| | |
|---|---|
| Reference | Radiation test on injection mortar HIT HY200 |
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| **D** | July 16, 2015 |


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**Determination of compressive strength in accordance with EN ISO 604 to justify the use of Hilti HIT-HY 200-A adhesive in the DIBt National Approval: "Hilti Undercut Anchor HDA for fastenings in nuclear power plants and other nuclear facilities" (DIBt Approval Z -21.1-1987) reference [1].**

The injection mortar HIT-HY 200 (see figure 1) is primarily used for post-installed anchoring in cracked and non-cracked concrete. European Technical Approval ETA-12/0004 reference [2] provides the performance values of the injection mortar for post-installed anchoring applications.

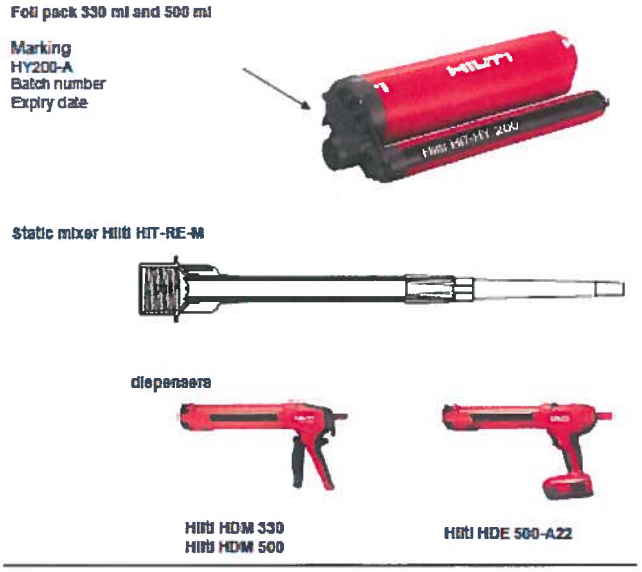


**Figure 1**


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The DIBt Approval Z -21.1-1987 reference [1] provides reduced displacement values under shear loading with the annular gap between fixture and anchor filled using injection mortar HIT-HY 200-A. As the anchor could be used in areas with exposure to ionizing radiation the resistance of the injection mortar to ionizing radiation has been verified through TÜV-SÜD-Test Report IS-ETM5-MUC/uh of 17 June 2014 reference [3]. The testing scope was the determination of the compressive strength in accordance with EN ISO 604.

## Condition of exposure to ionizing radiation:

Radiation exposure and testing was carried out in an independent laboratory. Cobalt 60 was used as radioactive isotope. HIT-HY 200-A mortar cylinders (Ø ~10 mm) were used as test specimens.

**821 kGy were applied with an dose of 500 Gy/h**

Date of testing:

- 19 February 2014 to 7 May 2014 storage in standard atmosphere according to EN ISO 291 23/50 (20 test specimens).
- 21 February 2014 to 28 April 2014 exposure to ionizing radiation (500 Gy/h) and 28 April 2014 to 7 May 2014 storage in standard atmosphere according to EN ISO 291 23/50 (20 test specimens).
- 7 May 2014 testing of compressive strength (38 test specimens).

## Comparison of results

Statistics table:

| Test at 23°C/50% rel.humidity | | $\sigma_{low}$ | $\sigma_{high}$ | $E_c$ | $\sigma_M$ | $\varepsilon_M$ |
|---|---|---|---|---|---|---|
| n = 19 | | [MPa] | [MPa] | [MPa] | [N/mm²] | [mm] |
| x | Non-radiated | 41.697 | 60.834 | 1280 | 92.7 | 1.0 |
| x | Radiated | 42.550 | 63.656 | 1410 | 96.8 | 1.0 |
| | Change [%] | **2.00** | **4.43** | **9.22** | **4.24** | **0.00** |

Results above shows the resistance of the compressive behavior of the injection mortar HIT-HY 200-A exposed to an ionizing radiation up to 821 kGy according to TÜV-SÜD-Test Report IS-ETM5-MUC/uh reference [3].

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**Summary:**

Hilti HIT-HY 200-A injection mortar could be used under radiation exposure with reference to DIBt Approval Z -21.1-1987 [1] to fill the annular gap between HDA anchor and anchor plate to reduce the anchor displacement under shear loading.

References:

[1] Z -21.1-1987, Hilti Undercut Anchor HDA for fastenings in NPP, DIBT, 2 March 2015

[2] ETA-12/0006, European Technical Approval injection mortar HIT HY 200, 4 April 2012

[3] Test Report IS-ETM5-MUC/uh, TÜV-SÜD, 17 June 2014

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