RSTEEL®

Technical Manual

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Version 18.5.2017

RT Standard Steel Parts

Design According to Eurocodes

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Highest Creditworthiness
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THE STRONGEST IN FINLAND
2017
R-Group Finland OY
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This manual is written in cooperation between the companies listed below and Betoniteollisuus Ry.

The companies listed are entitled to manufacture the RT steel components presented in this manual.

By harmonizing RT steel component, the work of designers, manufacturers, concrete element manufacturers, contractors and officials is made easier owing to the interchangeability of the components.

The guidelines given are intended to be used by qualified persons with the ability to understand the restrictions of the guidelines and to take responsibility for applying the guidelines in practical construction projects. Although the preparation of this manual has been done by the leading technical experts in the nation, neither Betoniteollisuus Ry or the persons involved in the preparation do not assume liability for guidelines given in this manual.

Manufacturers:

R-Group Finland Oy

Peikko Finland Oy

Anstar Oy

Semko Oy

Publisher: Rakennusteollisuus ry

Betoniteollisuus ry

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2.1 RT 23 dimensions and materials

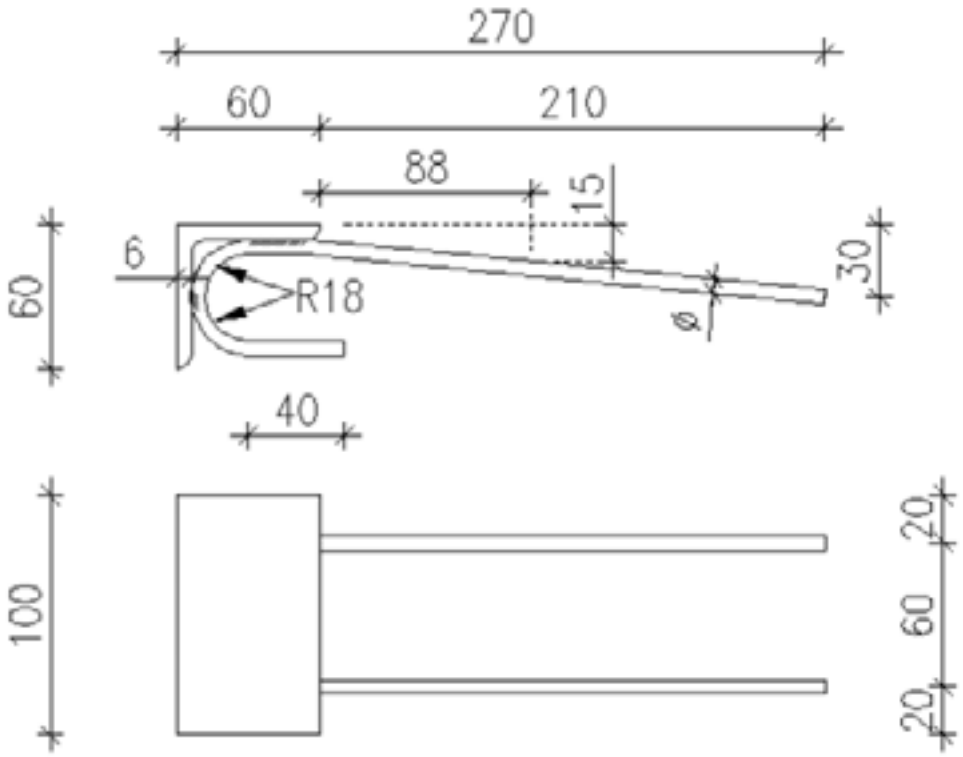

Figure 1. RT 23 standard steel part dimensions

Table 1. RT 23 standard steel part materials

Type	Plate		Anchors	
	Material	Standard	Material	Standard
RT 23	S235JR+AR	SFS-EN 10025	B500B BSt 500 S	SFS 1300
RTR 23	1.4301	SFS-EN 10088	B500B BSt 500 S	SFS 1300
RTRr 23	1.4301	SFS-EN 10088	B600XB / B600XC (B600KX)	SFS 1259

RT 23, RTR 23: Ø = 6 mm

RTRr 23: Ø = 5 mm

2.2 RT 24 dimensions and materials

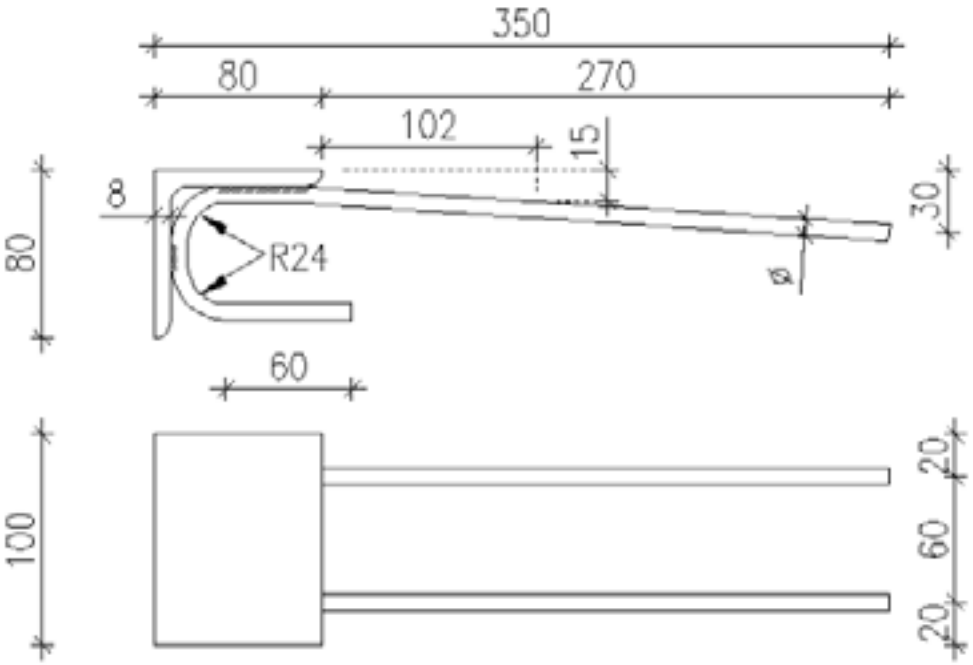

Figure 2. RT 24 standard steel component dimensions

Table 2. RT 24 standard steel component dimensions

Type	Plate		Anchors	
	Material	Standard	Material	Standard
RT 24	S235JR+AR	SFS-EN 10025	B500B BSt 500 S	SFS 1300
RTR 24	1.4301	SFS-EN 10088	B500B BSt 500 S	SFS 1300
RTRr 24	1.4301	SFS-EN 10088	B600XB / B600XC (B600KX)	SFS 1259

RT 24, RTR 24: Ø = 8 mm

RTRr 24: Ø = 7 mm

2.3 RT 38 dimensions and materials

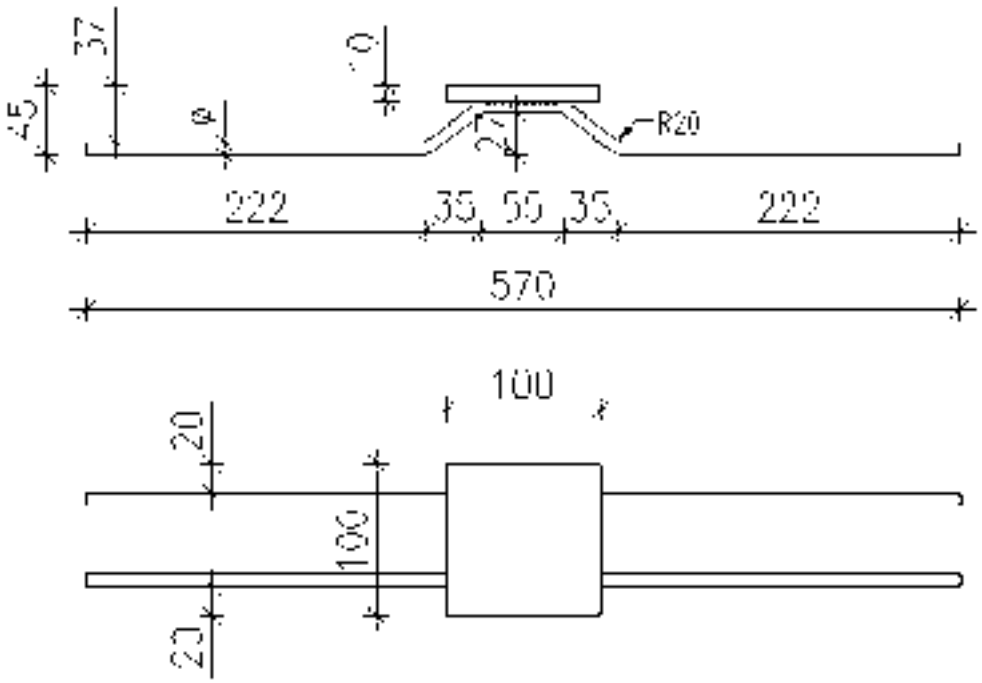

Figure 3. RT 38 standard steel component dimensions

Table 3. RT 38 standard steel component materials

Type	Plate		Anchors	
	Material	Standard	Material	Standard
RT 38	S355J2+N	SFS-EN 10025	B500B BSt 500 S	SFS 1300
RTR 38	1.4301	SFS-EN 10088	B500B BSt 500 S	SFS 1300
RTRr 38	1.4301	SFS-EN 10088	B600XB / B600XC (B600KX)	SFS 1259

RT 38, RTR 38: Ø = 8 mm

RTRr 38: Ø = 7 mm

2.4 RT 39 dimensions and materials

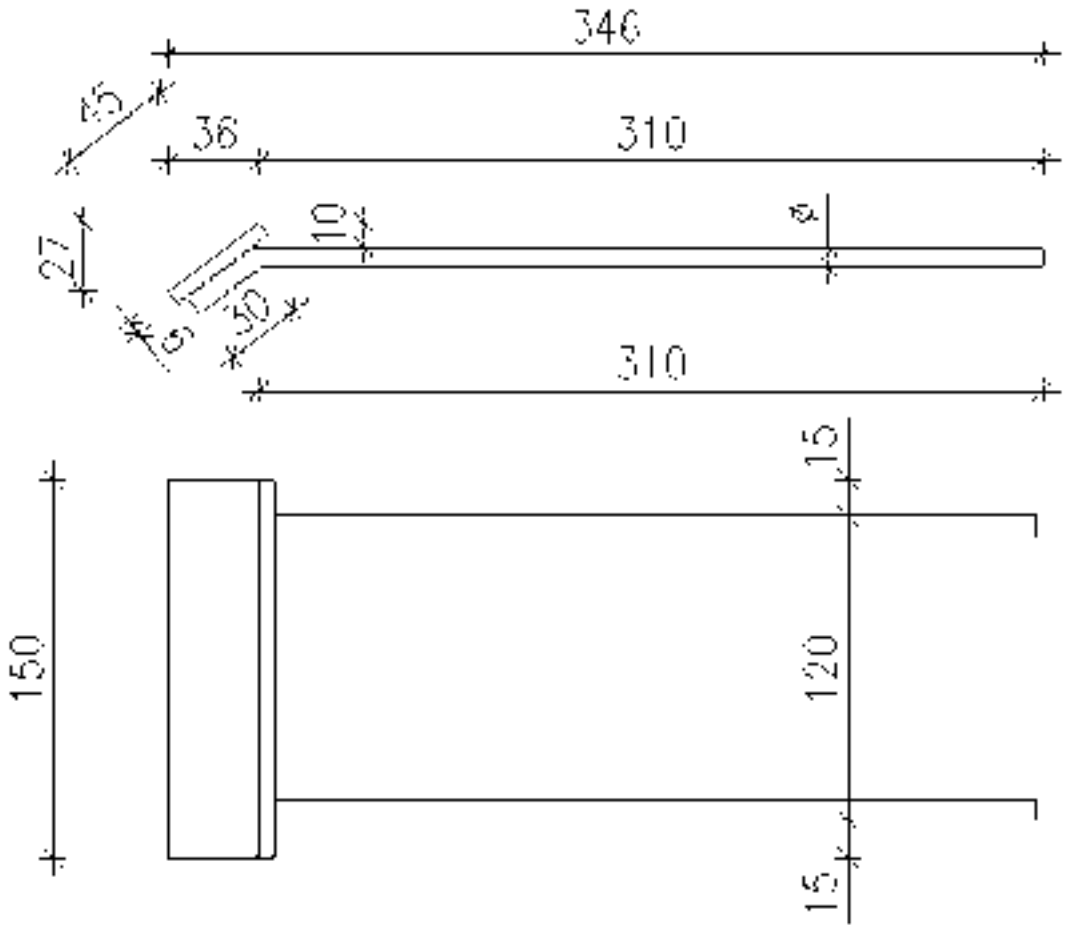

Figure 4. RT 39 standard steel component dimensions

Table 4. RT 39 standard steel component materials

Type	Plate		Anchors	
	Material	Standard	Material	Standard
RT 39	S235J2+N	SFS-EN 10025	B500B BSt 500 S	SFS 1300
RTR 39	1.4301	SFS-EN 10088	B500B BSt 500 S	SFS 1300
RTRr 39	1.4301	SFS-EN 10088	B600XB / B600XC (B600KX)	SFS 1259

RT 39, RTR 39: ø = 8 mm

RTRr 39: ø = 7 mm

2.5 RT 44 dimensions and materials

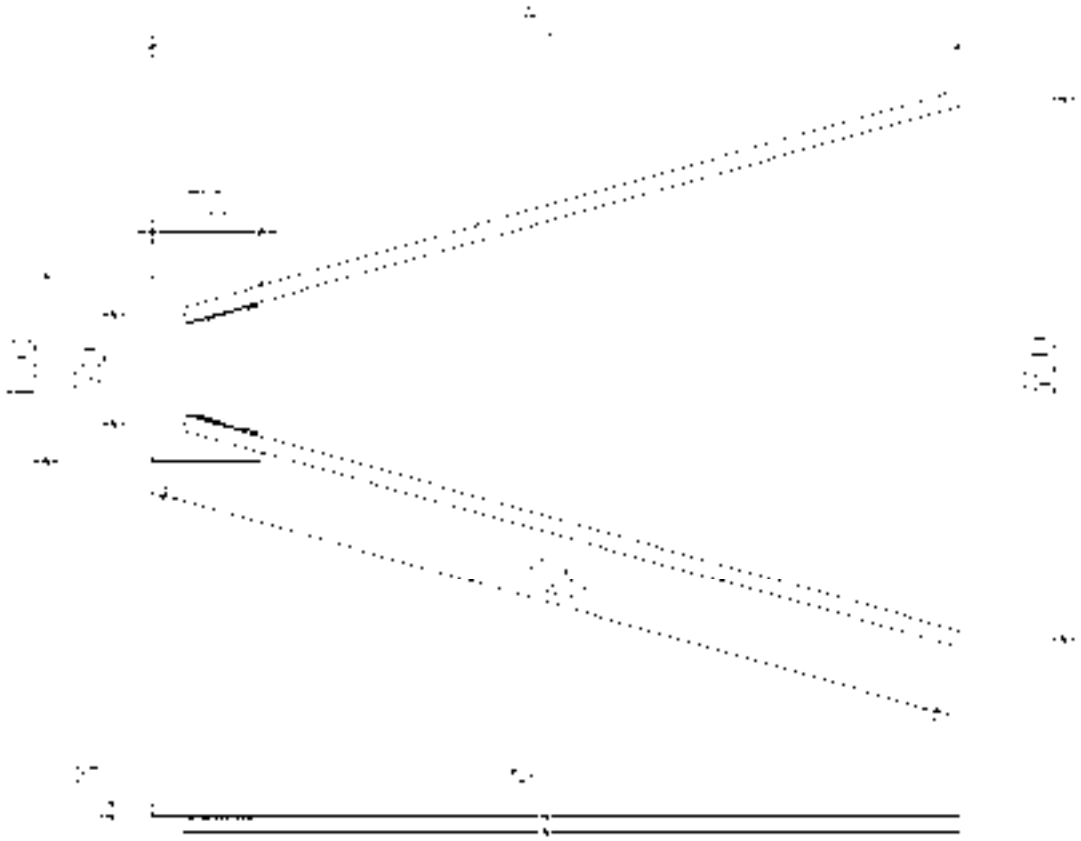

Figure 5. RT 44 standard steel component dimensions

Table 5. RT 44 standard steel component materials

Type	Plate		Anchors	
	Material	Standard	Material	Standard
RT 44	S355J2+N	SFS-EN 10025	B500 BSt 500 S	SFS 1300
RTR 44	1.4301	SFS-EN 10088	B500B BSt 500 S	SFS 1300
RTRr 44	1.4301	SFS-EN 10088	B600XB / B600XC (B600KX)	SFS 1259

RT 44, RTR 44: Ø = 10 mm

RTRr 44: Ø = 9 mm

3. Manufacturing and Tolerances

3.1 Manufacturing method and execution class

Steel plates:	Thermal or mechanical cutting
Steel bars:	Mechanical cutting
Welding:	MAG welding, manual or robotic, resistance welding or arc stud welding
Welding class:	C (SFS-EN ISO 5817), EXC2 (SFS-EN 1090-2 section 7.6)
Execution class:	EXC2 (SFS-EN 1090-2) [more demanding classes according to a separate guideline]

3.2 Manufacturing tolerances

Plate side lengths:	± 3 mm L ≤ 120 mm ± 4 mm 120 mm < L ≤ 315 mm
Plate straightness:	L/150
Plate cut edge surface roughness:	SFS-EN 1090-2
Squareness of cut edges:	SFS-EN 1090-2
Steel part height:	± 3 mm
Anchor location:	± 5 mm
Anchor spacing:	± 5 mm
Anchor inclination:	± 5°

3.3 Surface treatment

Protective painting shall be applied to the visible surfaces of the standard steel components. Standard steel components are delivered with an approximately 40 µm shop priming. Upon request the standard steel components are delivered with a 60 µm epoxy painting or hot dip galvanized according to galvanizing standard. Stainless and acid-proof standard steel components are delivered without protective painting.

3.4 Quality control

Demands of product standards are to be applied in quality control. The manufacturer of the standard steel components has a valid quality control agreement for the quality control of steel part manufacturing.

4. Resistances

4.1 Basis of structural design

The resistances of RT standard steel components have been calculated according to the following norms, rules and regulations:

SFS-EN 1992 Eurocode 2 Design of concrete structures
SFS-EN 1993 Eurocode 3 Design of steel structures

The resistances have been calculated with respect to static loads. For dynamic and fatigue loads the resistances need to be separately checked on a case-by-case basis.

The resistances of RT standard steel components are applicable to service situations and use purposes given in this manual. When used for other purposes the resistances need to be separately checked on a case-by-case basis.

The eccentricity of loads that has been taken into account in calculations is ± 15 mm.

The resistances of RT standard steel parts have been calculated for concrete strength C25/30.

4.2 RT 23 Resistances

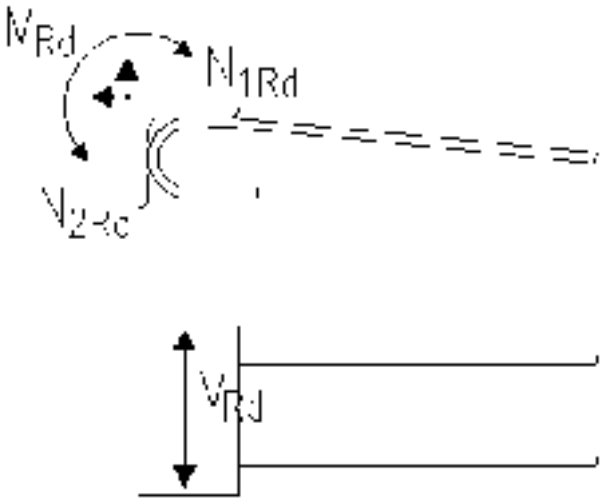

Figure 6. RT 23 notation and directions for the resistances

Table 6. RT 23 resistances

Load effect	Resistance [kN, kNm]	
	RT, RTR	RTRr
N_{1Rd}	14,2	12,2
N_{2Rd}	4,5	3,4
M_{Rd}	0,6	0,6
V_{Rd}	6,8	5,1

4.3 RT 24 resistances

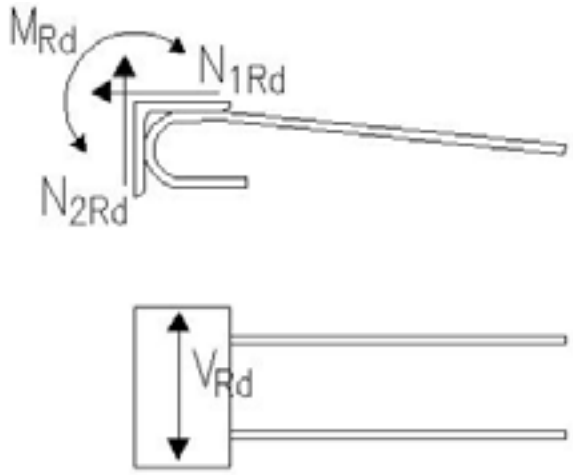

Figure 7. RT 24 notation and directions for the resistances

Table 7. RT 24 resistances

Load effect	Resistance [kN, kNm]	
	RT, RTR	RTRr
N_{1Rd}	24,2	21,6
N_{2Rd}	8,0	6,7
M_{Rd}	1,4	1,3
V_{Rd}	12,0	10,1

4.4 RT 38 resistances

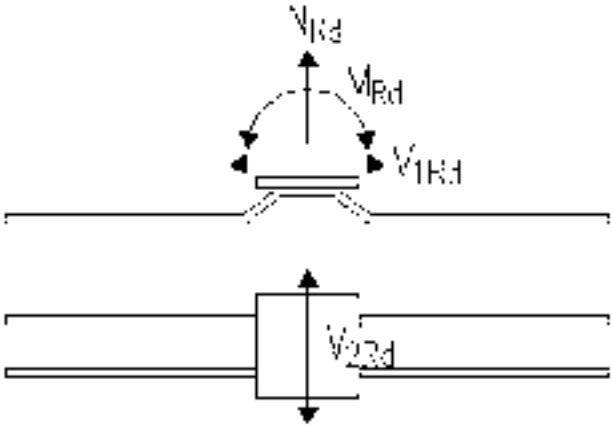

Figure 8. RT 38 notation and directions for the resistances

Table 8. RT 38 resistances

Load effect	Resistance [kN, kNm]	
	RT, RTR	RTRr
N_{Rd}	14,4	13,0
M_{Rd}	0,6	0,6
V_{1Rd}	16,2	14,5
V_{2Rd}	6,8	5,7

Minimum fastening surface 44 mm x 44 mm.

4.5 RT 39 resistances

Figure 9. RT 39 notation and directions for the resistances

Table 9. RT 39 resistances

Load effect	Resistance [kN, kNm]	
	RT, RTR	RTRr
N_{Rd}	13,5	11,8
V_{Rd}	11,8	9,9

4.6 RT 44 resistances

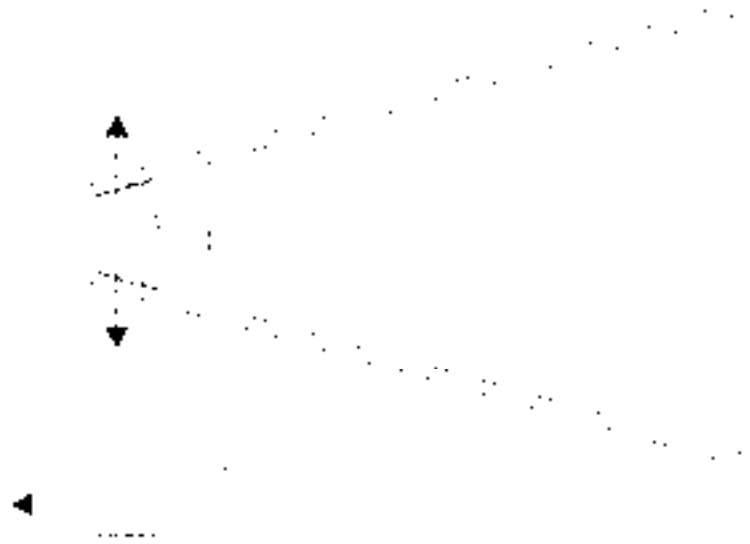

Figure 10. RT 44 notation and directions for the resistances

Table 10. RT 44 resistances

Load effect	Resistance [kN, kNm]	
	RT, RTR	RTRr
N_{Rd}	51,2	49,8
V_{Rd}	18,4	16,4

4.7 Fastening surface

If the fastening surface of the steel component to be fixed is smaller than the minimum fastening surface the resistances of RT 38 standard steel component need to be reduced according to formula (1).

$$N_{Rd.red} = N_{Rd} \times \frac{(C - a_0)}{(C - a_1)} \quad , a_0 > a_1 \qquad (1)$$

where

$N_{Rd.red}$ = reduced resistance to normal force
N_{Rd} = given normal force resistance for the minimum fastening area
c = distance between anchor centers
a_0 = side length of the minimum fastening surface (value according to table 3)
a_1 = side length of the fastening surface

The same formula for the reduction of capacity can be used for moment capacity also. For shear force and torsional moment, it is not necessary to reduce the resistances due to fastening area.

4.8 Minimum thickness of the concrete base and the effect of base thickness to resistances

Thickness of the concrete base of RT standard steel components is decided by the concrete cover demand of the concrete structure exposure class and the concrete cover requirement of the rebar anchorage. The thickness of the base concrete must be at least larger of the values rebar anchor diameter + 2 x (concrete cover + concrete cover tolerance) or 7 x rebar anchor diameter. The concrete base must be designed to withstand the loadings from the RT standard steel component.

4.9 Resistances of RT standard steel components for combinations of load effects

If multiple load effects act simultaneously on RT standard steel component, the resistance of the RT standard steel components shall be checked according to the following formula.

$$\left(\frac{N_{Ed}}{N_{Rd}} + \frac{M_{EdB}}{M_{RdB}} + \frac{M_{EdL}}{M_{RdL}}\right)^{\frac{4}{3}} + \left(\frac{V_{EdB}}{V_{Rd}} + \frac{V_{EdL}}{V_{Rd}} + \frac{T_{Ed}}{T_{Rd}}\right)^{\frac{4}{3}} \leq 1{,}0 \qquad (2)$$

Where subscript Ed means the ultimate limit state value for the dimensioning value of the load effect and Rd the corresponding resistance of the RT standard steel component.

4.10 Effect of additional reinforcement on resistances

Additional reinforcement does not increase the resistances of the RT standard steel components. In location of the standard steel plates minimum reinforcement according to SFS-EN 1992-1-1 is installed to guarantee ductile action in ultimate limit state.

5. Use of Standard Steel Components

5.1 Service life and allowed exposure classes

Service life of RT standard steel components depends on the chosen fastening plate material. RT standard steel components can be used in all concrete structure exposure classes as long as the exposure class requirements for the concrete cover for the steel parts of the fastening plate are taken into account. If needed RTR components with stainless steel plate, RTRr components with stainless steel plate and anchors, RTH components with acid-proof plate or RTHr components with acid-proof plate and stainless steel anchors can be used. The resistances of stainless and acid-proof steel components are equal.

5.2 Limitations for use

Capacities for RT standard steel components are calculated for static loads. For dynamic or fatigue loads larger partial safety factors for loads must be used and the components of the connection must be checked on a case-by-case basis.

Resistances for RT standard steel components have been calculated for concrete with strength C25/30

A reinforcement to guarantee ductile action of the structure in ultimate limit state must always be installed in location of the RT standard steel components.

6. Storage Transportation and Marking

RT standard steel components are to be stored protected from the rain.

Marking is made into RT standard steel components that shows at least the manufacturer, type and identifier of the RT standard steel component.

7. Literature Related to the Manual

SFS-EN 1992-1-1 Eurocode 2: Design of concrete structures. Part 1-1: General rules and rules for buildings

SFS-EN 1993-1-1 Eurocode 3: Design of steel structures. Part 1-1: General rules and rules for buildings

SFS-EN 1993-1-8 Eurocode 3: Design of steel structures. Part 1-8: Design of joints

SFS-EN 1993-1-10 Eurocode 3: Design of steel structures. Part 1-10: Material toughness and through-thickness properties

SFS-EN 1090-2 Execution of steel structures and aluminium structures. Part 2: Technical requirements for steel structures

SFS-EN 10080 Steel for the reinforcement of concrete. Weldable reinforcing steel. General

SFS 1216 Betoniteräkset. Hitsattava kuumavalssattu harjatanko A700HW

SFS 1257 Betoniteräkset. Kylmämuokattu harjatanko B500K

SFS 1259 Betoniteräkset. Kylmämuokattu ruostumaton harjatanko B600KX

SFS 1268 Betoniteräkset. Hitsattava kuumavalssattu harjatanko B500B

SFS 1269 Betoniteräkset. Hitsattava kuumavalssattu harjatanko B500C1

SFS 1300 Betoniteräkset. Hitsattavien betoniterästen ja betoniteräsverkkojen vähimmäisvaatimukset

SFS-EN 10025 Hot rolled products of structural steels.

SFS-EN 10088 Stainless steels

SFS-EN ISO 17660-1 Welding. Welding of reinforcing steel. Part 1: Load-bearing welded joints

SFS-EN ISO 5817 Welding. Fusion-welded joints in steel, nickel, titanium and their alloys (beam welding excluded). Quality levers for imperfections.

SFS-EN ISO 3834-3 Quality requirements for fusion welding of metallic materials. Part 3: Standard quality requirements

SFS-EN ISO 14554-2 Quality requirements for welding. Resistance welding of metallic materials. Part 2: Elementary quality requirements.

SFS-EN 15609-1 Specification and qualification of welding procedures for metallic materials. Welding procedure specification. Part 1: Arc welding.

SFS-EN 15609-2 Specification and qualification of welding procedures for metallic materials. Welding procedure specification. Part 2: Gas welding

SFS-EN 15609-5 Specification and qualification of welding procedure for metallic materials. Welding procedure specification. Part 5: Resistance welding

SFS-EN 287-1 Qualification test of welders. Fusion welding Part 1: Steels

SFS-EN ISO 9606-1 Qualification testing of welders. Fusion welding. Part 1: Steels

SFS-EN ISO 14731 Welding coordination. Tasks and responsibilities

SFS-EN ISO 14732 Welding personnel. Qualification testing of welding operators and weld setters for mechanized and automatic welding of metallic materials

SFS-EN ISO 9018 Destructive tests on welds in metallic materials. Tensile test on cruciform and lapped joints.

SFS-EN 10204 Metallic products. Types of inspection documents

NA SFS-EN 1992-1-1 Finnish national annex

NA SFS-EN 1993-1-1 Finnish national annex

NA SFS-EN 1993-1-8 Finnish national annex

NA SFS-EN 1993-10 Finnish national annex

About
R-Group

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With over three decades of our participation in huge projects, we don't compromise on quality or customer satisfaction and we create connections for a lifetime.

Our customer-oriented service, excellent and reliable network of suppliers plus our extensive product portfolio ensure that we are able to offer professional and flexible solutions for any kind of projects.

In our operations we comply with the ISO 9001 and 14001 standards

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