



# TEST-REPORT

**PENETRATION OF WATER UNDER PRESSURE WITH 500 kPa  
IN HARDENED CONCRETE C25/30**

**SAMPLES WITH ANCHOR ROD HIT-V-R M12x150  
INSTALLED WITH HIT-RE 500 V3**

EN 12390-8:2009: Testing hardened concrete -  
Part 8: Depth of penetration of water under pressure

description of order

Ordering party	Hilti Entwicklungsgesellschaft mbH Development Chemical Anchors
Address of ordering party	Hiltistr. 6 86916 KAUFERING GERMANY
Date of order Order No.	February 22 <sup>nd</sup> , 2016
Test material	HIT-RE 500 V3 Injection Adhesive HIT-V-R M12x150
Receipt of test material	February 22 <sup>nd</sup> , 2016

Test Report No.	040/16
Date of issue	April 21 <sup>st</sup> , 2016
This report consists of:	Text            5 pages Appendix 1    2 pages

The reported test results relate only to the tested items.

If this test report is transcribed or copied, the wording and layout may not be changed, nothing may be omitted and no additions may be made. Extracts may only be copied or published with the written permission of the testing station.

The Testing Laboratory at the HTL Rankweil (Bautechnische Versuchsanstalt) is attached to the HTBLuVA Rankweil. The Testing Laboratory is accredited by BMWFJ-92.221/0002-I/12/2016 vom 13.01.2016 as Testing Laboratory/Inspecting body (Id.No. 115).

## 1 MISCELLANEOUS

The Hilti Entwicklungsgesellschaft mbH contracted the Testing Laboratory at the HTL Rankweil (Bautechnische Versuchsanstalt an der HTL Rankweil) to conduct tests to determine the depth of penetration of water under pressure in hardened concrete, when anchor rods HIT-V-R M12x150 are installed with the adhesive mortar HIT-RE 500 V3.

Following test procedure was agreed upon between the ordering party and the Testing Laboratory:

- casting of 5 concrete samples using C25/30  $D_{max}$  22, cubes with 200 mm edge-length;
- installation of the anchor rod HIT-V-R M12x150 with HIT-RE 500 V3 according to the instructions given by the ordering party;
- testing the samples on the basis of EN 12390-8:2009 respectively of ISO 1920-5:2004 by applying a water presser with  $(500 \pm 50)$  kPa for the duration of  $(72 \pm 2)$  hours.

It was agreed upon, that the specimens in which the anchors were installed are not water-cured for the whole period between demolding and testing.

Tested adhesive anchor:



Hilti HIT-RE 500 V3



HIT-V-R M12x150

## 2 CONCRETE MIX DESIGN - CASTING OF CONCRETE SAMPLES

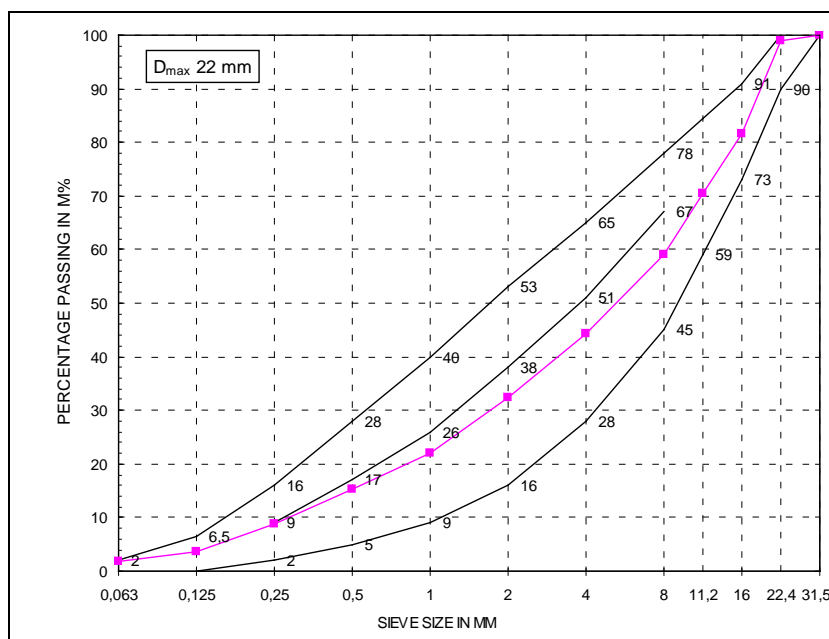
### 2.1 CONCRETE MIX DESIGN

Cement: 345 kg/m<sup>3</sup> CEM II/A-LL 32,5 R, Heidelberger Cement  
Water: drinking water 189 kg/m<sup>3</sup>  
W/C - ratio: 0,55

Aggregate - natural rounded gravel

0/4: 841 kg/m<sup>3</sup> Zech-Kies GmbH  
4/8: 272 kg/m<sup>3</sup> Zech-Kies GmbH  
8/16: 466 kg/m<sup>3</sup> Zech-Kies GmbH  
16/22: 349 kg/m<sup>3</sup> Zech-Kies GmbH

Grading of the aggregates:



### 2.2 CASTING OF CONCRETE SPECIMENS

The concrete components were mixed with a laboratory compulsory mixer. After adding the water the concrete was mixed for 2 minutes. Subsequent to the mixing the concrete flow and the density of fresh concrete were tested.

Properties of the fresh concrete

date of casting	13.10.2015
concrete flow	41 cm
density of fresh concrete	2456 kg/m <sup>3</sup>
temperature of fresh concrete	22,4 °C
fabricated specimens 5 cubes 200x200x200 mm	15.24212 - 15.24216 respectively 16.04001 - 16.04005

The moulds were filled and the concrete was compacted with a vibrating table at 7500 R/min during at least 30 sec.

### Storing and curing the specimens:

All samples were stored 24 hours within the mould at room temperature ( $20 \pm 2$ ) °C and the concrete surface was covered with plastic foil.

After remoulding the specimen were stored as follows:

cubes to test water-penetration of concrete with installed adhesive anchors  
till the age of 7 days under water at a temperature of ( $20 \pm 2$ ) °C;  
subsequently till installing the anchors and testing the water penetration at room  
temperature ( $20 \pm 2$ ) °C.

## 3 TEST PROCEDURE AND TEST RESULTS

### 3.1 SETTING THE ADHESIVE ANCHORS

#### USED ANCHORING SYSTEM

Adhesive Mortar: **HIT-RE 500 V3**  
Lot Nr. A: 9000092  
B: 9100097  
  
Anchor rod: **HIT-V-R M12x150**  
Articel No.:387081  
Lot Nr. 12994536

#### SETTING DETAILS

Drill bit: TE-CX 14  
Cutting diameter of  
used drill bit:  $d_{cut} = 14,28$  mm  
Depth of bore hole:  $h = 130$  mm  
Rotary hammer drill: TE-30M-AVR  
Bore hole cleaning: dust removal with compressed air (6 bar) 2 times  
brushing with steel-wire brush 2 times  
dust removal with compressed air (6 bar) 2 times

#### SETTING PROCEDURE

The hole was drilled vertically downwards in the centre of a casted surface perpendicular to the direction of casting. The bore hole was cleaned and diameter and depth were measured. Then the adhesive was injected using the dispenser MD 2500 and the anchor rod was inserted.

Five samples were prepared and setting was done on February 23<sup>rd</sup> 2016. After setting the anchors, the adhesive was allowed to cure for > 24 hours at room temperature ( $20 \pm 2$ ) °C.

specimen no	bore hole diameter mm	bore hole depth mm	depth of embedment mm
16.04001	13,7	130	125
16.04002	13,6	130	125
16.04003	13,6	130	125
16.04004	13,7	130	125
16.04005	13,6	130	125

3.4 PENETRATION OF WATER UNDER PRESSURE  
SAMPLES WITH **HIT-RE 500 V3**

Test procedure: EN 12390-8:2009, section 6  
ISO 1920-5:2004, section 5.4

Deviation from the standard test method:  
curing of the concrete under water only to the age of 7 days

Details of test:

date of start of the test: 26.02.2016  
end of testing: 29.02.2016  
age of concrete at start of test: 136 days  
direction of application of water pressure: on bottom of the specimen perpendicular to the direction of casting and parallel to the axis of the adhesive anchor.  
applied water pressure: **(500 ± 50) kPa** during (72 ± 2) h  
exposed concrete area: the surface with the installed anchor was exposed to the water pressure; an area according to a circle with 100 mm diameter with the anchor in its centre was exposed to the water pressure.  
specimens: cubes with 200 mm edge-length.

specimen no	16.04001		16.04002		16.04003		16.04004		16.04005	
maximum depth of penetration mm	32	32	37	37	35	36	45	46	48	48
deviation of the water penetration from the acceptable one	none		none		none		none		none	
leakage	none		none		none		none		none	
opposite surface after testing	dry		dry		dry		dry		dry	
overall mean of maximum depth of water penetration	<b>40 mm</b>									
penetration front curve	see appendix 2, page 1 and 2									

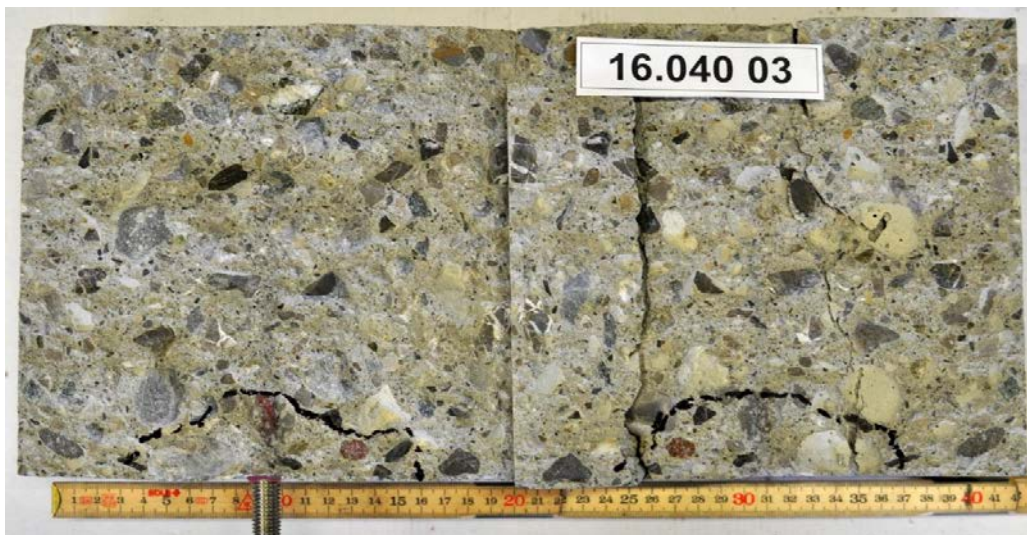
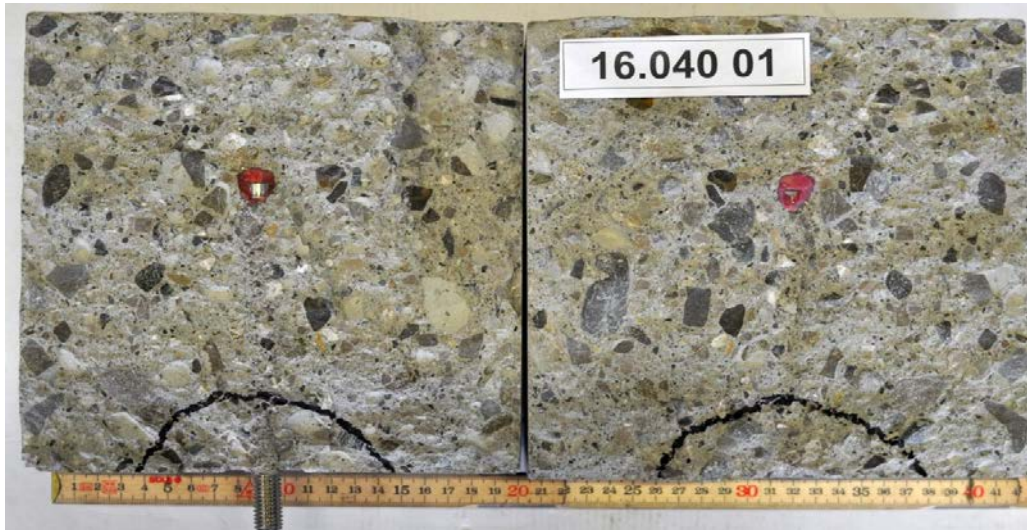
Rankweil, April 21<sup>st</sup>, 2016



Responsible for testing

*W. Wechner*  
Dipl.-Ing. W. Wechner  
Department Manager

**PENETRATION FRONT CURVE**  
Samples with adhesive mortar HIT-RE 500 V3



**PENETRATION FRONT CURVE**  
Samples with adhesive mortar HIT-RE 500 V3

