Certificate of Test

Title: Seismic Testing of a Blida Hospital Tiled Façade Sample for NBK Keramik GmbH.

Certificate of Test Number: 18758

Customer's Name & Address:

NBK Keramik GmbH
Reeser Strasse 235
D 46446 Emmerich
Germany

Our Ref: N950/TR0007

VTC Job No: 3SQ1

Your Ref: N/A

Date: 11 December 2013

Date sample(s) received: 29 November 2013

Sample(s) received from: NBK

Sample No(s): S4745

Tested by: .....
N Vincent (position: Principal Engineer)

Authorised by: .....
S Moxon (position: Manager)

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If unsigned by the tester this is because the tester is site based and therefore unable to sign this Certificate of Test. However, all work has been checked, validated and approved prior to inclusion.

This Certificate of Test and the results shown are based upon the information, drawings samples and tests referred to herein.

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1. INTRODUCTION

This certificate of test describes a seismic test carried out at the request of NBK Keramik GmbH on 2nd December 2013 at the Technology Centre.

The test was carried out in accordance with the Technology Centre method statement S4209/seismicMS rev 1.

2. SAMPLE DESCRIPTION

The sample consisted of a grid of ceramic tiles, five units wide and 9 units high. The Tiles were mounted on aluminium carrier rails, these were attached to the steel members of the test rig using aluminium angle brackets. Aluminium to aluminium and aluminium to steel connections were made using self-drilling and tapping screws. See Appendix 1 for a drawing of the test sample.

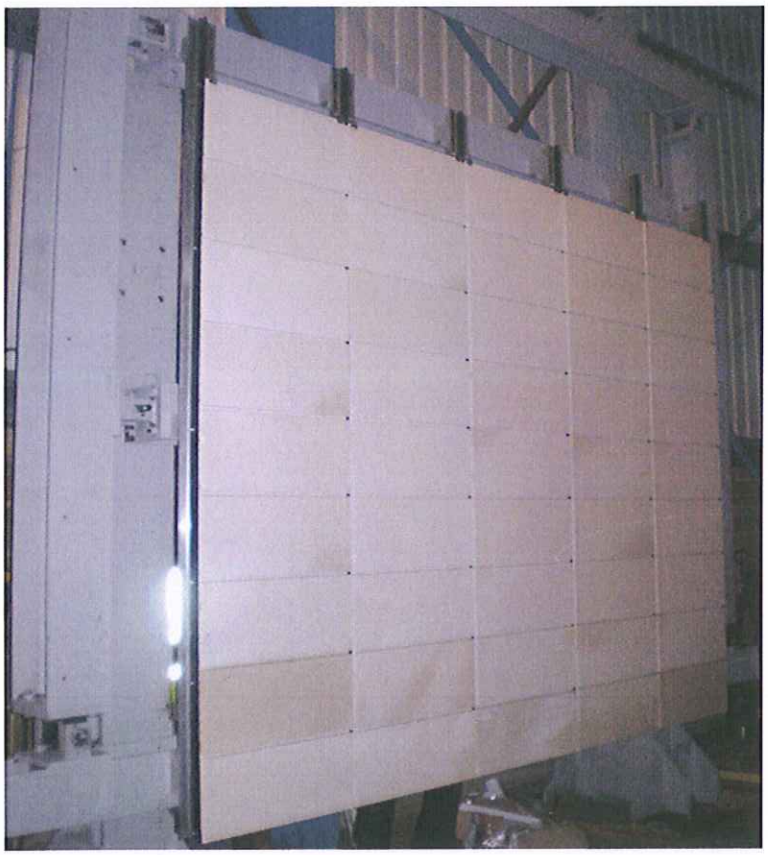

Plate 1. Test sample (Photo PC 020047)

3. TEST PROCEDURE

3.1 Test Rig

The test rig comprised a steel support frame with an integral horizontal member at high level. From this horizontal member hung an articulated steel frame consisting of two vertical uprights, two intermediate horizontal members and a bottom horizontal member See Plate 2. The bottom member was driven by a hydraulic actuator to give the required level of acceleration.

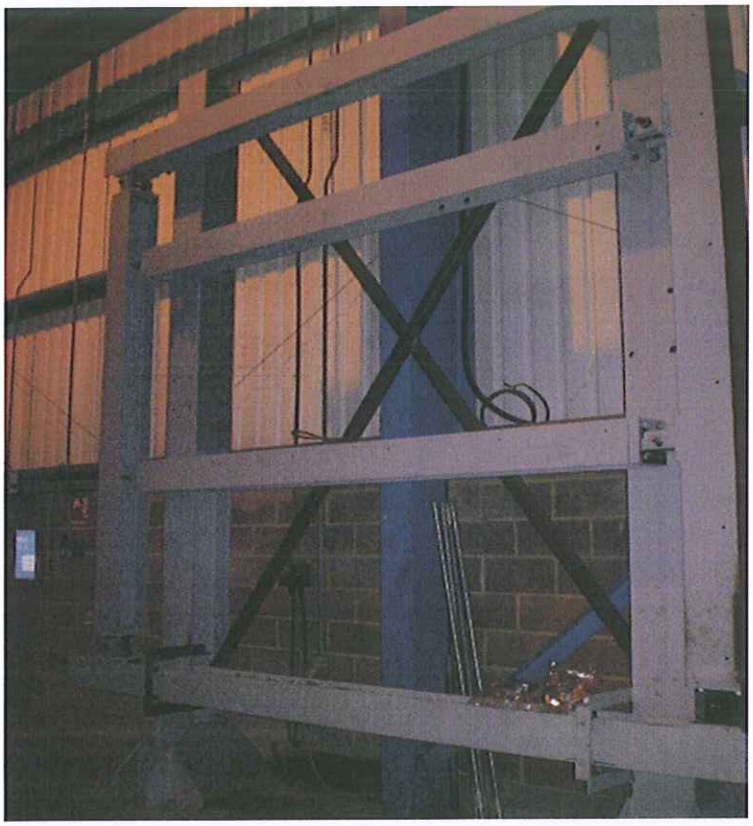

Plate 2. Test rig (photo PB290039)

3.2 Hydraulic Actuator System

This consisted of a hydraulic ram equipped with a displacement control system. The ram was supplied with hydraulic fluid via a servo valve to position the ram in response to an input position signal derived from a signal generator. The stroke and frequency of the ram movement were controlled by the magnitude and frequency of the input signal.

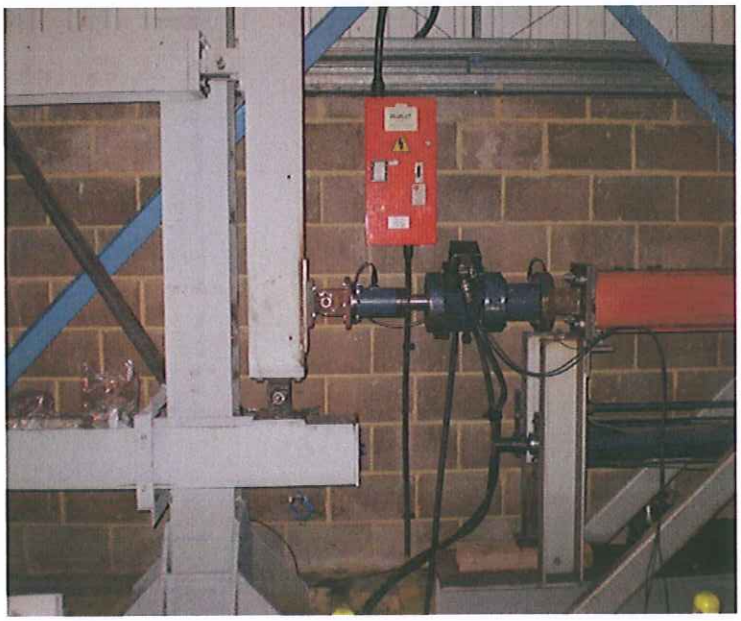

Plate 3. Actuator (Photo PB290041)

3.3 Instrumentation

The required parameter for severity of the test was the acceleration applied to the sample. This was measured using an accelerometer attached to the bottom horizontal member of the test rig, measuring in the direction of excitation. The displacement of the actuator was also measured using the built in displacement transducer used for control.

The data from these two measurements was recorded on a data logging system.

3.4 Test Control

Prior to installing the sample the test rig was commissioned, this process gave the initial settings for the frequency and magnitude of the input signals to be used during the test. These values would need to be modified at test to account for the increase in weight and stiffness of the test rig and sample combination.

To prevent the sample experiencing an initial high acceleration value at machine start the magnitude signal was started at zero and quickly increased to the initial value, this was then slightly adjusted whilst observing the real-time acceleration value to give the correct magnitude, Figure 1 shows the displacement of the test rig. The required level of acceleration was then applied for a minimum period of 10 seconds, Figure 2 shows the measured acceleration of the test rig. The frequency of vibration achieved during the test was 1.7Hz.

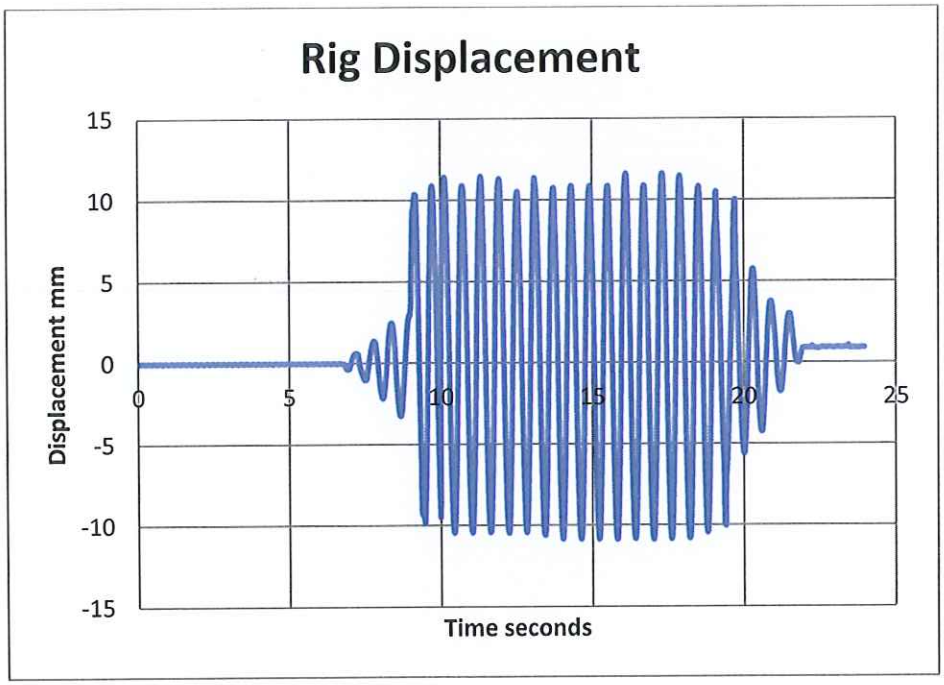

Fig. 1 Rig displacement

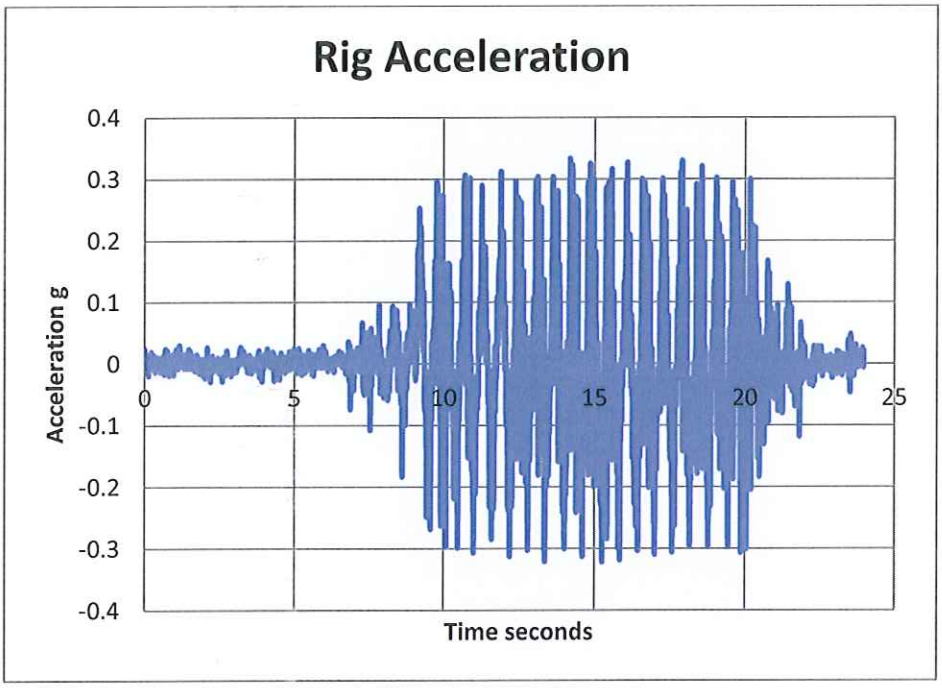

Fig. 2 Rig acceleration

4. TEST RESULTS

At the end of the test the sample was examined for any signs of damage. There was no visible damage to any of the tiles and examination of the video record showed that the tile edges did not contact each other indicting that the spacing system continued to maintain a gap between tiles, see Plate 4.

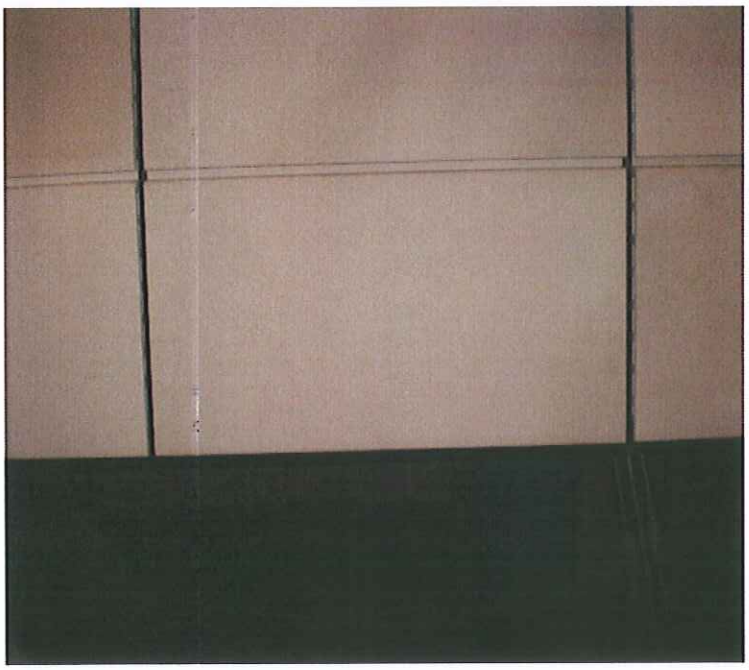

Plate 4. Tile spacing post-test (Photo PC020051)

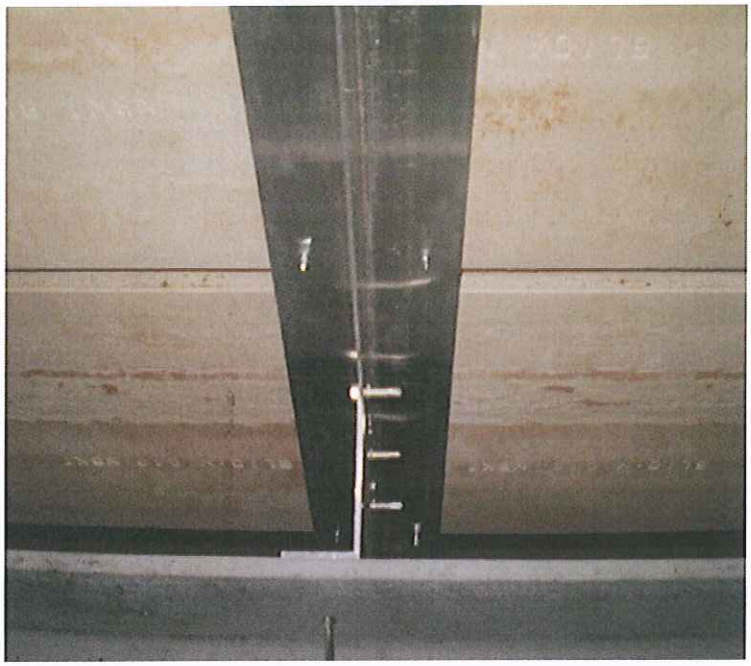

Plate 5. Angle bracket post-test (PC020049)

Plate 6. Sample rear surface post-test (Photo PC 020048)

There was no visible damage or deformation of the aluminium mounting brackets or the aluminium rails, see Plates 5 & 6.

Appendix 1

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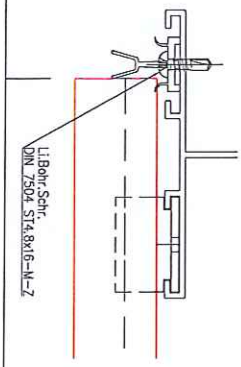
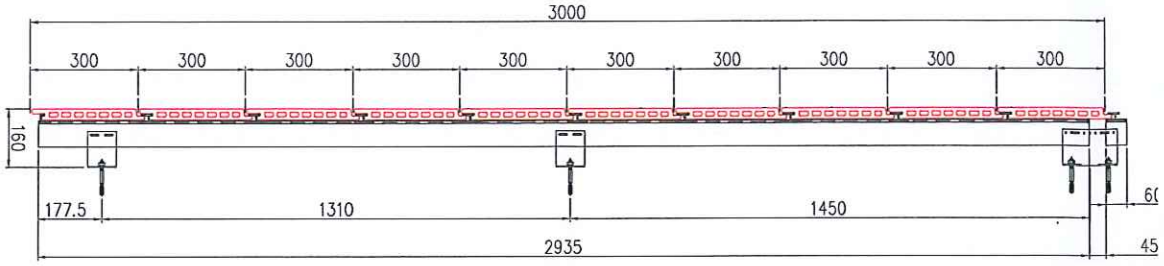
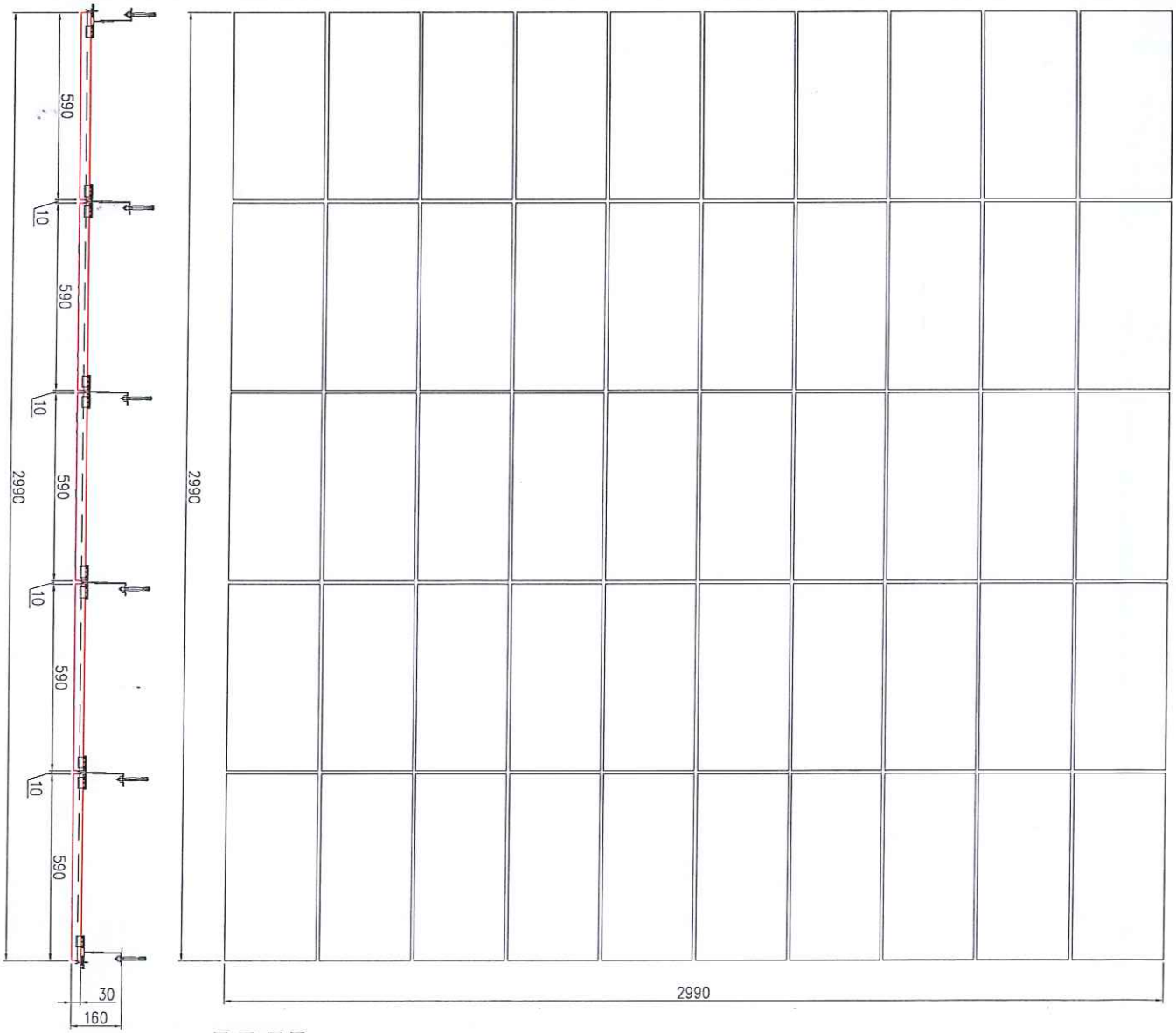
Drawing Bfl Blida Earth Quake Test Drg. 12-70-21 Rev C

END OF CERTIFICATE







Blida
Earth Quake Test
Drg. 12-70-21
Rev C

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