ETAG 020

Edition March 2006

GUIDELINE FOR EUROPEAN TECHNICAL APPROVAL
of
PLASTIC ANCHORS
FOR MULTIPLE USE IN CONCRETE AND MASONRY
FOR NON-STRUCTURAL APPLICATIONS

Part three : PLASTIC ANCHORS FOR USE IN
SOLID MASONRY MATERIALS

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TABLE OF CONTENTS

PART THREE : PLASTIC ANCHORS FOR USE IN SOLID MASONRY MATERIALS

Table of contents
Foreword

SECTION TWO: GUIDANCE FOR THE ASSESSMENT OF THE FITNESS FOR USE 4

5. METHODS OF VERIFICATION 4
   5.4. Safety in use 4
   5.4.2. Tests for suitability 4
   5.4.3. Tests for admissible service conditions 6

6. ASSESSING AND JUDGING THE FITNESS FOR USE 7
   6.4. Safety in use 7
   6.4.1.2. Conversion of ultimate loads to take account of concrete-, masonry- and steel strength 7
   6.4.1.3. In all tests the following criteria shall be met 7
   6.4.2. Criteria valid for suitability tests 7
   6.4.3. Admissible service conditions 7
   6.4.3.1. General 7
   6.4.3.2. Characteristic resistance of single anchor for the different conditions 7
   6.4.3.3. Characteristic resistance of single anchor in the ETA 9
   6.4.3.4. Displacement behaviour 9

7. ASSUMPTIONS AND RECOMMENDATIONS UNDER WHICH THE FITNESS FOR USE OF THE PRODUCTS IS ASSESSED
   7.1. Design methods for anchorage in solid masonry 10
   7.1.1. Multiple use 10
   7.1.2. Design and safety concept 10
   7.1.3. Specific conditions for the design in masonry 11

SECTION FOUR: ETA CONTENT

9. THE ETA CONTENT 12
   9.1.4. Characteristics of the anchor with regard to safety in use and methods of verification
   9.1.6. Assumptions under which the fitness of the anchor for the intended use was favourably assessed
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 solid masonry materials (clay or calcium silicate or normal weight concrete) with a minimum mortar strength class of M2.5 are given. For a general assessment of plastic anchors, on principle, Part 1 applies.

In general, solid masonry units do not have any holes or cavities other than those inherent in the material. However, solid units may have a vertically perforation of up to 15% of the cross section.

The required tests for suitability are given in Table 5.1 and the tests for admissible service conditions are given in Tale 5.2. The determination of admissible service conditions and determination of characteristic resistances for plastic anchors to be used in solid masonry materials are completely given in 6.4.3.

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

The plastic anchors for use in solid masonry materials 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 may specify the number \( n_1 \) of fixing points to fasten the fixture and the number \( n_2 \) of anchors per fixing point. Furthermore by specifying the design value of actions \( N_{Sd} \) on a fixing point to a value \( \leq n_3 \) (kN) 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 to 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:

\[
\begin{align*}
n_1 &\geq 4; \quad n_2 \geq 1 \quad \text{and} \quad n_3 \leq 4.5 \text{ kN or} \\
n_1 &\geq 3; \quad n_2 \geq 1 \quad \text{and} \quad n_3 \leq 3.0 \text{ kN.}
\end{align*}
\]
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 may be performed in single units or in a wall. If test are done in a wall, the thickness of the joints should be about 10mm and the joints should be completely filled with mortar of strength class M2.5 with a strength $\leq 5$ N/mm$^2$. If tests have been performed in walls with a mortar strength higher than M2.5 then the minimum mortar strength shall be given in the ETA. The walls may be lightly prestressed in vertical direction to allow handling and transportation the wall.

In general, the tests should be carried out in the base material for which the plastic anchor is intended to be used. Bricks should be used with the compressive strength between 20 to 30 N/mm$^2$. The determined characteristic resistances for the ETA are valid only for the brick sizes which are used in the tests or larger brick sizes; therefore the information about the brick sizes shall be given in the ETA.

The types of suitability tests, test conditions, the number of required tests and the criteria applied to the results are given in Tables 5.1.

If there are existing tests for suitability carried out in concrete (according to Part 2, Table 5.1) for the plastic anchors, then the results of these suitability tests ($\text{min} \alpha_1$, $\text{min} \alpha_2$ and $\text{min} \alpha_V$) may be taken for the determination of the characteristic values of the plastic anchors to be used in solid masonry.
<table>
<thead>
<tr>
<th></th>
<th>Purpose of test</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Setting capacity for nailed-in anchors only</td>
<td>(10)</td>
<td>d&lt;sub&gt;cut,m&lt;/sub&gt;</td>
<td>min t°C(2)</td>
<td>standard</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>≥ 0.9</td>
</tr>
<tr>
<td>2</td>
<td>Functioning, depending on the diameter of hole</td>
<td>(10)</td>
<td>d&lt;sub&gt;cut,min&lt;/sub&gt;, d&lt;sub&gt;cut,max&lt;/sub&gt; (12)</td>
<td>normal, normal</td>
<td>standard, standard</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>≥ 1.0, ≥ 0.8</td>
</tr>
<tr>
<td>4</td>
<td>Functioning under conditioning</td>
<td>(10)</td>
<td>d&lt;sub&gt;cut,m&lt;/sub&gt;</td>
<td>normal</td>
<td>dry</td>
<td>-</td>
<td>5</td>
<td>-</td>
<td>≥ 0.8</td>
</tr>
<tr>
<td>5</td>
<td>Functioning, Effect of temperature (10) d&lt;sub&gt;cut,m&lt;/sub&gt;</td>
<td>min t°C(3), 0°C(4), +50°C(5), +80°C(5)</td>
<td>standard, standard, standard, standard</td>
<td>-</td>
<td>5</td>
<td>-</td>
<td>&gt; 1.0, &gt; 1.0, &gt; 1.0, &gt; 0.8(8)</td>
<td>5.4.2.6</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Functioning under sustained loads</td>
<td>(10)</td>
<td>d&lt;sub&gt;cut,m&lt;/sub&gt;, d&lt;sub&gt;cut,m&lt;/sub&gt;</td>
<td>normal, +50°C(5)</td>
<td>standard, standard</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>≥ 0.9, &gt; 0.9</td>
</tr>
<tr>
<td>7</td>
<td>Functioning 24 h relaxation 500h</td>
<td>(10)</td>
<td>d&lt;sub&gt;cut,m&lt;/sub&gt;, d&lt;sub&gt;cut,m&lt;/sub&gt;</td>
<td>normal, normal</td>
<td>standard, standard</td>
<td>-</td>
<td>5</td>
<td>-</td>
<td>≥ 0.9, ≥ 1.0</td>
</tr>
<tr>
<td>8</td>
<td>Maximum torque moment</td>
<td>(10)</td>
<td>d&lt;sub&gt;cut,m&lt;/sub&gt;</td>
<td>normal</td>
<td>standard</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td></td>
</tr>
</tbody>
</table>

(1) Normal ambient temperature: 21±3°C (plastic anchor and base material),
(2) Minimum installation temperature as specified by the manufacturer; normally 0 °C to + 5 °C.
(3) Tests with lowest temperature as specified by the manufacturer –5°C, –20°C, –40°C.
(4) Installation at minimum installation temp. as specified by the manufacturer; normally 0 °C to + 5 °C.
(5) For temperature range b), Part 1, 4.4.2.6; for other temperature range see Part 1, 5.4.2.6 and 6.4.2.6.
(6) Conditioning of plastic anchor sleeve according to Part 1, 5.4.2.5.
(7) This test is not required for screwed-in plastic anchors with polyamide PA 6 polymeric sleeve.
(8) Reference values from the tests with maximum long term temperature +50°C.
(9) Anchor size: s = small; m = medium; l = large.
   If more than 3 sizes shall be assessed the intermediate sizes shall not be tested if the tests from line 1 of Table 5.2 show regularity in failure mode and ultimate load.
(10) Base material for the tests see 5.4.2.
(11) N<sub>Rk</sub> Part 1, 5.4.2.8 (5.3); characteristic resistance N<sub>Rk</sub> as given in the ETA evaluated according to 6.4.3.3.
(12) The test series with d<sub>cut,max</sub> may be omitted if the test series according to Table 5.2, line 1 are carried out with d<sub>cut,max</sub>.
5.4.3. Tests for admissible service conditions

The tests may be performed in single units or in a wall. If test are done in a wall, the thickness of the joints should be about 10mm and the joints should be completely filled with mortar of strength class M2.5 with a strength $\leq 5$ N/mm$^2$. If tests have been performed in walls with a mortar strength higher than M2.5 then the minimum mortar strength shall be given in the ETA. The walls may be lightly prestressed in vertical direction to allow handling and transportion the wall.

In general, the tests should be carried out in the base material for which the plastic anchor is intended to be used. Bricks should be used with the compressive strength between 20 to 30 N/mm$^2$. The determined characteristic resistances for the ETA are valid only for the brick sizes which are used in the tests or larger brick sizes; therefore the information about the brick sizes has to be given in the ETA.

For determination of the admissible service conditions the tests given in Table 5.2 shall be carried out.

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.

All tests for determination of admissible service conditions should be carried out according to Annex A in the base material for which the plastic anchor is intended to be used at normal ambient temperature ($+21^\circ\text{C} \pm 3^\circ\text{C}$) and standard conditioning of the polymeric sleeve. The drill holes should be drilled using $d_{cut,m}$ drill bits.

The minimum edge distance $c_{\text{min}}$ and minimum spacing $s_{\text{min}}$ should be given by the manufacturer and should be confirmed by the tests according to Table 5.2, line 2.

<table>
<thead>
<tr>
<th>Table 5.2</th>
<th>Tests for admissible service conditions for plastic anchors for use in solid masonry</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Purpose of test</td>
</tr>
<tr>
<td>2</td>
<td>Load direction</td>
</tr>
<tr>
<td>3</td>
<td>Distances</td>
</tr>
<tr>
<td>4</td>
<td>Member thickness $h$</td>
</tr>
<tr>
<td>5</td>
<td>Remarks</td>
</tr>
<tr>
<td>6</td>
<td>Minimum number of tests for $s,m,l$</td>
</tr>
<tr>
<td>7</td>
<td>Test procedure described in Annex A</td>
</tr>
<tr>
<td>1</td>
<td>Characteristic resistance for tension loading not influenced by edge and spacing</td>
</tr>
<tr>
<td>2</td>
<td>Minimum edge distance for characteristic tension resistance</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>1</th>
<th>Characteristic resistance for tension loading not influenced by edge and spacing</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>$s &gt; s_{\text{min}}$</td>
</tr>
<tr>
<td></td>
<td>$c &gt; c_{\text{min}}$</td>
</tr>
<tr>
<td></td>
<td>$\geq h_{\text{min}}$</td>
</tr>
<tr>
<td></td>
<td>test with single anchors (1)</td>
</tr>
<tr>
<td></td>
<td>5 Annex A 5.2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2</th>
<th>Minimum edge distance for characteristic tension resistance</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>$s &gt; s_{\text{min}}$ (3)</td>
</tr>
<tr>
<td></td>
<td>$c = c_{\text{min}}$</td>
</tr>
<tr>
<td></td>
<td>$= h_{\text{min}}$</td>
</tr>
<tr>
<td></td>
<td>test with single anchor (2)</td>
</tr>
<tr>
<td></td>
<td>5 Annex A 5.2</td>
</tr>
</tbody>
</table>

(1) Tension tests with single anchors in the centre of the brick

(2) Tension tests with single anchors near the free edge to determined the characteristic resistance depending on the minimum edge distance $c_{\text{min}}$.

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

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

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

(4) Anchor sizes small (s), medium (m) and large (l) of an anchor system should 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 solid masonry should be carried out according to chapter 6.4.3.2.

6.4.1.3. In all tests the following criteria shall be met

(2) In general, in each test series, the coefficient of variation of the ultimate load should be smaller than \( \nu = 20 \% \) in the suitability tests and \( \nu = 15 \% \) 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 \( \alpha_V \)-value has to be taken into account:

\[
\alpha_V = \frac{1}{1 + 0,03 \times (\nu \% - 20)} \leq 1.0 \tag{6.6a}
\]

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

\[
\alpha_V = \frac{1}{1 + 0,03 \times (\nu \% - 15)} \leq 1.0 \tag{6.6b}
\]

6.4.2. Criteria valid for suitability tests

In the suitability tests according Table 5.1 the criteria described in Part 1, 6.4 should be met. The values of the reference tests are taken from the tests according to Table 5.2, line 1 for the corresponding solid masonry material.

If there are existing tests for suitability carried out in concrete (according to Part 2, Table 5.1) for the plastic anchors, then the results of these suitability tests (\( \min \alpha_1, \min \alpha_2 \) and \( \min \alpha_V \)) may be taken for the determination of the characteristic values of the plastic anchors to be used in solid masonry.

6.4.3. Admissible service conditions

6.4.3.1. General

In all tension tests, the requirement for the load/displacement curves should satisfy the requirements laid down in Part 1, 6.4.1.3 (1). The requirements on the coefficient of variation of the ultimate loads is given in 6.4.1.3 (2) and 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 5.2, line 1)

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

\[
N_{Rk1} = N_{Rk1,0} \times \min \left( \min \alpha_1 ; \min \alpha_2, \text{line 1,2,7,8} \right) \times \min \alpha_2, \text{line 4,5} \times \min \alpha_V \tag{6.7}
\]

\( 1) \) The lowest value of \( \min \alpha_1 \) or \( \min \alpha_2, \text{line 1,2,7,8} \) is govern.

with: \( N_{Rk1,0} = \) characteristic resistance evaluated from the results of tests according to Table 5.2, line 1

The tests should be carried out in bricks with compressive strengths between 20 to 30 N/mm\(^2\) for determination of the characteristic resistance for bricks
≥ 20 N/mm². For compressive strength < 20 N/mm² down to 10 N/mm² a reduction factor of 0.7 is taken into account.

\[ \min \alpha_1 = \text{minimum value } \alpha_1 \text{ (reduction factor from the load/displacement behaviour) according to Part 1, Equation (6.2) of all tests (≤ 1.0)} \]

\[ \min \alpha_{2,\text{line } 4,5} = \text{minimum value } \alpha_2 \text{ (reduction factor from the ultimate loads in the suitability tests) according to Part 1, Equ. (6.5) of suitability tests according to Table 5.1, line 4 and 5 (conditioning and temperature) (≤ 1.0)} \]

\[ \min \alpha_{2,\text{line } 1,2,7,8} = \text{minimum value } \alpha_2 \text{ (reduction factor from the ultimate loads in the suitability tests) according to Part 1, Equ. (6.5) of suitability tests according to Table 5.1, line 1, 2, 7 and 8 (≤ 1.0)} \]

\[ \min \alpha_V = \text{minimum value } \alpha_V \text{ to consider a coefficient of variation of the ultimate loads in the suitability and admissible service condition tests larger than 20% or 15% respectively, Equations (6.6a) and (6.6b)}. \]

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

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

\[ N_{Rk2} = N_{Rk2}^1 \times \frac{f_b}{f_{b,\text{test}}} \times \min \alpha_1 \times \min \alpha_V \]  

1) (6.8)

with:

\[ N_{Rk2}^1 \] = characteristic resistance evaluated from the results of tests according to Table 5.2, line 2

\[ f_b \] = normalised mean compressive strength of the chosen masonry unit in the ETA

\[ f_{b,\text{test}} \] = mean compressive strength of the test masonry unit

\[ \min \alpha_1 \] = minimum value \( \alpha_1 \) (reduction factor from the load/displacement behaviour) according to Part 1, Equation (6.2) of all tests (≤ 1.0)

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

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

(3) Tension loading influenced by minimum spacing effects (Table 5.2, footnote (3))

In the design concept it is assumed that a group with 2 or 4 anchors with \( s \geq s_{\text{min}} \) has the same characteristic resistance as a single anchor with a large spacing to neighbouring anchors. Therefore the characteristic resistances of single anchors \( N_{Rk3} \) with minimum spacing near the free edge under tension loading shall be calculated according to 6.4.3.2 (2), however as value \( N_{Rk2}^1 \) the characteristic resistance evaluated from the results of tests according to Table 5.2, footnote (3) shall be taken.

If pull-out failure is observed in tests according to Table 5.2, footnote (3), then the evaluation should be done according to Equation (6.7).
(4) Shear loading

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

- $V_{Rk,b} = 0.5 \times V_{Rk,c}$ (shear loading in direction to the free edge)
- $V_{Rk,b} = 1.0 \times V_{Rk,c}$ (shear loading in other directions)

The concrete strength $f_{ck,cube}$ has to be replaced by the brick normalised mean compressive strength $f_b$ in the relevant Equation of Annex C.

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

$$V_{Rk,b} = V_{Ru} \times \frac{f_b}{f_{b,\text{test}}} \times \min \alpha_V$$

with:
- $V_{Ru}$ = characteristic resistance evaluated from the results of tests
- $f_b$ = normalised mean compressive strength of the chosen masonry unit in the ETA
- $f_{b,\text{test}}$ = mean compressive strength of the test masonry unit
- $\min \alpha_V$ = minimum value $\alpha_V$ to consider a coefficient of variation of the ultimate loads in the suitability and admissible service condition tests larger than 20% or 15% respectively, 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:

$$V_{Rk,s} = 0.5 \times A_s \times f_{uk}$$

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 $F_{Rk}$ the design values for $N_{Rk1}$, $N_{Rk2}$, $N_{Rk3}$, $V_{Rk,s}$, and $V_{Rk,b}$ 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 $F_{Rk}$ given in the ETA.

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

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 / 6 / 7.5 / 9 kN

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 (6.11)

$$F = \frac{F_{Rk}}{\gamma_F \times \gamma_M}$$

with:
- $F_{Rk}$ = characteristic resistance according to 6.4.3.3
- $\gamma_F = 1.4$
- $\gamma_M$ = corresponding material partial safety factor
The displacements under short term tension loading (\(\delta_{NO}\)) are evaluated from the tests with single anchors without edge or spacing effects according to Table 5.2, line 1. The value derived should 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 \(\delta_{NO}\).

The displacements under short term shear loading (\(\delta_{VO}\)) are evaluated from the corresponding shear tests with single anchors. The value derived should 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 (\(\delta_{VO}\)) for a plastic anchor with metal expansion element may be determined for the load according to Equation (6.11) with a shear stiffness of 1200 N/mm.

The long term shear loading displacements \(\delta_{V\infty}\) may be assumed to be approximately equal to 1.5-times the value \(\delta_{VO}\).

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

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

7.1. Design methods for anchorage in solid masonry

7.1.1. Multiple use

The plastic anchors for use in solid masonry materials should 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 may specify the number \(n_1\) of fixing points to fasten the fixture and the number \(n_2\) of anchors per fixing point. Furthermore by specifying the design value of actions \(N_{Sd}\) on a fixing point to a value \(\leq n_3\) (kN) 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 to 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:

\[ n_1 \geq 4; \quad n_2 \geq 1 \quad \text{and} \quad n_3 \leq 4.5 \text{ kN} \quad \text{or} \]

\[ n_1 \geq 3; \quad n_2 \geq 1 \quad \text{and} \quad n_3 \leq 3.0 \text{ kN} \]

7.1.2. Design and safety concept

The design concept with partial safety factors should be used for anchorages in solid masonry.

In the absence of national regulations the following partial safety factors for resistances \(\gamma_M\) may be used:

Steel failure: Tension loading:

\[ \gamma_{Ms} = \frac{1.2}{f_{yk}/f_{uk}} \geq 1.4 \]  

(7.1)

Shear loading of the anchor with and without lever arm:
\[
\gamma_{Ms} = \frac{1.0}{f_{yk} / f_{uk}} \geq 1.25 \text{ for } f_{uk} \leq 800 \text{ N/mm}^2 \text{ and } f_{yk}/f_{uk} \leq 0.8 \quad (7.2)
\]
\[
\gamma_{Ms} = 1.5 \text{ for } f_{uk} > 800 \text{ N/mm}^2 \text{ or } f_{yk}/f_{uk} > 0.8 \quad (7.3)
\]

Other failure modes: \( \gamma_{M} = 2.5 \) \quad (7.4)

7.1.3. Specific conditions for the design method in masonry

(1) The ETA should contain only one characteristic resistance \( F_{Rk} \) 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 \( F_{Rk} \) for a single plastic anchor may also be taken 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 should be \( s \geq 250 \text{mm} \).

(3) If the vertical joints of the wall are designed not to be filled with mortar then the design resistance \( N_{Rd} \) has to be limited to 2.0 kN to ensure that a pull-out of one brick out of the wall will be prevented. This limitation can be omitted if interlocking units are used for the wall or when the joints are designed to be filled with mortar.

(4) If the joints of the masonry are not visible the characteristic resistance \( F_{Rk} \) has to be reduced with the factor \( \alpha_{j} = 0.5 \).

If the joints of the masonry are visible (e.g. unplastered wall) following has to be taken into account:

The characteristic resistance \( F_{Rk} \) may be used only, if the wall is designed such that the joints are to be filled with mortar.

If the wall is designed such that the joints are not to be filled with mortar then the characteristic resistance \( F_{Rk} \) may be used only, if the minimum edge distance \( c_{min} \) to the vertical joints is observed. If this minimum edge distance \( c_{min} \) can not be observed then the characteristic resistance \( F_{Rk} \) has to be reduced with the factor \( \alpha_{j} = 0.5 \).
Section four:
ETA CONTENT

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 should contain only one characteristic resistance $F_{Rk}$ 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.

The determined characteristic resistances for the ETA are valid only for the brick sizes which are used in the tests or larger brick sizes; therefore the information about the brick sizes has to be given in the ETA. Furthermore, if the tests have been performed in walls with a mortar strength higher than M2.5 then the minimum mortar strength shall also be given in the ETA.

If smaller brick sizes are present on the construction site or if the mortar strength is smaller than the required value the characteristic resistance of the plastic anchor may be determined by "job site tests" according to Annex B.

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 should be given in the ETA as well.