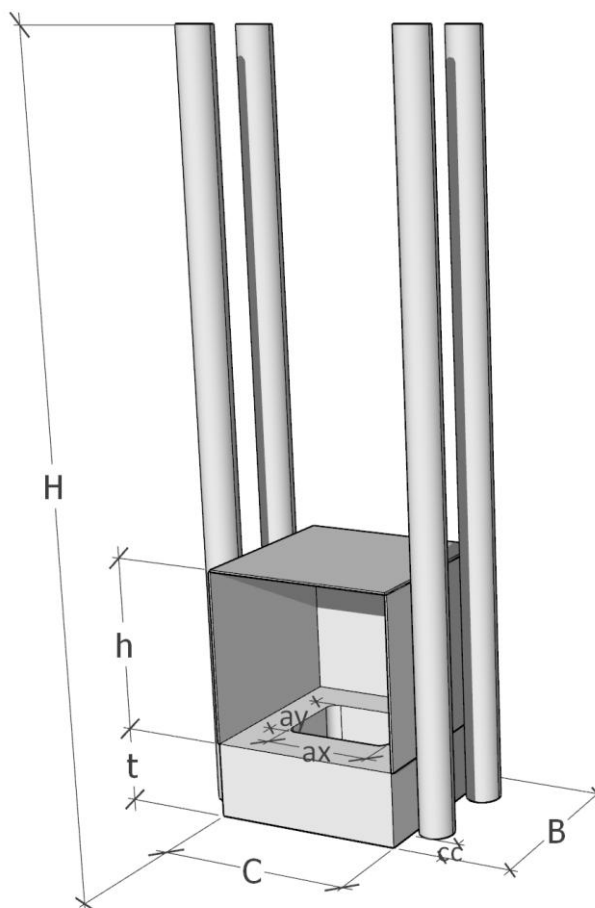


Figure 2. RSK-E type wall shoe

Table 2. Dimensions of RSK-E wall shoe

Type	Size	B [mm]	C [mm]	n×Ø [mm]	H [mm]	h [mm]	t [mm]	ax [mm]	ay [mm]	Weight [kg]	Color
RSK-E	M30	130	145	2×Ø25	1460	120	45	90	55	20.3	Black
	M36	150	164	2×Ø32	1765	140	55	96	61	37.1	Red
	M39	150	165	4×Ø25	1650	147	60	99	64	38.3	Brown
	M45	175	180	4×Ø32	2015	162	70	105	75	69.6	Purple
	M52	230	210	4×Ø32	2215	185	80	112	82	89.6	White

Note: n – the number of side bar, Ø is diameter of side bar.

Table 3. Wall shoe non-centric washer dimensions

Type	Size	e [mm]	c [mm]	D [mm]	t [mm]
RAL	N30	37.5	95	31	20
	N36	45.0	110	37	30
	N39	47.5	115	40	30
	N45	55.0	130	46	35
	N52	67.5	155	52	40

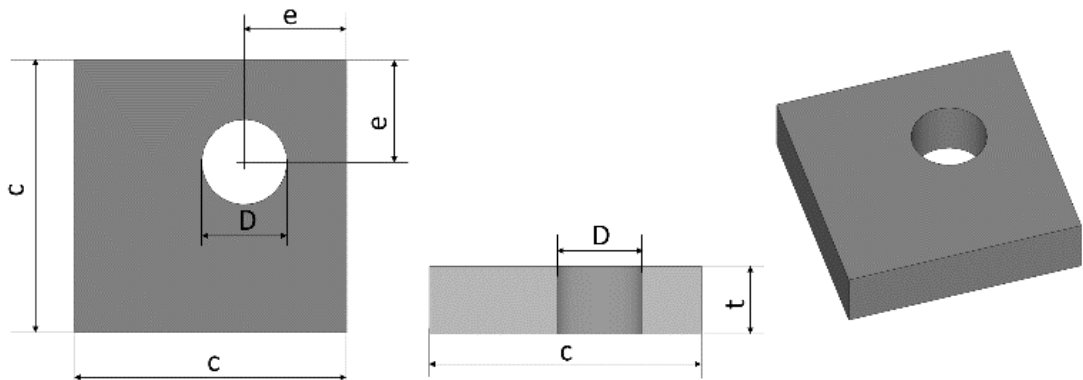


Figure 3. RAL type wall shoe non-centric washer

3. MANUFACTURING AND TOLERANCES

3.1. Manufacturing method

Plates:	Thermal or mechanical cutting
Rebars:	Mechanical cutting
Welding:	MAG welding, manual or robotic
Welding class:	B (EN ISO 5817)
Surface treatment:	Untreated as standard
Execution class:	EXC2 (EN 1090-2) [more demanding classes according to a separate guideline]



The product shall be produced clean and dry. Light surface rusting may be present at delivery of the product. The product is to be stored in dry conditions. The product may be installed with light surface rusting, and in accordance with general requirements for reinforcement bars.

3.2. Manufacturing tolerances

Overall length: ± 10 mm

3.3. Quality control

R-Group Baltic OÜ internal manufacturing and quality control in accordance with EN 1090-2. External quality control provided to R-Group Baltic OÜ by Kiwa Inspecta OÜ.

3.4. Markings

RSK-E wall shoes are marked with at least the RSTEEL® logo, type and identifier, manufacturing date, FI and BY (Concrete Association of Finland) logo.

4. RESISTANCES

The tension capacities of RSK-E wall shoes, calculated in accordance with EN 1992 and EN 1993, are governed by the tension capacity of the connected RPP-E base bolt. More information is provided in the RSTEEL® RPP-E base bolt technical manual.

The anchorage length is determined according to the diameter of the anchor bar.

Minimum concrete grade is C25/30.

Anchorage coefficients, $\eta_1 = 1.0$ (good), lap factor $\alpha_6 = 1.5$, $\alpha_2 = 0.7$, others $\alpha_1 \dots \alpha_5 = 1.0$.

Table 4. Nominal RSK-E wall shoe design tension resistances

RSK-E	RAL	RPP-E base bolt	N_{Rd} [kN]
M30	N30	M30	299.2
M36	N36	M36	435.7
M39	N39	M39	520.5
M45	N45	M45	696.5
M52	N52	M52	937.6



RAL non-centric washers are supplied with RPP-E base bolts on request.

Shear forces acting on the wall can be resisted by friction between the grout and concrete in the case of compression at the joint. A friction coefficient of 0.2 can be used for a sand-cement grout, without additional tests.



RSTEEL® Design Tool software for wall shoe connections on [rsteel-design.com](https://www.rsteel-design.com).

Wall shoe installation and additional reinforcement must be in accordance with instructions in this user guide.

5. USER INSTRUCTIONS

5.1. Limits of Use

The capacities of the wall shoes have been calculated for static loads. Increased load factors are to be adopted for case specific dynamic and fatigue effects. For design in accordance with the Eurocodes, the lowest operating temperature is calculated from EN 1991-1-5.

5.2. Design Guidance

Grout is to be applied to the joint as soon as possible after the wall element has been lifted into position. Other structures can be installed on top of the wall element after the grout has hardened. Out-of-plane (transverse) support of the wall element must always be considered carefully.

The RSK-E wall shoe is to be installed in the middle of the precast wall element, and the anchor bars are to be tied to the reinforcement of the wall. Minimum wall thickness and associated minimum concrete cover to the anchor bars of the wall shoe, are given in the table below. Minimum wall thickness is determined considering minimum requirements presented in EN 1992-1-1 for concrete cover to the anchor bars of the wall shoe.

The wall shoe is designed for environmental condition exposure class XC1. Design standard requirements must be carefully considered for other exposure classes, for example minimum wall thickness and concrete cover for fire and exposure classes.

Table 5. Minimum wall thickness and concrete cover

Type	Size	Wall thickness t_w [mm]	Concrete cover c_c [mm]	Figure
RSK-E	M30	130	53	
	M36	150	59	
	M39	190	43	
	M45	210	46	
	M52	250	43	

Table 6. Minimum edge distance and spacing

Type	Size	Edge distance R [mm]	Spacing c/c [mm]	Figure
RSK-E	M30	180	280	
	M36	200	320	
	M39	170	300	
	M45	200	320	
	M52	220	350	

5.3. Reinforcement instructions

Reinforcement of the wall according to EN 1992-1-1 and following details:

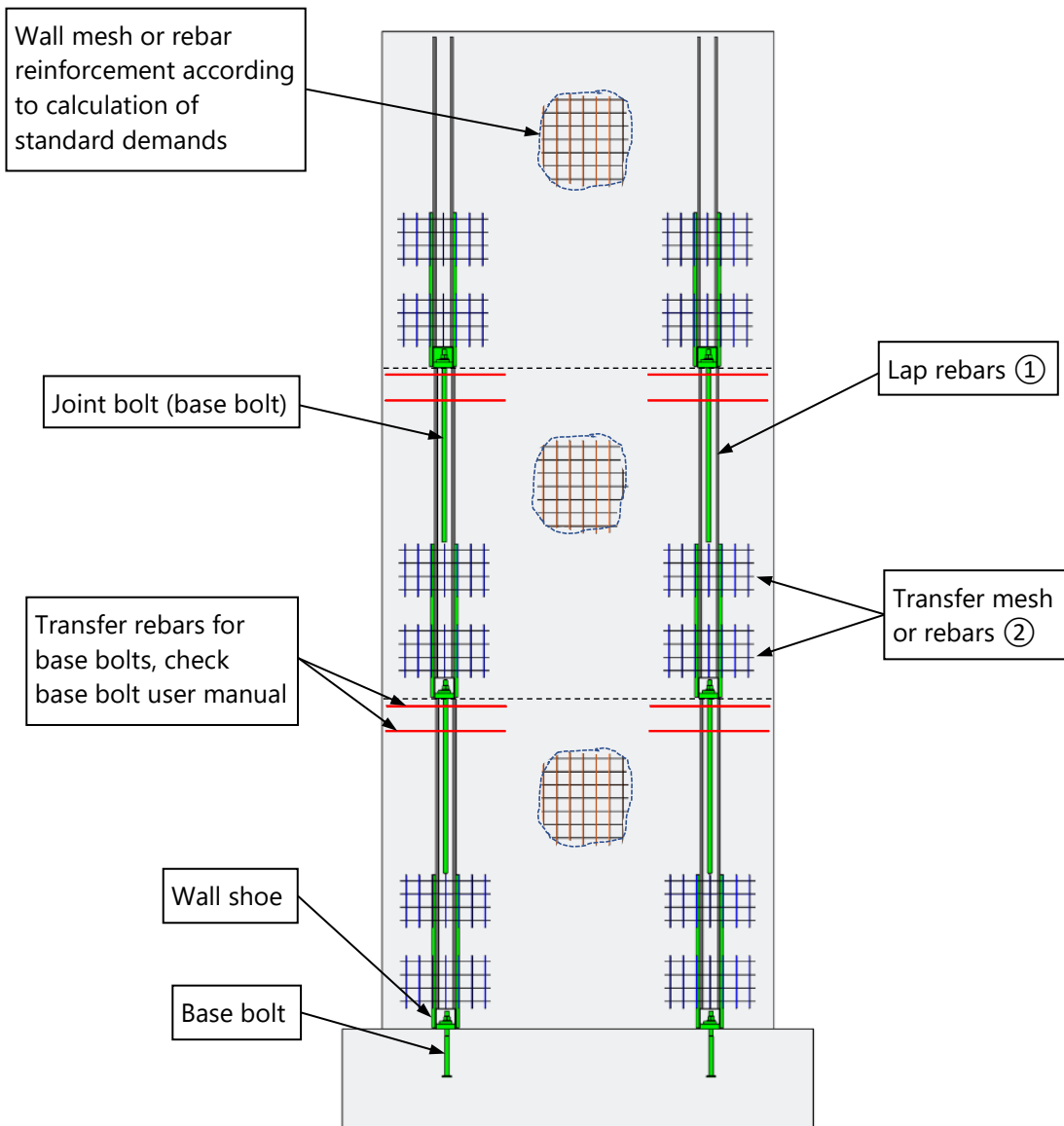


Figure 4. Overview of the reinforced structure

Supplementary transfer reinforcement for the wall shoes must be added according to shoe size. Related values are given in Table 7 to Table 11 based on the shoe type and size. This reinforcement is transverse reinforcement for lapped bars in tension and is applied in the lapping zone between wall shoe sidebars and lapping rebars. Transverse reinforcement is required in the lap zone to resist transverse tension forces, and it must be used independently of the main wall reinforcement. Only if the diameter of the lapped bars is less than 20 mm, then any transverse reinforcement or links necessary for other reasons may be assumed sufficient for the transverse tensile forces without further justification according to EN 1992-1-1: 8.7.4.1.

Reinforcement mesh or rebar according to calculation or standard demands.

Minimum mesh requirement on the wall is defined in EN 1992-1-1 section 9.6. Vertical reinforcement should be not less than $0.002A_c$. Horizontal reinforcement is 25% of vertical reinforcement or $0.001A_c$. Greater value should be used (National Annexes should be checked).

Table 7. Supplementary transfers reinforcement on one side mesh

RSK-E	Lapping rebars ①	Horizontal bars ②		a [mm]	L_{B1} [mm]	L_{A1} [mm]	L_{S1} [mm]
		\varnothing_{m1}	n				
M30	2x $\varnothing 25$	$\varnothing 8$	4	150	600	820	304.5
M36	2x $\varnothing 32$	$\varnothing 10$	4	150	600	845	298.5

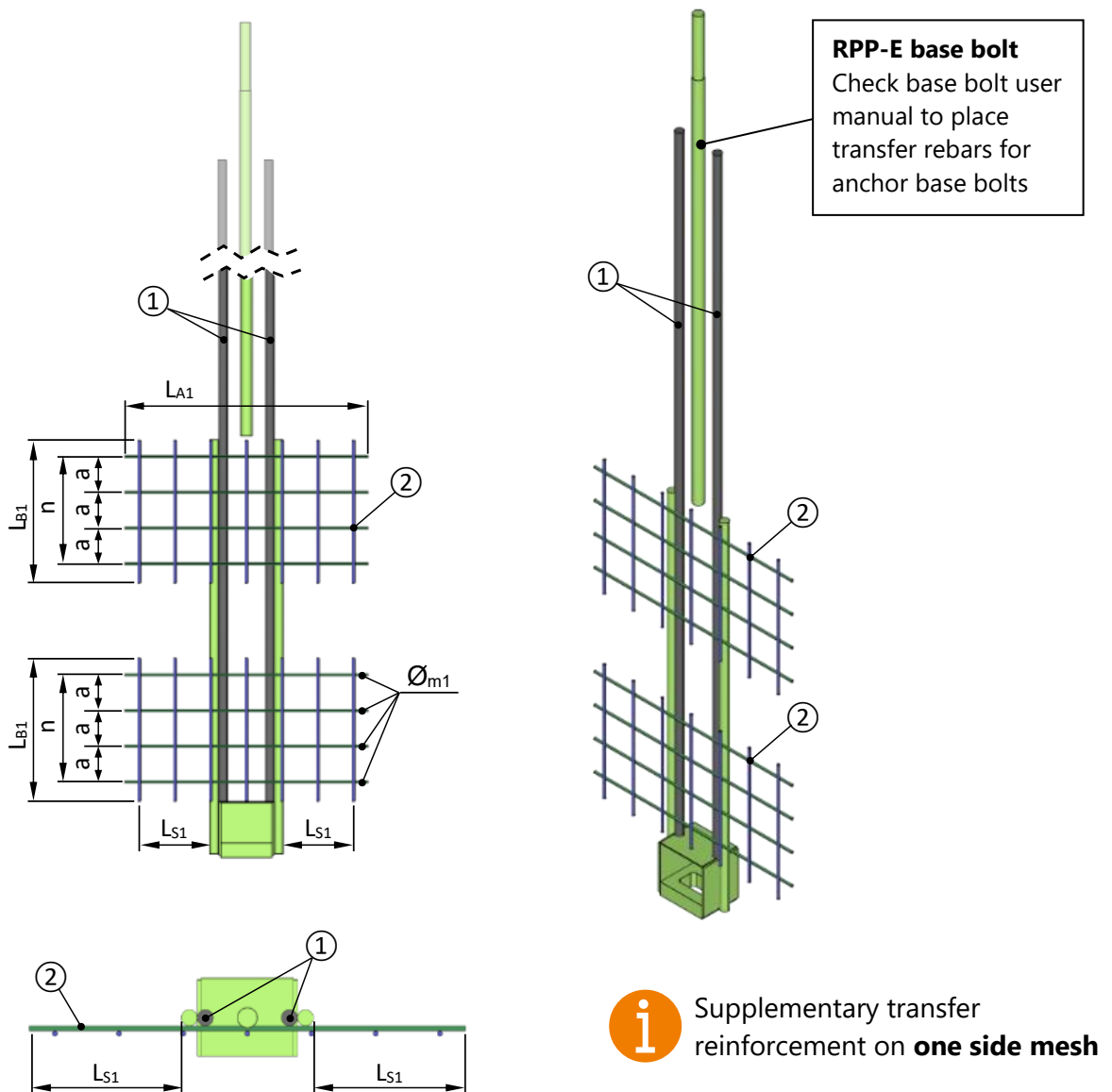


Figure 5. Supplementary transfer reinforcement with one side mesh

Table 9. Supplementary transfers reinforcement two sides mesh

RSK-E	Lapping rebars ①	Horizontal bars ②		a [mm]	L _{A2} [mm]	L _{S2} [mm]
		Ø _{m2}	n			
M30	2×Ø25	Ø8	2	150	820	304.5
M36	2×Ø32	Ø10	2	150	845	298.5

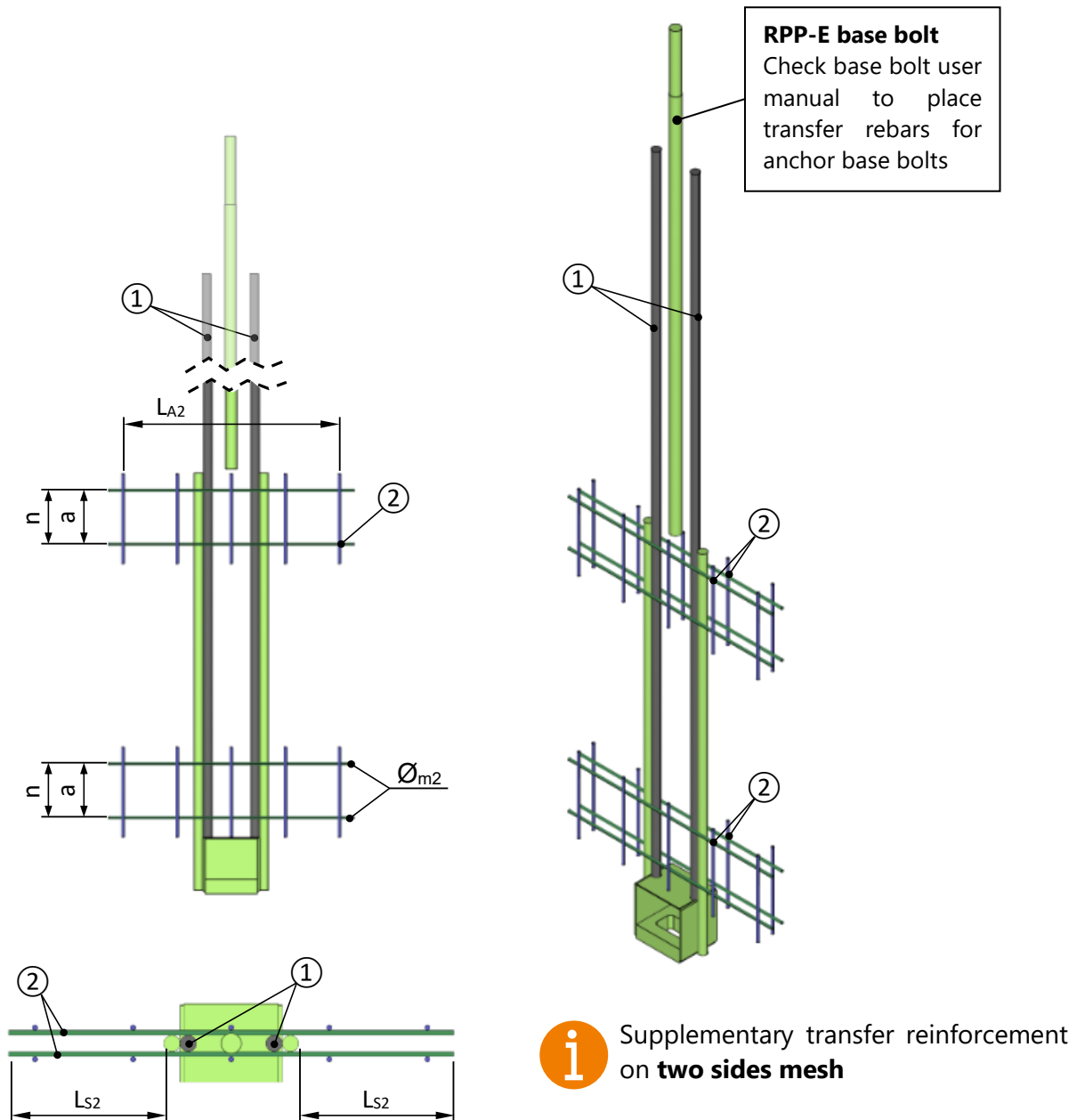


Figure 7. Supplementary transfer reinforcement with two sides mesh

Table 10. Supplementary transfers reinforcement two sides rebar

RSK-E	Lapping rebars ①	Horizontal bars ②		a [mm]	L _{A2} [mm]
		Ø _{m2}	n		
M30	2×Ø25	Ø8	2	150	1070
M36	2×Ø32	Ø10	2	150	1095

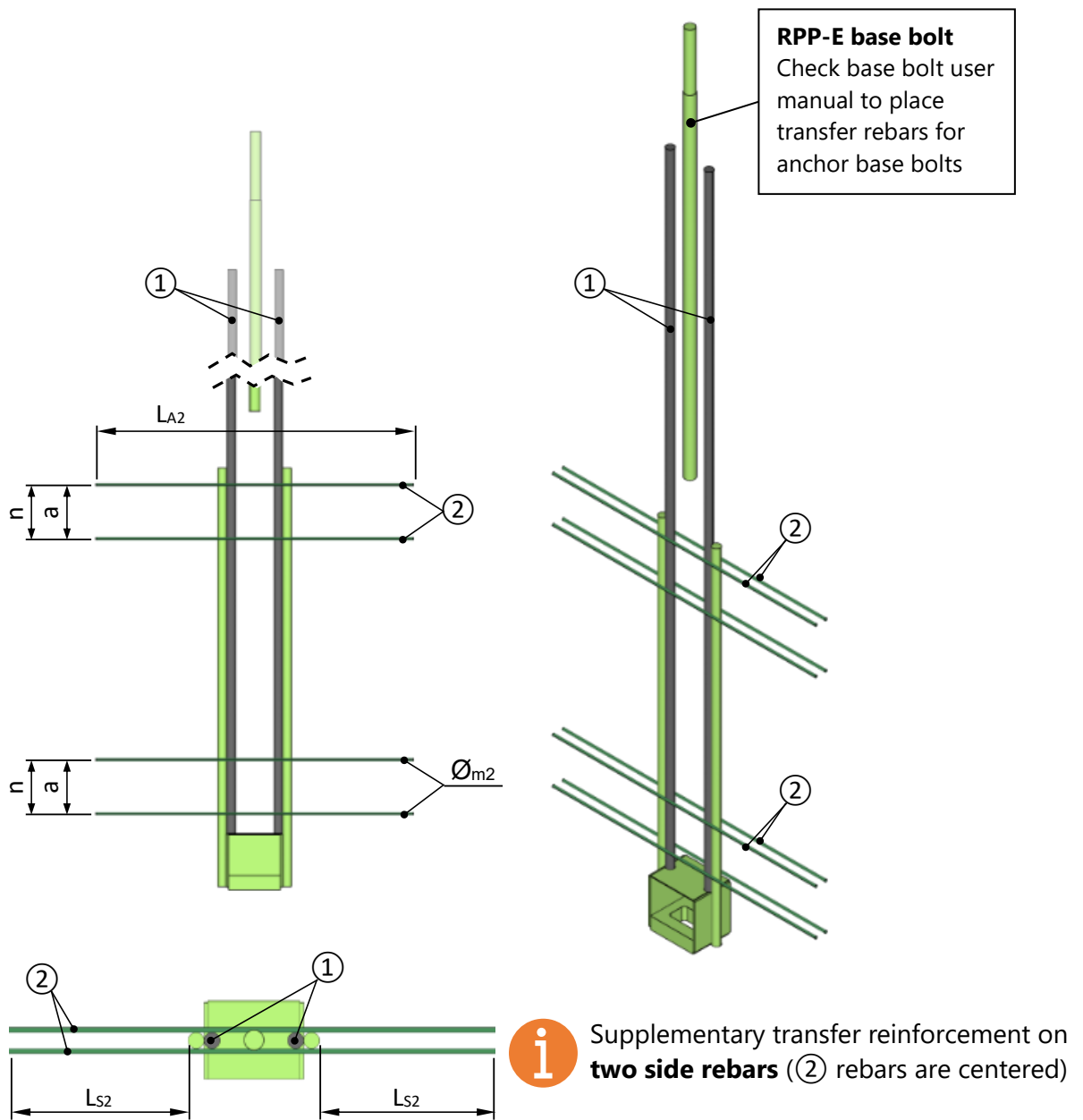


Figure 8. Supplementary transfer reinforcement with two side rebar

Table 11. Supplementary reinforcement with stirrups (M30, M36)

RSK-E	Lapping rebars ①	Horizontal bars ②		a [mm]
		\varnothing_{ms}	n	
M30	4× $\varnothing 20$	$\varnothing 8$	5	100
M36	4× $\varnothing 20$	$\varnothing 10$	5	100

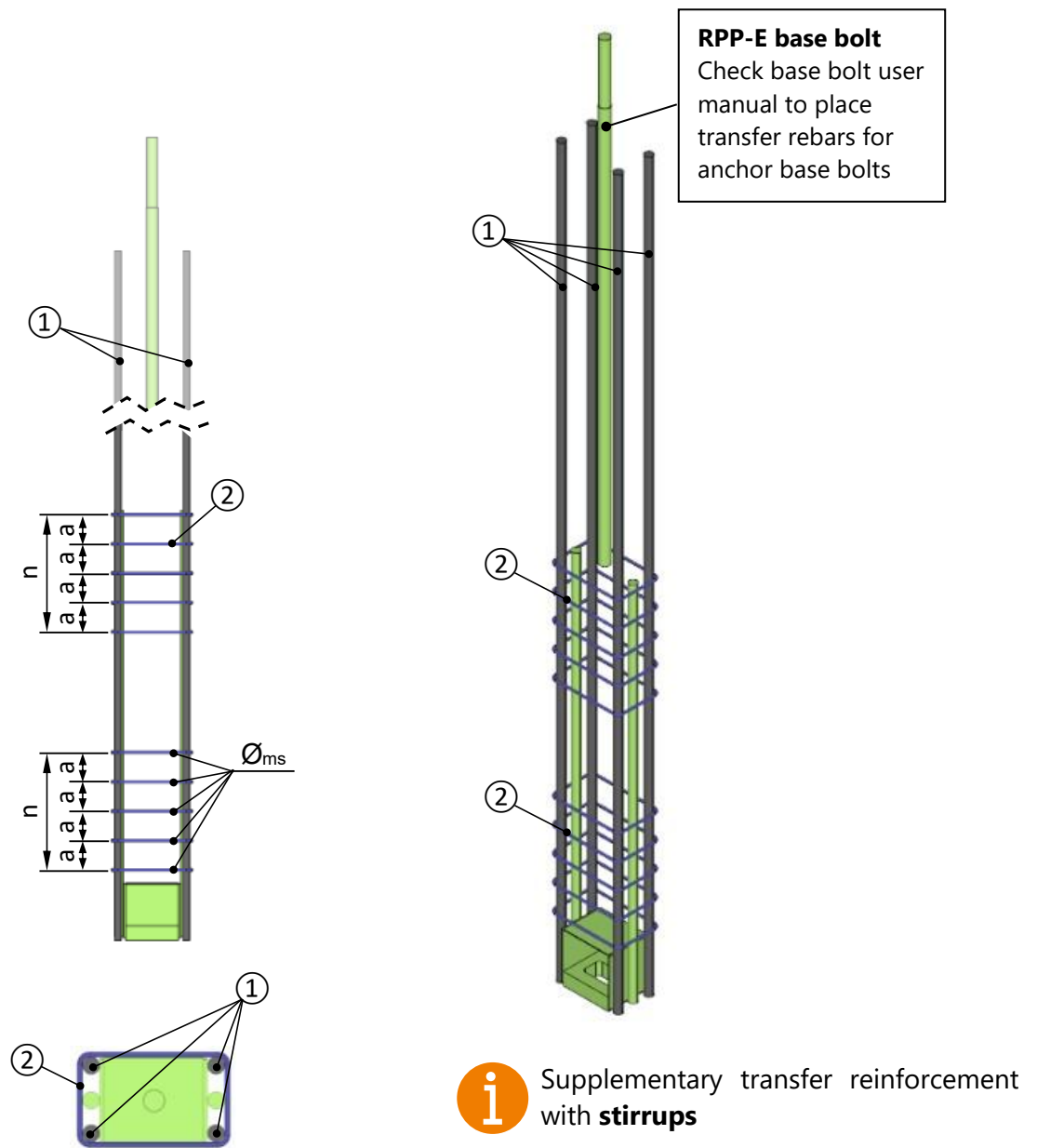


Figure 9. Supplementary transfer reinforcement with stirrups (M30, M36)

Table 12. Supplementary reinforcement with stirrups (M39, M45, M52)

RSK-E	Lapping rebars ①	Horizontal bars ②		a [mm]
		\varnothing_{ms}	n	
M39	4x $\varnothing 25$	$\varnothing 8$	5	100
M45	4x $\varnothing 32$	$\varnothing 10$	5	120
M52	4x $\varnothing 32$	$\varnothing 10$	5	130

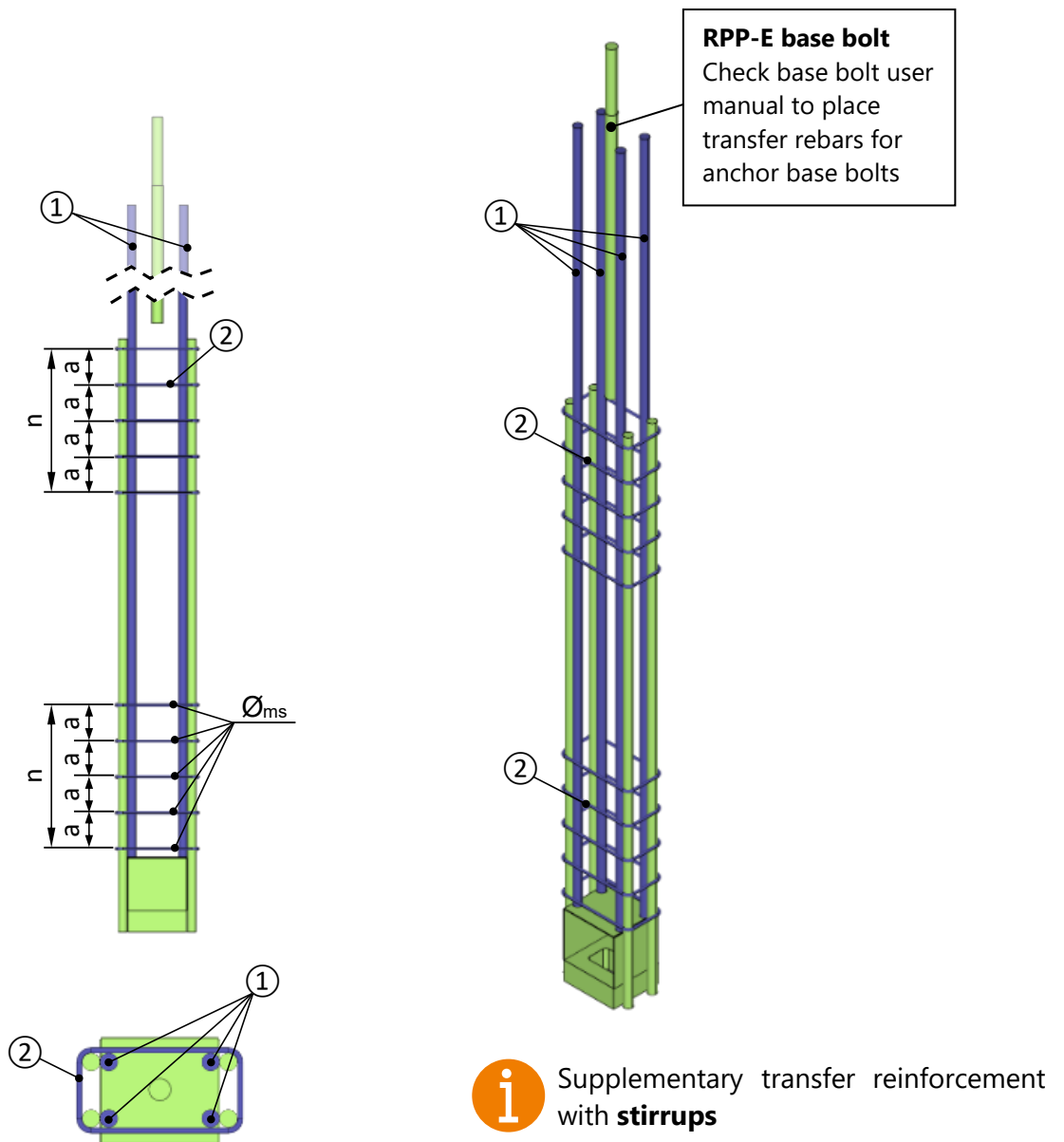


Figure 10. Supplementary transfer reinforcement with stirrups (M39, M45, M52)

6. INSTALLATION

The wall shoe is secured to the reinforcement of the wall, and its base plate is connected, for example, by clamping to the formwork. Additional reinforcement is to be installed according to requirements set out in Section 5.3. The gap between the wall shoe and the top of the foundation or wall is 20 mm.

Table 13. Installation tolerances for RSK-E wall shoe

RSK-E	Transversal direction $T_{w,t}$ [mm]	Longitudinal direction $T_{w,l}$ [mm]
M30	± 3	± 5
M36	± 3	± 5
M39	± 3	± 5
M45	± 4	± 5
M52	± 4	± 5



Figure 11. Installation tolerances for RSK-E wall shoe

Table 14. Installation dimensions and tolerances for RPP-E base bolts

RPP-E base bolt	Bolt length h [mm]	Installation tolerance T [mm]
M30	145	± 3
M36	165	± 4
M39	185	± 4
M45	195	± 4
M52	220	± 5



RPP-E base bolt tolerances are in accordance with their respective technical user manuals.

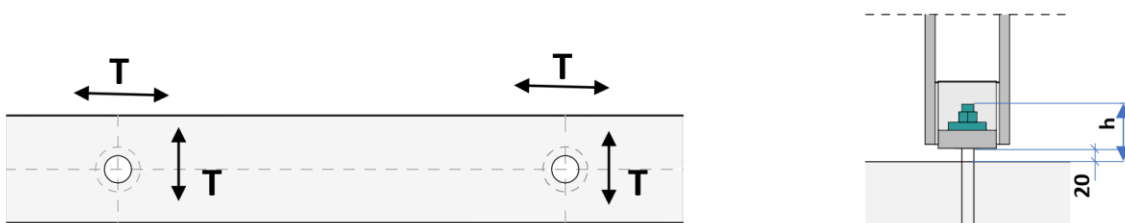


Figure 12. Installation dimensions and tolerances for RPP-E base bolts

6.1. Inspection instructions for installation of the wall shoe

Checklist before casting:

- The correct shoe type and size is installed.
- The positioning of the shoe is correct and according to installation tolerances.
- The shoe is properly secured in the reinforcement and formwork.
- The correct supplementary reinforcement is installed according to manufacturing drawings.

Checklist after casting:

- Position of the shoe is correct and according to tolerances.
- Shoes are cleaned and any casting boxes are removed.

6.2. Inspection instructions for installation of the wall

The precast wall element is installed at the correct level by using packer plates. The wall element is to be temporarily supported during erection, and its level and inclination checked. Before the nuts are tightened, the position of the RAL washer plates inside the wall shoe must be checked. Nuts are to be firmly tightened, for example using an impact wrench. Following tightening of the nuts, lifting connections can be disconnected. Erection must follow the erection scheme that is approved by the responsible engineer. Space required for tightening the nut with an impact wrench is verified in accordance with DIN 7444. Once the wall element is set at the correct level and inclination, and the nuts are tightened, the base is to be grouted in accordance with the manufacturer's guidance. The grout must be of a non-shrinking type and with strength greater than the weakest of the concrete structures connected with the bolt and shoe assembly.

TECHNICAL MANUAL REVISIONS

08.08.2022 (JK)

- RSK-E and RSK-E separated to own manuals

31.10.2022 (FA)

- New graphical layout

12.04.2023 (FA, AV)

- Supplementary reinforcement graphics and tables visually updated
- Stirrup version is added

30.06.2025 (AV)

- New graphical layout
- Shear capacity description changes

29.08.2025 (AV)

- Minor text changes

23.04.2026 (AV)

- Table 2: colors added

DESIGN TOOLS

RSTEEL® Design Tool was created to facilitate the work of designers and offer the best and most transparent design process on the market. The free and fully cloud-based software guarantees seamless workflow within the design organization, as well as continuous support and updates.

rsteel-design.com

DESIGN COMPONENTS

We have created design components for Tekla as well as Revit and AutoCAD. More products will be created, and existing products will receive steady updates and fixes when needed.

warehouse.tekla.com/#/organization/u7be79e90-ace8-46ca-a26c-849a5dc4c283

proplib.com/rsteel

SALES AND TECHNICAL SUPPORT

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DOCUMENTATION

All our products have been tested and have all necessary approvals and markings. You can find all related information on each products page.

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