

DECLARATION OF PERFORMANCE
DoP No. 2873-CPR-401-7 / 01.21-EN

1. Unique identification code of the product-type: **Toge concrete screw TSM high performance**
2. Type, batch or serial number or any other element allowing identification of the construction product as required pursuant to Article 11(4):

Annex A 2

Batch number: see packaging of the product.

3. Intended use or uses of the construction product, in accordance with the applicable harmonised technical specification, as foreseen by the manufacturer:

generic type	concrete screw
for use in	Cracked and non-cracked concrete C 20/25-C 50/60 (EN 206) covered sizes: 6, 8,10,12,14
option / category	Option 1 Seismic category C1
loading	static or quasi-static
material	<u>zinc-plated steel, steel with zinc flake coating :</u> dry internal conditions only <u>stainless steel</u> internal and external use without particular aggressive conditions <u>high corrosion resistant steel</u> internal and external use with particular aggressive conditions covered sizes: 6, 8,10,12,14

4. Name, registered trade name or registered trade mark and contact address of the manufacturer as required pursuant to Article 11(5):
Toge Dübel GmbH & Co. KG, Illesheimer Strasse 10, 90431 Nuernberg
5. Where applicable, name and contact address of the authorised representative whose mandate covers the tasks specified in Article 12(2): --
6. System or systems of assessment and verification of constancy of performance of the construction product as set out in Annex V: **System 1**
7. In case of the declaration of performance concerning a construction product covered by a harmonised standard: --
8. In case of the declaration of performance concerning a construction product for which a European Technical Assessment has been issued:

Deutsches Institut für Bautechnik, Berlin

has issued the following:

ETA-15/0514

on the basis of

EAD 330232-00-0601

The notified body **2873-CPR** performed

- i) determination of the product-type on the basis of type testing (including sampling), type calculation, tabulated values or descriptive documentation of the product ;
- ii) factory production control.
- iii) testing of samples taken at the factory in accordance with a prescribed test plan.

and has issued the following: certificate of conformity 2873-CPR-401-7.

9. Declared performance:


Essential Characteristics	Design Method	Performance	Harmonized Technical Specification
Characteristic resistance for tension load	EN 1992-4	Annex B4, C1 and C2	EOTA TR 045 EAD 330232-00-0601 EAD 330011-00-0601
Characteristic resistance for shear load	EN 1992-4	Annex C1, C2	
Displacement for serviceability limit state	EN 1992-4	Annex C7	
Characteristic resistance for seismic	CEN/TS 1992-4:2009	Annex C3, C4, C5 and C8	
Characteristic resistance under fire exposure	CEN/TS 1992-4:2009	Annex C6	

Where pursuant to Article 37 or 38 in the Specific Technical Documentation has been used, the requirements with which the product complies: --

This declaration of performance is issued under the sole responsibility of the manufacturer identified in point 4.

Signed for and on behalf of the manufacturer by:




Waldemar Gunkel
Dipl.-Wirtsch.-Ing. (FH), B.Eng.
Head of Engineering

Nuernberg, 2024-09-12

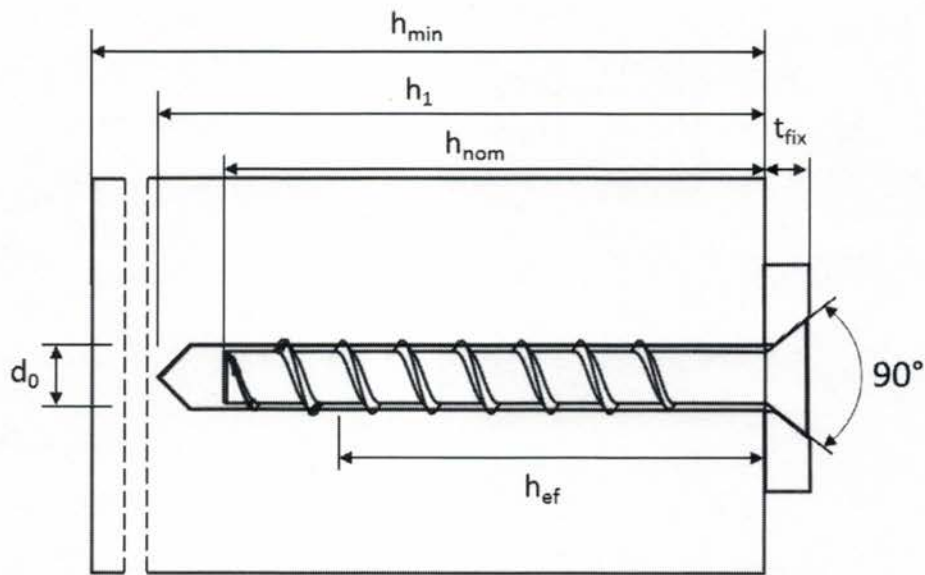

Andreas Gerhard
CEO

Nuernberg, 2024-09-12

Table 5: Minimum thickness of member, minimum edge distance and minimum spacing

TSM concrete screw size		6		8			10		
Nominal embedment depth	h_{nom}	h_{nom1}	h_{nom2}	h_{nom1}	h_{nom2}	h_{nom3}	h_{nom1}	h_{nom2}	h_{nom3}
	[mm]	40	55	45	55	65	55	75	85
Minimum thickness of member	h_{min}	[mm]	100	100		120	100	130	
Minimum edge distance	c_{min}	[mm]	40	40	50		50		
Minimum spacing	s_{min}	[mm]	40	40	50		50		

TSM concrete screw size		12			14			
Nominal embedment depth	h_{nom}	h_{nom1}	h_{nom2}	h_{nom3}	h_{nom1}	h_{nom2}	h_{nom3}	
	[mm]	65	85	100	75	100	115	
Minimum thickness of member	h_{min}	[mm]	120	130	150	130	150	170
Minimum edge distance	c_{min}	[mm]	50		70	50	70	
Minimum spacing	s_{min}	[mm]	50		70	50	70	



TOGE concrete screw TSM High Performance

Intended use

Minimum thickness of member, minimum edge distance and minimum spacing

Annex B4

Table 6: Characteristic values for static and quasi-static loading, sizes 6-10

TSM concrete screw size			6			8			10		
Nominal embedment depth	h_{nom}	h_{nom1}	h_{nom2}	h_{nom1}	h_{nom2}	h_{nom3}	h_{nom1}	h_{nom2}	h_{nom3}		
	[mm]	40	55	45	55	65	55	75	85		
Steel failure for tension and shear loading											
Characteristic tension load	$N_{Rk,s}$	[kN]	14,0			27,0			45,0		
Partial factor tension load	$\gamma_{Ms,N}$	[-]	1,5								
Characteristic shear load	$V_{Rk,s}$	[kN]	7,0		13,5		17,0		22,5		34,0
Partial factor shear load	$\gamma_{Ms,V}$	[-]	1,25								
Ductility factor	k_7	[-]	0,8								
Characteristic bending load	$M^0_{Rk,s}$	[Nm]	10,9			26,0			56,0		
Pull-out failure											
Characteristic tension load C20/25	cracked	$N_{Rk,p}$	[kN]	2,0	4,0	5,0	9,0	12,0	9,0	$\geq N^0_{Rk,c}$	
	uncracked	$N_{Rk,p}$	[kN]	4,0	9,0	7,5	12,0	16,0	12,0	20,0	26,0
Increasing factor for $N_{Rk,p}$	C25/30	Ψ_c	[-]	1,12							
	C30/37			1,22							
	C40/50			1,41							
	C50/60			1,58							
Concrete failure: Splitting failure, concrete cone failure and pry-out failure											
Effective embedment depth	h_{ef}	[mm]	31	44	35	43	52	43	60	68	
k-factor	cracked	$k_1 = k_{cr}$	[-]	7,7							
	uncracked	$k_1 = k_{ucr}$	[-]	11,0							
Concrete cone failure	spacing	$s_{cr,N}$	[mm]	$3 \times h_{ef}$							
	edge distance	$c_{cr,N}$	[mm]	$1,5 \times h_{ef}$							
Splitting failure	spacing	$s_{cr,Sp}$	[mm]	120	160	120	140	150	140	180	210
	edge distance	$c_{cr,Sp}$	[mm]	60	80	60	70	75	70	90	105
Factor for pry-out failure	k_8	[-]	1,0						2,0		
Installation factor	γ_{inst}	[-]	1,0								
Concrete edge failure											
Effective length in concrete	$l_f = h_{ef}$	[mm]	31	44	35	43	52	43	60	68	
Nominal outer diameter of screw	d_{nom}	[mm]	6			8			10		
TOGE concrete screw TSM High Performance									Annex C1		
Performances Characteristic values for static and quasi-static loading, sizes 6-10											

Table 7: Characteristic values for static and quasi-static loading, sizes 12-14

TSM concrete screw size			12			14			
Nominal embedment depth	h_{nom}	h_{nom1}	h_{nom2}	h_{nom3}	h_{nom1}	h_{nom2}	h_{nom3}		
	[mm]	65	85	100	75	100	115		
Steel failure for tension and shear loading									
Characteristic tension load	$N_{Rk,s}$	[kN]	67,0			94,0			
Partial factor tension load	$\gamma_{Ms,N}$	[-]	1,5						
Characteristic shear load	$V_{Rk,s}$	[kN]	33,5	42,0		56,0			
Partial factor shear load	$\gamma_{Ms,V}$	[-]	1,25						
Ductility factor	k_7	[-]	0,8						
Characteristic bending load	$M^0_{Rk,s}$	[Nm]	113,0			185,0			
Pull-out failure									
Characteristic tension load C20/25	cracked	$N_{Rk,p}$	[kN]	12,0	$\geq N^0_{Rk,c}$				
	uncracked	$N_{Rk,p}$	[kN]	16,0					
Increasing factor for $N_{Rk,p}$	C25/30	ψ_c	[-]	1,12					
	C30/37			1,22					
	C40/50			1,41					
	C50/60			1,58					
Concrete failure: Splitting failure, concrete cone failure and pry-out failure									
Effective embedment depth	h_{ef}	[mm]	50	67	80	58	79	92	
k-factor	cracked	$k_1 = k_{cr}$	[-]	7,7					
	uncracked	$k_1 = k_{ucr}$	[-]	11,0					
Concrete cone failure	spacing	$s_{cr,N}$	[mm]	$3 \times h_{ef}$					
	edge distance	$c_{cr,N}$	[mm]	$1,5 \times h_{ef}$					
Splitting failure	spacing	$s_{cr,Sp}$	[mm]	150	210	240	180	240	280
	edge distance	$c_{cr,Sp}$	[mm]	75	105	120	90	120	140
Factor for pry-out failure	k_8	[-]	1,0	2,0		1,0	2,0		
Installation factor	γ_{inst}	[-]	1,0						
Concrete edge failure									
Effective length in concrete	$l_f = h_{ef}$	[mm]	50	67	80	58	79	92	
Nominal outer diameter of screw	d_{nom}	[mm]	12			14			
TOGE concrete screw TSM High Performance							Annex C2		
Performances Characteristic values for static and quasi-static loading, sizes 12-14									

Table 8: Seismic category C1 – Characteristic load values

TSM concrete screw size			8	10	12	14
Nominal embedment depth	h_{nom}	h_{nom3}				
	[mm]	65	85	100	115	
Steel failure for tension and shear load						
Characteristic load	$N_{Rk,s,eq}$	[kN]	27,0	45,0	67,0	94,0
Partial factor tension load	γ_{Ms}	[-]	1,5			
Characteristic load	$V_{Rk,s,eq}$	[kN]	8,5	15,3	21,0	22,4
Partial factor shear load	γ_{Ms}	[-]	1,25			
With filling of the annular gap ¹⁾	α_{gap}	[-]	1,0			
Without filling of the annular gap	α_{gap}	[-]	0,5			
Pull-out failure						
Characteristic tension load in cracked concrete C20/25	$N_{Rk,p,eq}$	[kN]	12,0	$\geq N^0_{Rk,c}$		
Concrete cone failure						
Effective embedment depth	h_{ef}	[mm]	52	68	80	92
Edge distance	$c_{cr,N}$	[mm]	$1,5 \times h_{ef}$			
Spacing	$s_{cr,N}$	[mm]	$3 \times h_{ef}$			
Installation safety factor	γ_{inst}	[-]	1,0			
Concrete pry-out failure						
Factor for pry-out failure	k_8	[-]	1,0	2,0		
Concrete edge failure						
Effective length in concrete	$l_f = h_{ef}$	[mm]	52	68	80	92
Nominal outer diameter of screw	d_{nom}	[mm]	8	10	12	14

1) Filling of the annular gap according to annex B7, figure 5

TOGE concrete screw TSM High Performance

Performances
Seismic category C1 – Characteristic load values

Annex C3

Table 9: Seismic category C2 ¹⁾ – Characteristic load values with filled annular gap according to annex B7, figure 5

TSM concrete screw size			8	10	12	14
Nominal embedment depth	h_{nom}		h_{nom3}			
	[mm]		65	85	100	115
Steel failure for tension						
Characteristic load	$N_{Rk,s,eq}$	[kN]	27,0	45,0	67,0	94,0
Partial factor tension load	γ_{Ms}	[-]	1,5			
With filling of the annular gap	α_{gap}	[-]	1,0			
Pull-out failure						
Characteristic load in cracked concrete	$N_{Rk,p,eq}$	[kN]	2,4	5,4	7,1	10,5
Steel failure for shear load						
Characteristic load	$V_{Rk,s,eq}$	[kN]	9,9	18,5	31,6	40,7
Partial factor shear load	γ_{Ms}	[-]	1,25			
With filling of the annular gap	α_{gap}	[-]	1,0			
Concrete cone failure						
Effective embedment depth	h_{ef}	[mm]	52	68	80	92
Edge distance	$c_{cr,N}$	[mm]	$1,5 \times h_{ef}$			
Spacing	$s_{cr,N}$	[mm]	$3 \times h_{ef}$			
Installation safety factor	γ_{Inst}	[-]	1,0			
Concrete pry-out failure						
Factor for pry-out failure	k_8	[-]	2,0			
Concrete edge failure						
Effective length in concrete	$l_f = h_{ef}$	[mm]	52	68	80	92
Nominal outer diameter of screw	d_{nom}	[mm]	8	10	12	14

1) A4 and HCR not suitable

TOGE concrete screw TSM High Performance	Annex C4
Performances Seismic category C2 – Characteristic load values with filled annular gap	

Table 10: Seismic category C2 ¹⁾ – Characteristic load values **without filled annular gap according to annex B7, figure 3**

TSM concrete screw size			8	10	12	14
Nominal embedment depth	h_{nom}	h_{nom3}				
	[mm]	65	85	100	115	
Steel failure for tension (hexagon head type)						
Characteristic load	$N_{Rk,s,eq}$	[kN]	27,0	45,0	67,0	94,0
Partial factor tension load	γ_{Ms}	[-]	1,5			
Pull-out failure (hexagon head type)						
Characteristic load in cracked concrete	$N_{Rk,p,eq}$	[kN]	2,4	5,4	7,1	10,5
Steel failure for shear load (hexagon head type)						
Characteristic load	$V_{Rk,s,eq}$	[kN]	10,3	21,9	24,4	23,3
Partial factor shear load	γ_{Ms}	[-]	1,25			
Without filling of the annular gap	α_{gap}	[-]	0,5			
Steel failure for tension (countersunk head type)						
Characteristic load	$N_{Rk,s,eq}$	[kN]	27,0	45,0	-	
Partial factor tension load	γ_{Ms}	[-]	1,5			
Pull-out failure (countersunk head type)						
Characteristic load in cracked concrete	$N_{Rk,p,eq}$	[kN]	2,4	5,4	-	
Steel failure for shear load (countersunk head type)						
Characteristic load	$V_{Rk,s,eq}$	[kN]	3,6	13,7	-	
Partial factor shear load	γ_{Ms}	[-]	1,25			
Without filling of the annular gap	α_{gap}	[-]	0,5			
Concrete cone failure						
Effective embedment depth	h_{ef}	[mm]	52	68	80	92
Edge distance	$c_{cr,N}$	[mm]	$1,5 \times h_{ef}$			
Spacing	$s_{cr,N}$	[mm]	$3 \times h_{ef}$			
Installation safety factor	γ_{inst}	[-]	1,0			
Concrete pry-out failure						
Factor for pry-out failure	k_8	[-]	2,0			
Concrete edge failure						
Effective length in concrete	$l_f = h_{ef}$	[mm]	52	68	80	92
Nominal outer diameter of screw	d_{nom}	[mm]	8	10	12	14

1) A4 and HCR not suitable

TOGE concrete screw TSM High Performance

Performances

Seismic category C2 – Characteristic load values without filled annular gap

Annex C5

Table 11: Fire exposure – characteristic values of resistance

TSM concrete screw size			6		8			10			12			14						
Nominal embedment depth	h_{nom}		1	2	1	2	3	1	2	3	1	2	3	1	2	3				
	[mm]		40	55	45	55	65	55	75	85	65	85	100	75	100	115				
Steel failure for tension and shear load ($F_{Rk,s,fi} = N_{Rk,s,fi} = V_{Rk,s,fi}$)																				
characteristic Resistance	R30	$F_{Rk,s,fi30}$	[kN]	0,9			2,4			4,4			7,3			10,3				
	R60	$F_{Rk,s,fi60}$	[kN]	0,8			1,7			3,3			5,8			8,2				
	R90	$F_{Rk,s,fi90}$	[kN]	0,6			1,1			2,3			4,2			5,9				
	R120	$F_{Rk,s,fi120}$	[kN]	0,4			0,7			1,7			3,4			4,8				
	R30	$M^0_{Rk,s,fi30}$	[Nm]	0,7			2,4			5,9			12,3			20,4				
	R60	$M^0_{Rk,s,fi60}$	[Nm]	0,6			1,8			4,5			9,7			15,9				
	R90	$M^0_{Rk,s,fi90}$	[Nm]	0,5			1,2			3,0			7,0			11,6				
	R120	$M^0_{Rk,s,fi120}$	[Nm]	0,3			0,9			2,3			5,7			9,4				
Pull-out failure																				
Characteristic Resistance	R30-R90	$N_{Rk,p,fi}$	[kN]	0,5	1,0	1,3	2,3	3,0	2,3	4,0	4,8	3,0	4,7	6,2	3,8	6,0	7,6			
	R120	$N_{Rk,p,fi}$	[kN]	0,4	0,8	1,0	1,8	2,4	1,8	3,2	3,9	2,4	3,8	4,9	3,0	4,8	6,1			
Concrete cone failure																				
Characteristic Resistance	R30-R90	$N^0_{Rk,c,fi}$	[kN]	0,9	2,2	1,2	2,1	3,4	2,1	4,8	6,6	3,0	6,3	9,9	4,4	9,6	14,0			
	R120	$N^0_{Rk,c,fi}$	[kN]	0,7	1,8	1,0	1,7	2,7	1,7	3,8	5,3	2,4	5,1	7,9	3,5	7,6	11,2			
Edge distance																				
R30 bis R120	$c_{cr,fi}$	[mm]	$2 \times h_{ef}$																	
In case of fire attack from more than one side, the minimum edge distance shall be ≥ 300 mm.																				
Spacing																				
R30 bis R120	$s_{cr,fi}$	[mm]	$4 \times h_{ef}$																	
Pry-out failure																				
R30 bis R120	k_8	[-]	1,0			2,0			1,0			2,0			1,0			2,0		
The anchorage depth has to be increased for wet concrete by at least 30 mm compared to the given value.																				
TOGE concrete screw TSM High Performance														Annex C6						
Performances Fire exposure – characteristic values of resistance																				

Table 12: Displacements under static and quasi-static tension load

TSM concrete screw size				6			8			10		
Nominal embedment depth			h_{nom}	h_{nom1}	h_{nom2}	h_{nom1}	h_{nom2}	h_{nom3}	h_{nom1}	h_{nom2}	h_{nom3}	
			[mm]	40	55	45	55	65	55	75	85	
Cracked concrete	tension load	N	[kN]	0,95	1,9	2,4	4,3	5,7	4,3	7,9	9,6	
	displacement	δ_{N0}	[mm]	0,3	0,6	0,6	0,7	0,8	0,6	0,5	0,9	
		$\delta_{N\infty}$	[mm]	0,4	0,4	0,6	1,0	0,9	0,4	1,2	1,2	
Uncracked concrete	tension load	N	[kN]	1,9	4,3	3,6	5,7	7,6	5,7	9,5	11,9	
	displacement	δ_{N0}	[mm]	0,4	0,6	0,7	0,9	0,5	0,7	1,1	1,0	
		$\delta_{N\infty}$	[mm]	0,4	0,4	0,6	1,0	0,9	0,4	1,2	1,2	

TSM concrete screw size				12			14		
Nominal embedment depth			h_{nom}	h_{nom1}	h_{nom2}	h_{nom3}	h_{nom1}	h_{nom2}	h_{nom3}
			[mm]	65	85	100	75	100	115
Cracked concrete	tension load	N	[kN]	5,7	9,4	12,3	7,6	12,0	15,1
	displacement	δ_{N0}	[mm]	0,9	0,5	1,0	0,5	0,8	0,7
		$\delta_{N\infty}$	[mm]	1,0	1,2	1,2	0,9	1,2	1,0
Uncracked concrete	tension load	N	[kN]	7,6	13,2	17,2	10,6	16,9	21,2
	displacement	δ_{N0}	[mm]	1,0	1,1	1,2	0,9	1,2	0,8
		$\delta_{N\infty}$	[mm]	1,0	1,2	1,2	0,9	1,2	1,0

Table 13: Displacements under static and quasi-static shear load

TSM concrete screw size				6			8			10		
Nominal embedment depth			h_{nom}	h_{nom1}	h_{nom2}	h_{nom1}	h_{nom2}	h_{nom3}	h_{nom1}	h_{nom2}	h_{nom3}	
			[mm]	40	55	45	55	65	55	75	85	
Cracked and uncracked concrete	shear load	V	[kN]	3,3			8,6			16,2		
	displacement	δ_{V0}	[mm]	1,55			2,7			2,7		
		$\delta_{V\infty}$	[mm]	3,1			4,1			4,3		

TSM concrete screw size				12			14		
Nominal embedment depth			h_{nom}	h_{nom1}	h_{nom2}	h_{nom3}	h_{nom1}	h_{nom2}	h_{nom3}
			[mm]	65	85	100	75	100	115
Cracked and uncracked concrete	shear load	V	[kN]	20,0			30,5		
	displacement	δ_{V0}	[mm]	4,0			3,1		
		$\delta_{V\infty}$	[mm]	6,0			4,7		

TOGE concrete screw TSM High Performance

Performances
Displacements under static and quasi-static loads

Annex C7

Table 14: Seismic category C2 ¹⁾ – Displacements **with filled annular gap** according to annex B7, figure 5

TSM concrete screw size			8	10	12	14
Nominal embedment depth	h_{nom}	h_{nom3}				
	[mm]	65	85	100	115	
Displacements under tension loads (hexagon head type)						
Displacement DLS	$\delta_{N,eq(DLS)}$	[mm]	0,66	0,32	0,57	1,16
Displacement ULS	$\delta_{N,eq(ULS)}$	[mm]	1,74	1,36	2,36	4,39
Displacements under shear loads (hexagon head type with hole clearance)						
Displacement DLS	$\delta_{V,eq(DLS)}$	[mm]	1,68	2,91	1,88	2,42
Displacement ULS	$\delta_{V,eq(ULS)}$	[mm]	5,19	6,72	5,37	9,27

Table 15: Seismic category C2 ¹⁾ – Displacements **without filled annular gap** according to annex B7, figure 3

TSM concrete screw size			8	10	12	14
Nominal embedment depth	h_{nom}	h_{nom3}				
	[mm]	65	85	100	115	
Displacements under tension loads (hexagon head type)						
Displacement DLS	$\delta_{N,eq(DLS)}$	[mm]	0,66	0,32	0,57	1,16
Displacement ULS	$\delta_{N,eq(ULS)}$	[mm]	1,74	1,36	2,36	4,39
Displacements under tension loads (countersunk head type)						
Displacement DLS	$\delta_{N,eq(DLS)}$	[mm]	0,66	0,32	-	
Displacement ULS	$\delta_{N,eq(ULS)}$	[mm]	1,74	1,36		
Displacements under shear loads (hexagon head type with hole clearance)						
Displacement DLS	$\delta_{V,eq(DLS)}$	[mm]	4,21	4,71	4,42	5,60
Displacement ULS	$\delta_{V,eq(ULS)}$	[mm]	7,13	8,83	6,95	12,63
Displacements under shear loads (countersunk head type with hole clearance)						
Displacement DLS	$\delta_{V,eq(DLS)}$	[mm]	2,51	2,98	-	
Displacement ULS	$\delta_{V,eq(ULS)}$	[mm]	7,76	6,25		

1) A4 and HCR not suitable

TOGE concrete screw TSM High Performance

Performances
Displacements under seismic loads

Annex C8