Report

Eurocode 3. Bolt check

Prepared by:

SDC Verifier

Prepared for:

Example

Engineer:

Customer:

Project Number:

Version: 1

Date: 30-05-2019

Content

Preface

This document is generated with SDC Verifier 5.2 and calculated with Femap v12.0.0

Model File: D:\Other\Standards\Eurocode 3. Design of steel structures - Part 1-8. Design of joints\Eurocode 3. Bolt check.modfem

Project File: D:\Other\Standards\Eurocode 3. Design of steel structures - Part 1-8. Design of joints\Eurocode 3. Bolt check.sdcv

Report Profile: 3..Report

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Unit System

Current Unit System = MKS (Meter/Kg/Second). It is used in calculations for the following standards: API RP 2A, ISO 19902, Norsok N004, DIN 15018, FEM 1.001 and Eurocode3.

Dimensions	Value
Length	Meter
Mass	Kilogram
Time	Second
Force	Newton
Stress	Pa

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Zijlvest 25

2011VB Haarlem

Netherlands

2..Eurocode3 Bolts (EN 1993-1-8, 2005)

Property	Value
Type	Predefined Standard
Constants	4
Classifications	0
Standard Tables	1
Checks	6

Constant

Title	Value	Description
Gamma_m0	1.1	Table 2.1: Partial safety factors for joints
Gamma_m2	1.25	Table 2.1: Partial safety factors for joints
Gamma_m3	1.25	Table 2.1: Partial safety factors for joints
Gamma_m3_ser	1.1	Table 2.1: Partial safety factors for joints

Characteristics

This paragraph contains information about extra elemental characteristics.

1..Bolt threat pitch

Property	Value
Type	Property '1..Bolt threat pitch'
Alias	P
1..Plate t=15mm	0
2..Plate t=10mm	0
3..Bolt M20. Class 8.8	0.0025
4..Spiders	0
5..Fundation	0

2..Bolt class

Property	Value
Type	Element '2..Bolt class'
Alias	bolt_class
Component '1..Bolts'	Class 8_8

3..Shear plane position

Property	Value
Type	Element '3..Shear plane position'
Alias	Shear_plane_position
Component '1..Bolts'	Passes through the threaded portion of the bolt

4..Hole diameter

Property	Value
Type	Element '4..Hole diameter'
Alias	d0
Component '1..Bolts'	0.022

5..Position of the bolt in the direction of load

Property	Value
Type	Element '5..Position of the bolt in the direction of load'
Alias	Position_in_the_direction_of_load
Component '1..Bolts'	End bolts

6..Position of the bolt perpendicular to the direction of load

Property	Value
Type	Element '6..Position of the bolt perpendicular to the direction of load'
Alias	Position_perpendicular_to_the_direction_of_load
Component '1..Bolts'	Edge bolts

7..Countersunk bolt

Property	Value
Type	Element '7..Countersunk bolt'

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Alias	Countersunk_bolt
Component '1..Bolts'	No

8..Hole type

Property	Value
Type	Element '8..Hole type'
Alias	Hole_type
Component '1..Bolts'	Normal holes

9..Class of friction surfaces

Property	Value
Type	Element '9..Class of friction surfaces'
Alias	Class_of_friction_surfaces
Component '1..Bolts'	A

10..Plate thickness

Property	Value
Type	Element '10..Plate thickness'
Alias	tp
Description	Thickness of the connected plates
Component '1..Bolts'	0.015

11..Thickness of countersinking

Property	Value
Type	Element '11..Thickness of countersinking'
Alias	tc
Component '1..Bolts'	0

12..Number of the friction planes

Property	Value
Type	Element '12..Number of the friction planes'
Alias	n
Component '1..Bolts'	1

13..Conection in tension

Property	Value
Type	Element '13..Conection in tension'
Alias	Conection_in_tension
Component '1..Bolts'	Yes

14..Net area

Property	Value
Type	Element '14..Net area'
Alias	Anet
Component '1..Bolts'	0

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15..End distance

Property	Value
Type	Element '15..End distance'
Alias	e1_d
Description	Figure 3.1: Symbols for end and edge distances and spacing of fasteners
Component '1..Bolts'	0.035

16..Spacing p1

Property	Value
Type	Element '16..Spacing p1'
Alias	p1_d
Description	Figure 3.1: Symbols for end and edge distances and spacing of fasteners
Component '1..Bolts'	0.22

17..Edge distance

Property	Value
Type	Element '17..Edge distance'
Alias	e2_d
Description	Figure 3.1: Symbols for end and edge distances and spacing of fasteners
Component '1..Bolts'	0.03

18..Spacing p2

Property	Value
Type	Element '18..Spacing p2'
Alias	p2_d
Description	Figure 3.1: Symbols for end and edge distances and spacing of fasteners
Component '1..Bolts'	0.07

19..Structure made from steel confirmong to

Property	Value
Type	Element '19..Structure made from steel confirmong to'
Alias	Structure_made_from_steel_confirmong_to
Component '1..Bolts'	EN 10025

Standard Tables

1..Nominal values of the yield strength and the ultimate tensile strength for bolts

Property	Value
Type	Standard Table
Alias	Table_fyb_fub

Description

240000000	320000000	300000000	400000000	480000000	640000000	900000000
400000000	400000000	500000000	500000000	600000000	800000000	1000000000

Checks

This paragraph contains checks descriptions with their results.

1..Bolt joint parameters and coefficients

Property	Value
Category	Elemental Custom Check
Selection	Component '1..Bolts'
Parameters	19

2..Design load

Property	Value
Category	Elemental Custom Check
Selection	Component '1..Bolts'
Parameters	4

1..Design loads

Check	[S2] 2..Design load	Loads Count	6
Selection	Element ID=2		

Load	Design shear load [N]	Preloading force [N]	Design tensile load [N]	Sum off all F_vEd in joint [N]
Load Set '1..S_sd 450 kN'	79.1e+3	137.1e+3	83.0e+3	791.2e+3
Load Set '2..S_sd 500 kN'	87.9e+3	137.1e+3	92.2e+3	879.1e+3
Load Set '3..S_sd 600 kN'	105.5e+3	137.1e+3	110.6e+3	1054.9e+3
Load Set '4..S_sd 800 kN'	140.7e+3	137.1e+3	147.5e+3	1406.5e+3
Load Set '5..S_sd 1000 kN'	175.8e+3	137.1e+3	184.4e+3	1758.1e+3
Load Group '1..Over all'	175.8e+3	137.1e+3	184.4e+3	1758.1e+3

3..Category A and D. Bearing type (non-preloaded)

Property	Value
Category	Elemental Custom Check
Selection	All Entities
Parameters	10

1..Extreme table results for IL

Standard	2..Eurocode3 Bolts (EN 1993-1-8, 2005)	Check	[S2] 3..Category A and D. Bearing type (non-preloaded)
Individual Load	IL1..S_sd 424.26kN	Selection	Component '1..Bolts'

Extreme	Shear resistance per shear plane [N]	Categori a A Utilizatio n factor 1	Bearing resistance [N]	Categori a A Utilizatio n factor 2	Tension resistance [N]	Categori a D Utilizatio n factor 1	Punchin g shear resistanc e [N]	Categori a D Utilizatio n factor 2	Combine d utilizatio n factor
Minimum									
Value	120.6e+3	0.62	137.5e+3	0.54	141.0e+3	0.51	369.1e+3	0.19	0.99
Element ID	1	2	1	2	1	1	1	1	1
Maximum									
Value	120.6e+3	0.63	137.5e+3	0.55	141.0e+3	0.55	369.1e+3	0.21	1.01
Element ID	1	4	1	4	1	2	1	2	3
Absolute									
Value	120.6e+3	0.63	137.5e+3	0.55	141.0e+3	0.55	369.1e+3	0.21	1.01
Element ID	1	4	1	4	1	2	1	2	3

Extreme	Utilization factor total
Minimum	
Value	0.99
Element ID	1
Maximum	
Value	1.01
Element ID	3
Absolute	
Value	1.01
Element ID	3

2..LG flow table for the worst element

Standard	2..Eurocode3 Bolts (EN 1993-1-8, 2005)	Check	[S2] 3..Category A and D. Bearing type (non-preloaded)
Load Group	LG1..Over all	Selection	Element ID=3

ID / Point	Shear resistance per shear plane [N]	Categoria A Utilization factor 1	Bearing resistance [N]	Categoria A Utilization factor 2	Tension resistance [N]	Categoria D Utilization factor 1	Punching shear resistance [N]	Categoria D Utilization factor 2	Combined utilization factor
3									
1 I / Top	120.6e+3	1.46	137.5e+3	1.28	141.0e+3	1.31	369.1e+3	0.50	2.39
2 I / Top	120.6e+3	1.46	137.5e+3	1.28	141.0e+3	1.31	369.1e+3	0.50	2.39
3 I / Top	120.6e+3	1.46	137.5e+3	1.28	141.0e+3	1.31	369.1e+3	0.50	2.39
4 I / Top	120.6e+3	1.46	137.5e+3	1.28	141.0e+3	1.31	369.1e+3	0.50	2.39
1 J / Bottom	120.6e+3	1.46	137.5e+3	1.28	141.0e+3	1.31	369.1e+3	0.50	2.39
2 J / Bottom	120.6e+3	1.46	137.5e+3	1.28	141.0e+3	1.31	369.1e+3	0.50	2.39
3 J / Bottom	120.6e+3	1.46	137.5e+3	1.28	141.0e+3	1.31	369.1e+3	0.50	2.39
4 J / Bottom	120.6e+3	1.46	137.5e+3	1.28	141.0e+3	1.31	369.1e+3	0.50	2.39
End I / Top	120.6e+3	1.46	137.5e+3	1.28	141.0e+3	1.31	369.1e+3	0.50	2.39
End J / Bottom	120.6e+3	1.46	137.5e+3	1.28	141.0e+3	1.31	369.1e+3	0.50	2.39
Total	120.6e+3	1.46	137.5e+3	1.28	141.0e+3	1.31	369.1e+3	0.50	2.39

ID / Point	Utilization factor total
3	
1 I / Top	2.39
2 I / Top	2.39
3 I / Top	2.39
4 I / Top	2.39
1 J / Bottom	2.39
2 J / Bottom	2.39
3 J / Bottom	2.39
4 J / Bottom	2.39
End I / Top	2.39
End J / Bottom	2.39
Total	2.39

3..Flow table results over all loads

Check	[S2] 3..Category A and D. Bearing type (non-preloaded)	Loads Count	6
Selection	Element ID=3		

Load	Shear resistance per shear plane [N]	Categoria A Utilization factor 1	Bearing resistance [N]	Categoria A Utilization factor 2	Tension resistance [N]	Categoria D Utilization factor 1	Punching shear resistance [N]	Categoria D Utilization factor 2	Combined utilization factor
Load Set '1..S_sd 450 kN'	120.6e+3	0.66	137.5e+3	0.58	141.0e+3	0.59	369.1e+3	0.22	1.08
Load Set '2..S_sd 500 kN'	120.6e+3	0.73	137.5e+3	0.64	141.0e+3	0.65	369.1e+3	0.25	1.20
Load Set '3..S_sd 600 kN'	120.6e+3	0.87	137.5e+3	0.77	141.0e+3	0.78	369.1e+3	0.30	1.43
Load Set '4..S_sd 800 kN'	120.6e+3	1.17	137.5e+3	1.02	141.0e+3	1.05	369.1e+3	0.40	1.91
Load Set '5..S_sd 1000 kN'	120.6e+3	1.46	137.5e+3	1.28	141.0e+3	1.31	369.1e+3	0.50	2.39
Load Group '1..Over all'	120.6e+3	1.46	137.5e+3	1.28	141.0e+3	1.31	369.1e+3	0.50	2.39

Load	Utilization factor total
Load Set '1..S_sd 450 kN'	1.08
Load Set '2..S_sd 500 kN'	1.20
Load Set '3..S_sd 600 kN'	1.43
Load Set '4..S_sd 800 kN'	1.91
Load Set '5..S_sd 1000 kN'	2.39
Load Group '1..Over all'	2.39

Load	Utilization factor total

1..Abs Utilization factor total (LG1, Component '1..Bolts', v1, Total)

Output Set; SDC.WorkOutputSet
Criteria: [S2] 3..Category A and D. Bearing type (non-preloaded) : LG1; Utiliza
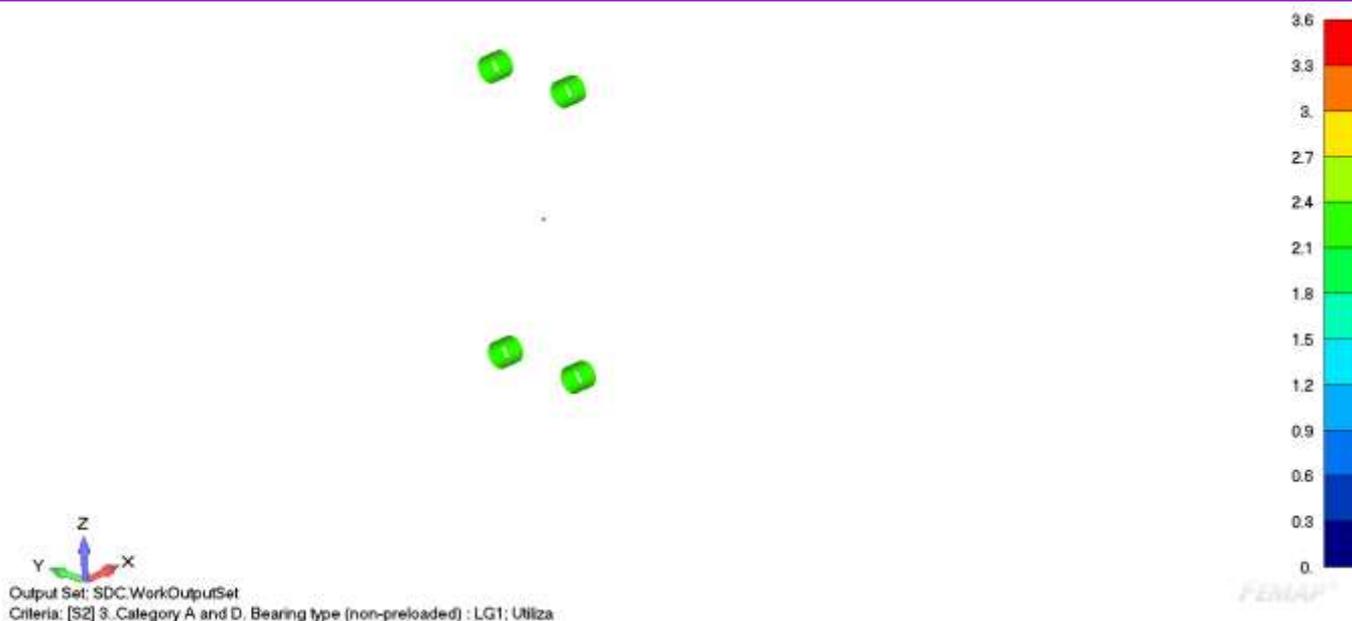
Check	[S2] 3..Category A and D. Bearing type (non-preloaded)	Point	Total
Load Group	LG1..Over all	Parameter	Absolute Utilization factor total
Selection	Component '1..Bolts'	View	1..Default View

2..Utilization factor total (IL1, Component '1..Bolts', v1, Total)

Output Set; SDC.WorkOutputSet
Criteria: [S2] 3..Category A and D. Bearing type (non-preloaded) : IL1; Utiliza

Check	[S2] 3..Category A and D. Bearing type (non-preloaded)	Point	Total
Individual Load	IL1..S_sd 424.26kN	Parameter	Utilization factor total
Selection	Component '1..Bolts'	View	1..Default View