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GUIDELINE FOR EUROPEAN TECHNICAL APPROVAL

of

PLASTIC ANCHORS FOR MULTIPLE USE IN CONCRETE AND MASONRY FOR NON-STRUCTURAL APPLICATIONS

Part five:

PLASTIC ANCHORS FOR USE IN AUTOCLAVED AERATED CONCRETE (AAC)

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PART FIVE:

PLASTIC ANCHORS FOR USE IN AUTOCLAVED AERATED CONCRETE (AAC)

FOREWORD

In this Part of ETAG "Plastic Anchors for Multiple Use in Concrete and Masonry for Non-Structural Applications" the methods of verification and the assessments required for the use of plastic anchors in autoclaved aerated concrete (AAC) are given. For a general assessment of plastic anchors, on principle, Part 1 applies.

In general this Guideline applies to the use of plastic anchors in autoclaved aerated concrete according to EN 771-4 [9] "Autoclaved aerated concrete masonry units" with a compressive strength 1,8 N/mm² $\leq f_{cm} \leq$ 8,0 N/mm² or EN 12602 [10] "Reinforced components of autoclaved aerated concrete" between strength classes AAC 2 and AAC 6.

If the anchor manufacturer applies for autoclaved aerated concrete masonry units with f_{cm} > 8,0 N/mm² or reinforced components of autoclaved aerated concrete with > AAC 6 to be stated in the ETA, additional tests have to be performed for these compressive strengths (Extrapolation is not possible.).

The required tests for suitability are given in Table 5.1a and b and the tests for admissible service conditions are given in Table 5.2a and b. The determination of admissible service conditions and determination of characteristic resistances for plastic anchors to be used in AAC are given in 6.4.3.

The same numbering of paragraphs as in Part 1 is used.

The plastic anchors for use in autoclaved aerated concrete (AAC) shall be used for multiple fixings. By multiple anchor use it is assumed that in the case of excessive slip or failure of one anchor the load can be transmitted to neighbouring anchors without significantly violating the requirements on the fixture in the serviceability and ultimate limit state.

Therefore the design of the fixture shall specify the number n_1 of fixing points to fasten the fixture and the number n_2 of anchors per fixing point. Furthermore the design value of actions N_{Sd} on a fixing point to a value $\leq n_3$ (kN) is specified up to which the strength and stiffness of the fixture are fulfilled and the load transfer in the case of excessive slip or failure of one anchor need not be taken into account in the design of the fixture.

The following default values for n_1, n_2 and n_3 may be taken:

$\mathbf{n_1 \geq 4}$; $\mathbf{n_2 \geq 1}$ and $\mathbf{n_3 \leq 4{,}5\ kN}$ or

$\mathbf{n_1 \geq 3}$; $\mathbf{n_2 \geq 1}$ and $\mathbf{n_3 \leq 3{,}0\ kN}$.

Section two:

GUIDANCE FOR THE ASSESSMENT OF THE FITNESS FOR USE

5. METHODS OF VERIFICATION

5.4. Safety in use

5.4.2. Tests for suitability

The tests shall be carried out according to Annex A.

In general, all the tests shall be performed with single plastic anchors without edge or spacing effects under tension loading.

(1) Tests for plastic anchors for use in non-cracked AAC (AAC blocks)

The tests shall be performed in single units or in a wall with units glued together. The walls may be lightly prestressed in vertical direction to allow handling and transportation of the wall.

The types of suitability tests, test conditions, the number of required tests and the criteria applied to the results are given in Table 5.1a: non-cracked AAC (AAC blocks).

Suitability tests of the functioning under conditioning and temperature (Table 5.1a, line 4 and 5) may be omitted if there is information about the influence (α-factor) of the load bearing behaviour from suitability tests in concrete according to Part 2 or in solid masonry according to Part 3.

(2) Tests for plastic anchors for use in reinforced AAC (prefabricated reinforced AAC members)

Some additional tests have to be carried out in prefabricated reinforced AAC, if the anchor shall also be assessed for the use in reinforced AAC. The types of the additional suitability tests, test conditions, the number of required tests and the criteria applied to the results are given in Table 5.1b: reinforced AAC (prefabricated reinforced AAC members).

Table 5.1a: Suitability tests for plastic anchors for use in non-cracked AAC (AAC blocks)

	1	2	3	4	5	6	7	8
	Purpose of test	**Strength of AAC**	**Drill bit**	**Ambient temperature (1)**	**Condition Polymeric Sleeve (8)**	**Minimum Number of tests per anchor size (11)**	**Criteria ultimate load req.α**	**Remarks to the test procedure described in Part 1**
1	Setting capacity for nailed-in anchors only	Low strength AAC: $1{,}8\ N/mm^2 \le f_{cm} \le 2{,}8\ N/mm^2$	$d_{cut,max}$	mint T **(2)**	standard	5	≥ 0,9	5.4.2.2
4	Functioning under conditioning of anchor sleeve		$d_{cut,m}$ $d_{cut,m}$	normal normal	dry wet	5 5	≥ 0,8 ≥ 0,8	5.4.2.5
5	Functioning, effect of temperature		$d_{cut,m}$ $d_{cut,m}$ $d_{cut,m}$ $d_{cut,m}$	min T **(3)** 0 °C **(4)** LT: +50 °C **(6)** ST: +80 °C **(6)**	standard standard standard standard	5 5 5 5	≥ 1,0 ≥ 1,0 ≥ 1,0 ≥ 0,8 **(10)**	5.4.2.6
6	Functioning under sustained loads		$d_{cut,m}$ $d_{cut,m}$	normal LT: +50 °C **(6)**	standard standard	5 5	≥ 0,9 ≥ 0,9	5.4.2.7 **(13)**
8	Maximum torque moment		$d_{cut,m}$	normal	standard	5		5.4.2.9

Table 5.1b: Additional suitability tests for plastic anchors for use in reinforced AAC (prefabricated reinforced AAC members)

	1	2	3	4	5	6	7	8	9
	Purpose of test	**Strength of reinforced AAC**	**Crack width Δw [mm]**	**Drill bit**	**Ambient temperature (1)**	**Condition polymeric sleeve (8)**	**Minimum number of tests per anchor size**	**Criteria ultimate load req.α**	**Remarks to the test procedure described in Part 1**
3	Functioning in cracks **(14)**	AAC 2 AAC 6	0,35 0,35	$d_{cut,m}$ $d_{cut,m}$	normal normal	standard standard	5 5	≥ 0,75 ≥ 0,75	5.4.2.4

(1) Normal ambient temperature: +21 ± 3 °C (plastic anchor and base material AAC),

(2) Minimum installation temperature as specified by the manufacturer; normally 0 °C to + 5 °C.

(3) Tests with lowest service temperature (min T) as specified by the manufacturer

(4) Installation at minimum installation temp. as specified by the manufacturer; normally 0 °C to + 5 °C.

(6) These values apply for temperature range b) according to Part 1, 4.4.2.6 (**LT** = maximum **long** term temperature +50 °C; **ST** = maximum **short** term temperature +80 °C). For temperature range a) and c) see Part 1, 4.4.2.6.

(8) Conditioning of polymeric anchor sleeve according to Part 1, 5.4.2.5

(10) Reference values from the tests with maximum long term temperature +50 °C

(11) Number of tests, if one anchor size only; if more than one size shall be assessed, then the smallest, the medium and the largest size shall be tested. Intermediate sizes shall be tested according to line 1, 6 and 8; these intermediate sizes shall not be tested, if the tests from line 1 of Table 5.2 show a regularity in failure mode and ultimate load.

(13) N_{Rk} Part 1, 5.4.2.7 (5.3); characteristic resistance N_{Rk} as given in the ETA evaluated according to 6.4.3.3

(14) The tests shall be carried out with the most unfavourable direction of expansion determined in test line 1, Table 5.2b.

5.4.3. Tests for admissible service conditions

The tests for determination of the admissible service conditions are given in Table 5.2a and/or Table 5.2b.

If existing information is available from the manufacturer and the corresponding test report contains all relevant data, then the Approval Body may reduce the number of tests for admissible service conditions, making use of this existing information. However, it will be considered in the assessment only if the results are consistent with the Institute's test results and experience.

All tests for determination of admissible service conditions shall be carried out in single units or in a wall for non-cracked AAC and in prefabricated reinforced AAC at normal ambient temperature (+21°C ± 3°C) and standard conditioning of the polymeric sleeve according to 5.4.2.5 of Part 1. The drill holes shall be drilled using $d_{cut,m}$ drill bits. The anchor installation shall be carried out according to the manufacturer's published instructions.

Table 5.2a: Tests for admissible service conditions for plastic anchors for use in non-cracked AAC (AAC blocks)

	1	2	3	4	5	6	7
	Purpose of test	**Strength of AAC [N/mm²]**	**Load direc-tion**	**Distances**	**Member thickness h**	**Minimum number of tests for s, m, l (2)**	**Remarks**
1	Characteristic resistance for tension loading not influenced by edge and spacing effects	$1{,}8 \leq f_{cm} \leq 2{,}8$ $6{,}5 \leq f_{cm} \leq 8{,}0$	N	$s > s_{min}$ $c > c_{min}$	$\geq h_{min}$	5 5	test with single anchor in the centre of the block
2	Edge distance to end of wall for characteristic tension resistance **(1)**	$1{,}8 \leq f_{cm} \leq 2{,}8$ $6{,}5 \leq f_{cm} \leq 8{,}0$	N	$s > s_{min}$ $c = c_{min}$	$= h_{min}$	5 5	test with single anchor at the corner

Table 5.2b: Tests for admissible service conditions for plastic anchors for use in reinforced AAC (prefabricated reinforced AAC members)

	1	2	3	4	5	6	7	8
	Purpose of test	**Strength class of reinforced AAC**	**Crack width Δw [mm]**	**Load direc-tion**	**Distances**	**Member thickness h**	**Minimum number of tests s, m, l (2)**	**Remarks**
1	Characteristic resistance for tension loading not influenced by edge and spacing effects	AAC 2 AAC 6	0,2	N	$s > s_{min}$ $c > c_{min}$	$\geq h_{min}$	5 5	test with single anchor
2	Edge distance to end of member for characteristic tension resistance **(1)**	AAC 2 AAC 6	0	N	$s > s_{min}$ $c = c_{min}$	$= h_{min}$	5 5	test with single anchor at the corner

(1) Tension tests with double anchor group with $s = s_{min}$ near the free edge ($c = c_{min}$) to determine the characteristic resistance depending for the minimum spacing s_{min} and the minimum edge distance c_{min} are required if the chosen minimum spacing is lower than the following values:

$s_{min} < 4 \cdot c_{min}$ (groups with spacing parallel to the edge)

$s_{min} < 2 \cdot c_{min}$ (groups with spacing perpendicular to the edge)

(2) Anchor sizes small (s), medium (m) and large (l) of an anchor system shall be tested; intermediate sizes need not to be tested

6. ASSESSING AND JUDGING THE FITNESS FOR USE

6.4. Safety in use

6.4.1.2. Conversion of ultimate loads to take account of concrete-, masonry- and steel strength

In contrast to Equation (6.0b) the conversion of the test results in autoclaved aerated concrete shall be carried out as follows:

(1) General

The tests results shall be converted as far as compressive strength and dry density are concerned.

(2) Compressive strength

- **AAC blocks:**

  For AAC blocks the characteristic compressive strength shall be determined from the declared value of compressive strength according to EN 771-4 [9] using the factor of 0,9.

  $$f_{ck} = 0{,}9 \; f_{c,decl}$$

- **Prefabricated reinforced AAC members:**

  For prefabricated reinforced AAC members the characteristic compressive strengths f_{ck} of strength AAC 2 and AAC 6 given in EN 12602 [10] shall be used for conversion of the test results.

(3) Dry density

As reference values of dry density the following minimum values of dry density shall be used for AAC for conversion of the test results:

low strength AAC: $\rho_{min} = 350\ kg/m^3$

high strength AAC: $\rho_{min} = 650\ kg/m^3$

(4) Conversion of test results

The test results obtained for low and high strength AAC shall be converted using the following Equation:

$$F_{Ru}^{tk} = F_{Ru}^{t} \frac{\rho_{min}^{3/4} \cdot f_{ck}}{\rho_{test}^{3/4} \cdot f_{c,test}} \quad [kN] \qquad (6.5)$$

From the above, the 5 %-fractile for the ultimate load shall be derived.

(5) Characteristic failure load (ultimate load) of the different strength of AAC

For the strength between low and high strength AAC the characteristic failure loads shall be determined by linear interpolation of the converted test results.

6.4.1.3 Criteria for all tests

In all tests the following criteria shall be met:

(2) In general, in each test series, the coefficient of variation of the ultimate load shall be smaller than v = 20 % in the **suitability tests** and v = 15 % in the **admissible service condition tests**.

If the coefficient of variation of the ultimate load in the **suitability test** is greater than 20 %, then the following α_V-value has to be taken into account:

$$\alpha_V = \frac{1}{1+0{,}03(v[\%]-20)} \leq 1{,}0 \qquad \textbf{(6.6a)}$$

If the coefficient of variation of the ultimate load in the **admissible service condition test** is greater than 15 %, then the following α_V-value has to be taken into account:

$$\alpha_V = \frac{1}{1+0{,}03(v[\%]-15)} \leq 1{,}0 \qquad \textbf{(6.6b)}$$

6.4.2. Criteria valid for suitability tests

In the suitability tests according to Table 5.1a and/or b the criteria described in the relevant sections of Part 1, 6.4 shall be met. The values of the reference tests are taken from the tests according to Table 5.2a, line 1 (for non-cracked AAC) and Table 5.2b, line 1 (for reinforced AAC) with the worst expansion direction of the anchor.

If there are existing tests for suitability of the functioning under conditioning and temperature carried out in concrete according to Part 2 or in solid masonry according to Part 3, Table 5.1, line 4 and 5, then the results of these suitability tests (min$\alpha_{1,}$ minα_2 and minα_V) may be taken for the determination of the characteristic values of the plastic anchors to be used in autoclaved aerated concrete. In case this option is exercised the results of these suitability tests (specifically Table 5.1, line 5) may also be used to determine the reference value for the comparison with the pullout tests subsequent to the sustained loading at maximum long term temperature (Table 5.1, line 6).

6.4.3. Admissible service conditions

6.4.3.1. General

In all tension tests the requirement for the load/displacement curves shall satisfy the requirements laid down in Part 1, 6.4.1.3 (1). The requirement of the coefficient of variation of the ultimate load is taken from 6.4.1.3 (2) Equation (6.6b).

6.4.3.2. Characteristic resistance of single anchor for the different conditions

(1) Tension loading not influenced by edge and spacing effects (Table 5.2a or b, line 1)

The characteristic resistances for single anchors without edge and spacing effects under tension loading shall be calculated as follows:

$$N_{Rk} = N_{Rk1,0} \cdot \min^{1)} (\min \alpha_1 ; \min \alpha_{2,\,line\,1,3,6}) \cdot \min \alpha_{2,\,line\,4,5} \cdot \min \alpha_V \qquad (6.7)$$

1) *The lowest value of min α_1 or min $\alpha_{2,\,line\,1,3,6}$ is governing.*

with:

$N_{Rk1,0}$ = characteristic resistance from the tests Table 5.2a or b, line 1 converted according to 6.4.1.2.

min α_1 = minimum value α_1 (reduction factor from the load/displacement behaviour) according to Part 1, Equation (6.2) of all tests

$\leq$ **1,0**

min $\alpha_{2,\,line\,4,5}$ = minimum value α_2 (reduction factor from the ultimate loads of the suitability tests) according to Part 1,Equation (6.5) of suitability tests according to Table 5.1, line 4 and 5 (conditioning and temperature)

$\leq$ **1,0**

min $\alpha_{2,\,line\,1,3,6}$ = minimum value α_2 (reduction factor from the ultimate loads of the suitability tests) according to Part 1,Equation (6.5) of suitability tests according to Table 5.1a, line 1 and 6 and only for reinforced AAC in addition tests according to Table 5.1b, line 3

$\leq$ **1,0**

min α_V = minimum value α_V to consider a coefficient of variation of the ultimate loads in the suitability and admissible service condition tests larger than 20 % and 15 %, respectively; see Equations (6.6a) and (6.6b).

(2) Tension loading influenced by minimum edge effects (Table 5.2a or b, line 2)

The characteristic resistances for single anchors near the free edge under tension loading shall be calculated as follows:

$$N_{Rk2} = N_{Rk2,0} \cdot \min \alpha_1 \cdot \min \alpha_V \;^{1)} \qquad (6.8)$$

1) If pull-out failure is observed in tests according to Table 5.2a or b, line 2, then the evaluation shall be done according to Equation (6.7).

with:

$N_{Rk2,0}$ = characteristic resistance from the tests Table 5.2a or b, line 2 converted according to 6.4.1.2.

min α_1 = minimum value α_1 (reduction factor from the load/displacement behaviour) according to Part 1, Equation (6.2) of all tests

$\leq$ 1,0

min α_V = minimum value α_V to consider a coefficient of variation of the ultimate loads in the suitability and admissible service condition tests larger than 20 % and 15 %, respectively; see Equations (6.6a) and (6.6b).

(3) Tension loading influenced by minimum spacing effects (Table 5.2a or b, footnote (1))

The characteristic resistances for single anchors with minimum spacing near the free edge under tension loading shall be calculated as follows:

$$N_{Rk3} = N_{Rk3,0} \cdot \min \alpha_1 \cdot \min \alpha_V \quad ^{1)} \qquad (6.9)$$

[1] If pull-out failure is observed in tests according to Table 5.2a or b, footnote (1), then the evaluation shall be done according to Equation (6.7).

with:

$N_{Rk3,0}$	=	characteristic resistance from the tests Table 5.2a or b, footnote (1) converted according to 6.4.1.2.
$\min \alpha_1$	=	minimum value α_1 (reduction factor from the load/displacement behaviour) according to Part 1, Equation (6.2) of all tests
	$\leq$	1,0
$\min \alpha_V$	=	minimum value α_V to consider a coefficient of variation of the ultimate loads in the suitability and admissible service condition tests larger than 20 % and 15 %, respectively; see Equations (6.6a) and (6.6b).

(4) Shear loading

If no shear tests are available, the characteristic shear resistances $V_{Rk,AAC}$ for aerated concrete edge failure may be calculated according to, Annex C for concrete edge failure as follows:

$$V_{Rk,AAC} = 0{,}5 \cdot V_{Rk,AAC} \quad \text{(shear loading in direction to the free edge)}$$

$$V_{Rk,AAC} = 1{,}0 \cdot V_{Rk,AAC} \quad \text{(shear loading in other directions)}$$

The concrete strength $f_{ck,cube}$ has to be replaced by the aerated concrete strength f_{ck} in the relevant Equation of Annex C.

If shear tests towards the edge are performed and aerated concrete edge failure occurs the characteristic shear resistance shall be calculated as follows:

$$V_{Rk,AAC} = V_{Rk,AAC,0} \cdot \min \alpha_V \qquad (6.10)$$

with:

$V_{Rk,AAC,0}$	=	characteristic resistance evaluated from the results of shear tests converted according to 6.4.1.2
$\min \alpha_V$	=	minimum value α_V to consider a coefficient of variation of the ultimate loads in the suitability and admissible service condition tests larger than 20 % and 15 %, respectively; see Equations (6.6a) and (6.6b).

The characteristic shear resistances $V_{Rk,s}$ of the metal expansion element for single anchors may be calculated as follows:

$$V_{Rk,s} = 0{,}5 \cdot A_s \cdot f_{uk} \qquad (6.11)$$

with:

A_s	=	stressed cross section of steel
f_{uk}	=	characteristic steel ultimate tensile strength (nominal value)

6.4.3.3. Characteristic resistance of single anchor in the ETA

For the determination of the characteristic resistance $\mathbf{F_{Rk}}$ the design values for N_{Rk1}, N_{Rk2} , N_{Rk3} , $V_{Rk,AAC}$ and $V_{Rk,s}$ have to be calculated under consideration of the appropriated partial safety factors. The corresponding partial safety factors are given in 7.1.2.

The minimum design value is decisive for the characteristic resistance $\mathbf{F_{Rk}}$ given in the ETA.

The value of the characteristic resistance $\mathbf{F_{Rk}}$ shall be rounded to the following numbers:

$\mathbf{F_{Rk}}$	=	0,3 / 0,4 / 0,5 / 0,6 / 0,75 / 0,9 / 1,2 / 1,5 / 2 / 2,5 / 3 / 3,5 / 4 / 4,5 / 5 / 5,5 / 6 / 6,5 / 7 / 7,5 / 8 / 8,5 / 9 / … kN
	≤	$\mathbf{N_{Sd} \cdot \gamma_{MAAC}}$

6.4.3.4. Displacement behaviour

As a minimum, the displacements under short and long term tension and shear loading shall be given in the ETA for a load F which corresponds approximately to the value according to Equation (6.12)

$$\mathbf{F} = \frac{F_{Rk}}{\gamma_F \cdot \gamma_M} \qquad \mathbf{(6.12)}$$

with:

F_{Rk}	=	characteristic resistance according to 6.4.3.3
γ_F	=	1,4
γ_M	=	corresponding material partial safety factor

The displacements under short term tension loading (δ_{NO}) are evaluated from the tests with single anchors without edge or spacing effects according to Table 5.2a, line 1 or Table 5.2.b, line 1. The value derived shall correspond approximately to the 95 %-fractile for a confidence level of 90 %.

The long term tension loading displacements $\delta_{N\infty}$ may be assumed to be approximately equal to 2,0-times the value δ_{NO}.

The displacements under short term shear loading (δ_{VO}) are evaluated from the corresponding shear tests with single anchors. The value derived shall correspond approximately to the 95 %-fractile for a confidence level of 90 %.

If no shear tests are performed the displacements under short term shear loading (δ_{VO}) for a plastic anchors with metal expansion element may be determined for the loading according to Equation (6.12) with a shear stiffness of 500 N/mm.

The long term shear loading displacements $\delta_{V\infty}$ may be assumed to be approximately equal to 1,5-times the value δ_{VO}.

Under shear loading, the displacements might increase due to a gap between fixture and anchor. The influence of this gap is into account in design.

7. ASSUMPTIONS AND RECOMMENDATIONS UNDER WHICH THE FITNESS FOR USE OF THE PRODUCTS IS ASSESSED

7.1. Design methods for anchorage in autoclaved aerated concrete

7.1.1. Multiple use

The plastic anchors for use in autoclaved aerated concrete (AAC) shall be used for multiple fixings. By multiple anchor use it is assumed that in the case of excessive slip or failure of one anchor the load can be transmitted to neighbouring anchors without significantly violating the requirements on the fixture in the serviceability and ultimate limit state.

Therefore the design of the fixture shall specify the number n_1 of fixing points to fasten the fixture and the number n_2 of anchors per fixing point. Furthermore the design value of actions N_{Sd} on a fixing point to a value $\leq n_3$ (kN) is specified up to which the strength and stiffness of the fixture are fulfilled and the load transfer in the case of excessive slip or failure of one anchor need not be taken into account in the design of the fixture.

The following default values for n_1, n_2 and n_3 may be taken:

$\mathbf{n_1 \geq 4}$; $\mathbf{n_2 \geq 1}$ and $\mathbf{n_3 \leq 4{,}5\ kN}$ or

$\mathbf{n_1 \geq 3}$; $\mathbf{n_2 \geq 1}$ and $\mathbf{n_3 \leq 3{,}0\ kN}$.

7.1.2. Design and safety concept

The design concept with partial safety factors shall be used for anchorages in autoclaved aerated concrete.

In the absence of national regulations the following partial safety factors for resistances γ_M may be used:

Steel failure:

- Tension loading:

$$\gamma_{Ms} = \frac{1{,}2}{f_{yk} / f_{uk}} \geq 1{,}4 \qquad \textbf{(7.1)}$$

- Shear loading of the anchor with and without lever arm:

$$\gamma_{Ms} = \frac{1{,}0}{f_{yk} / f_{uk}} \geq 1{,}25 \qquad f_{uk} \leq 800\ N/mm^2 \quad \text{and} \quad f_{yk} / f_{uk} \leq 0{,}8 \qquad \textbf{(7.2)}$$

$$\gamma_{Ms} = 1{,}5 \qquad f_{uk} > 800\ N/mm^2 \quad \text{or} \quad f_{yk} / f_{uk} > 0{,}8 \qquad \textbf{(7.3)}$$

Other failure modes:

$$\gamma_{MAAC} = 2{,}0 \qquad \textbf{(7.4)}$$

7.1.3. Specific conditions for the design method in autoclaved aerated concrete

(1) The ETA shall contain only one characteristic resistance $\mathbf{F_{Rk}}$ independent of the load direction and the mode of failure. The appropriated partial safety factor and the corresponding values c_{min} and s_{min} for this characteristic resistance shall also be given.

(2) The characteristic resistance $\mathbf{F_{Rk}}$ for a single plastic anchor shall be taken also for a group of two or four plastic anchors with a spacing equal or larger than the minimum spacing s_{min}.

The distance between single plastic anchors or a group of anchors is a $\geq$ 250mm.

(3) See also Annex C, 5.3 (3).

(4) For **prefabricated reinforced components** the following has to be taken into account if no special tests or calculation for the resistance of the member made of AAC will carried out:

- The design value of shear resistance in the member caused by the anchorage are less than or equal to 40% of the design value of resistance of the member in the critical cross section.
- The edge distance c is $\geq$ 150 mm for slabs of width $\leq$ 700 mm.
- The spacing ~~s~~ of fixing points is a $\geq$ 250 mm. For prefabricated reinforced floor units the spacing of fixing points is a ≥ 600 mm. Fixing points are single anchors or groups of 2 or 4 anchors.

Section four:
ETA CONTENT

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9. THE ETA CONTENT

9.1.4. Characteristics of the anchor with regard to safety in use and methods of verification

- Characteristic values to be used for the calculation of the ultimate limit state:

  The ETA shall contain only one characteristic resistance $\mathbf{F_{Rk}}$ for one base material independent of the load direction and the mode of failure. The appropriated partial safety factor and the corresponding values c_{min} and s_{min} for this characteristic resistance shall also be given.

9.1.6. Assumptions under which the fitness of the anchor for the intended use was favourably assessed

The specific conditions (2), (3) and (4) for the design method according to 7.1.3 shall be given in the ETA as well.

The ETA also has to include that the plastic anchor shall not be installed and used in water saturated aerated concrete.