Certificate of Test

Title: Impact testing a sample of stone cladding for Riverside Drive, Dundee

Certificate of Test Number: 30239

T I Tiles International
Devro Campus,
Gartferry Road,
Glasgow G69 0JE,
United Kingdom

Our Ref: N950/TR0189

VTC Job No: C8334

Your Ref:

Date: 23 March 2021

Date sample(s) received: 16 March 2021

Sample(s) received from: TI Tiles International

Sample No(s): 1-2

Tested by: ....
D. Bennett (position: Technician)

Authorised by: ....
N. McDonald (position: Manager)

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Registered office, Watford, England. Registered No. 05640885

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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TECHNOLOGY CENTRE

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1. INTRODUCTION

This certificate of test describes impact tests carried out at the request of TI Tiles International on 16/17 March 2021 at VINCI Technology Centre, Leighton Buzzard.

The test was carried out in accordance with CWCT TN76.

2. CLASSES

Note: Tables 1 to 2 are taken from CWCT TN76.

Table 1 - Classes for serviceability performance

Class	Definition	Explanation/Examples
1	No damage.	No damage visible from 1m, and Any damage visible from closer than 1 m unlikely to lead to significant deterioration.
2	Surface damage of an aesthetic nature which is unlikely to require remedial action.	Dents or distortion of panels not visible from more than 5m (note visibility of damage will depend on surface finish and lighting conditions – damage will generally be more visible on reflective surfaces), and Any damage visible from closer than 5 m unlikely to lead to significant deterioration.
3	Damage that may require remedial action or replacement of components to maintain appearance or long term performance but does not require immediate action.	Dents or distortion of panels visible from more than 5 m, or Spalling of edges of panels of brittle materials, or Damage to finishes that may lead to deterioration of the substrate.
4	Damage requiring immediate action to maintain appearance or performance. Remedial action may include replacement of a panel but does not require dismantling or replacement of supporting structure.	Significant cracks in brittle materials e.g. cracks that may lead to parts of tile falling away subsequent to test, or Fracture of panels causing significant amounts of material to fall away during test.
5	Damage requiring more extensive replacement than 4.	Buckling of support rails.

Table 2 - Classes for safety performance

Class	Explanation/examples
Negligible risk	No material dislodged during test, and No damage likely to lead to materials falling subsequent to test, and No sharp edges produced that would be likely to cause severe injury to a person during impact, and Cladding not penetrated by impactor.
Low risk	Maximum mass of falling particle 50g, and Maximum mass of particle that may fall subsequent to impact 50g, and No sharp edges produced that would be likely to cause severe injury during impact.
Moderate risk	Maximum mass of falling particle less than 500g, and Maximum mass of particle that may fall subsequent to impact less than 500g, and Cladding not penetrated by impact, and No sharp edges produced that would be likely to cause severe injury during impact.
High risk	Maximum mass of falling particle greater than 500g, or Cladding penetrated by impact, or Sharp edges produced that would be likely to cause severe injury during impact.

3. SAMPLE DESCRIPTION

The samples were mounted on an aluminium frame which was fixed to a rigid concrete wall as shown in the photographs below.

PHOTO 7195

HARD BODY IMPACT SAMPLE

PHOTO 7227

SOFT BODY IMPACT SAMPLE

4. TEST EQUIPMENT

The hard body impactor was solid steel ball of 50.0 mm or 62.5 mm diameter and mass of 0.5 kg or 1.0 kg.

The soft body impactor comprised a canvas spherical/conical bag 400 mm in diameter filled with 3 mm diameter glass spheres with a total mass of 50 kg suspended from a cord at least 3 m long.

5. TEST PROCEDURE

5.1.1 Hard body

The impactor almost touched the face of the sample when at rest. It was swung in a pendular movement to hit the sample normal to its face. The test was performed at the locations shown in Figure 1. The impact energies were 6 Nm for serviceability and 10 Nm for safety.

5.1.2 Soft body

The impactor almost touched the face of the sample when at rest. It was swung in a pendular movement to hit the sample normal to its face. The test was performed at the locations shown in Figure 2. The impact energies were 120 Nm for serviceability and 350 Nm for safety.

6. TEST RESULTS

Test Date: 16 March 2021

Ambient temperature = 6 °C

FIGURE 1

HARD BODY IMPACT LOCATIONS

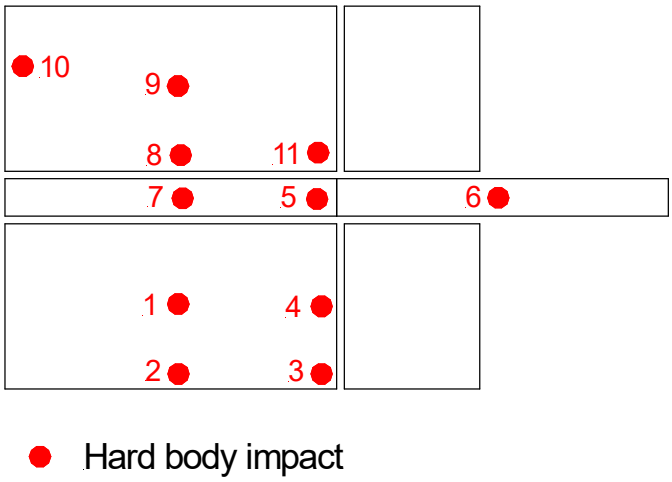


TABLE 3

HARD BODY IMPACT TEST RESULTS

Location	Impact energy (Nm)	Observations	Classification
1	6	No damage	Class 1
2	6	Minor indent	Class 1
3	6	No damage	Class 1
4	6	No damage	Class 1
5	6	Minor indent	Class 1
6	6	Vertical crack – still secure	Class 3
7	10	Vertical crack – 41 g fragment	Low risk
8	10	No damage	Negligible risk
9	10	Minor indent	Negligible risk
10	10	No damage	Negligible risk
11	10	Corner fragment – 42 g	Low risk

PHOTO 7221

HARD BODY IMPACTOR

PHOTO 7213

HARD BODY SERVICEABILITY IMPACTS

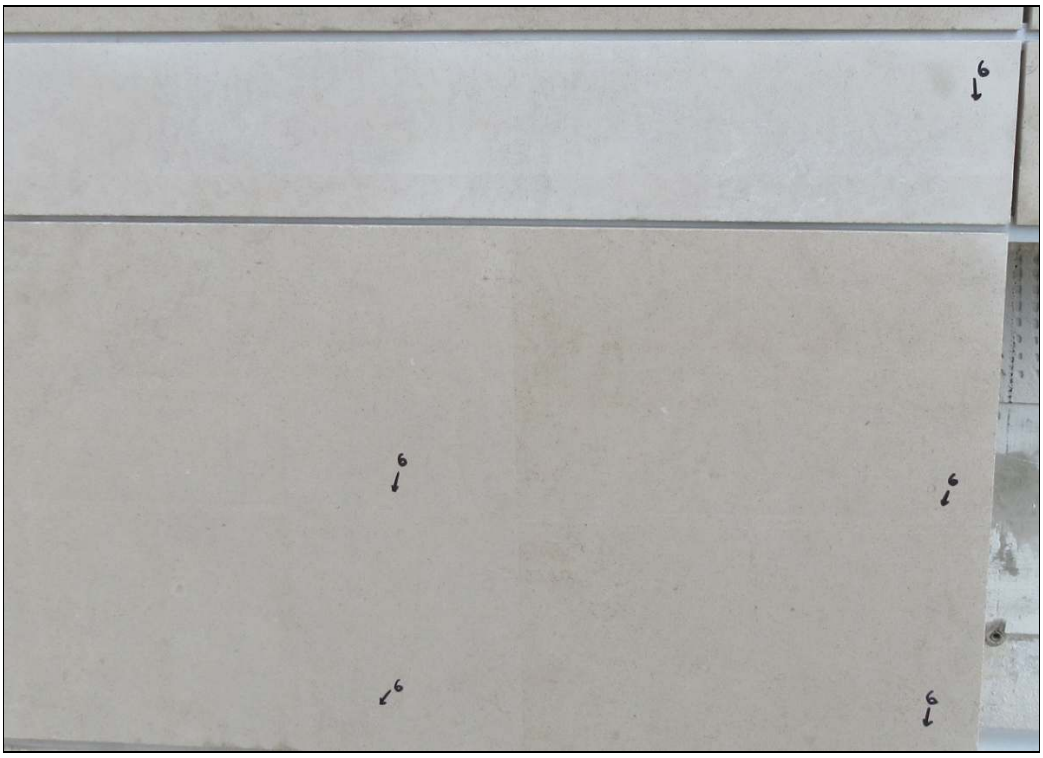


PHOTO 7214

HARD BODY SERVICEABILITY IMPACT AT LOCATION 1

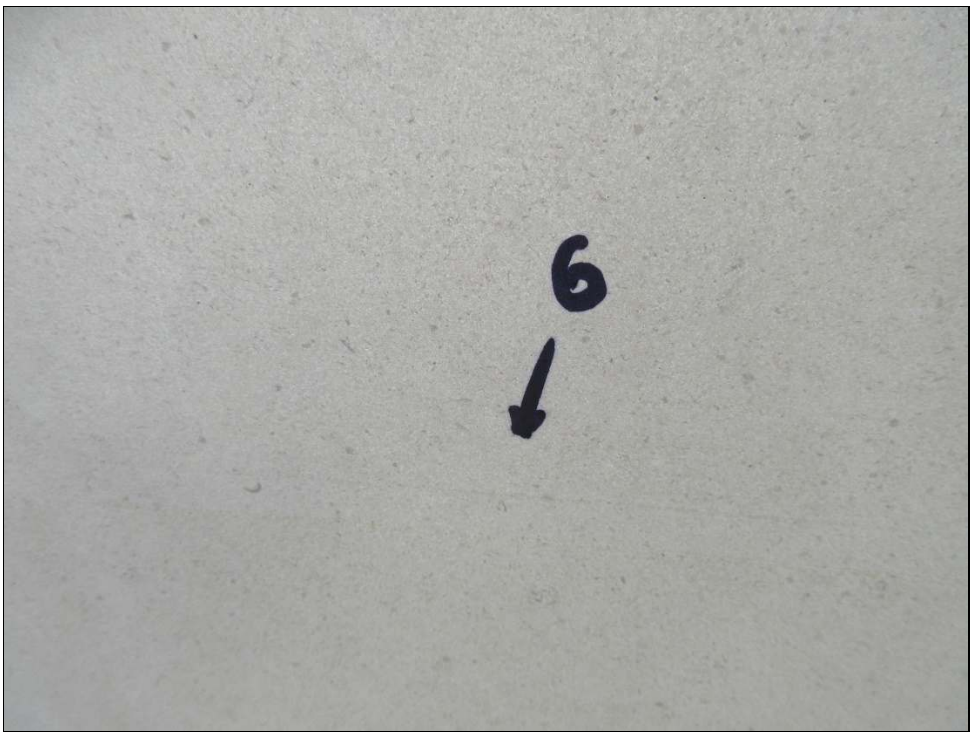


PHOTO 7215

HARD BODY SERVICEABILITY IMPACT AT LOCATION 2

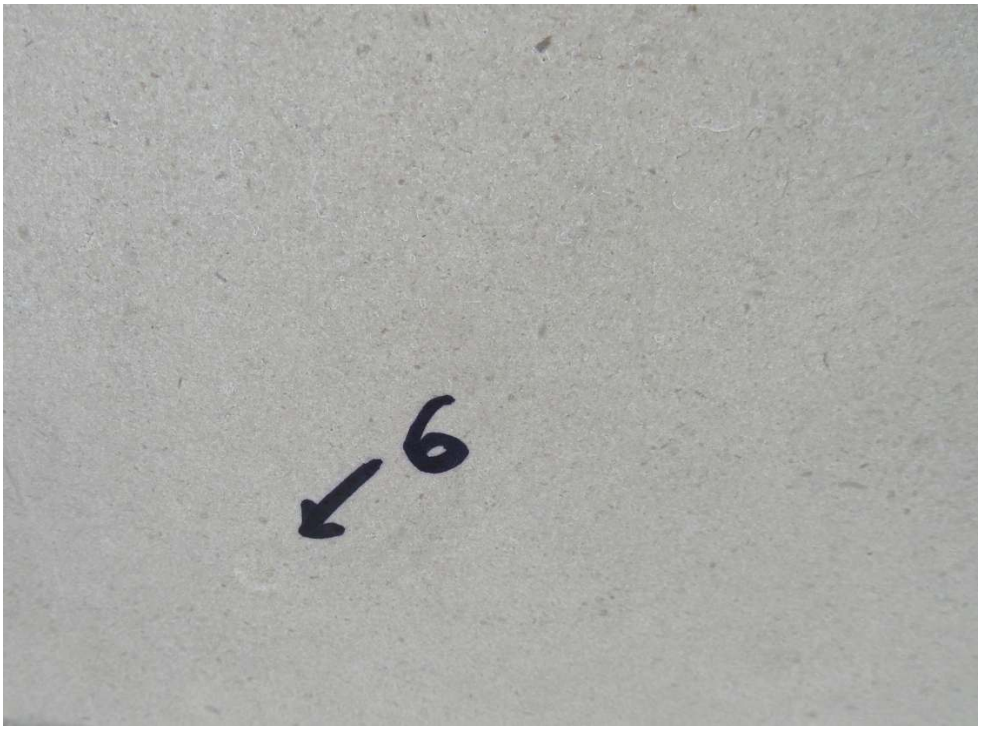


PHOTO 7216

HARD BODY SERVICEABILITY IMPACT AT LOCATION 3

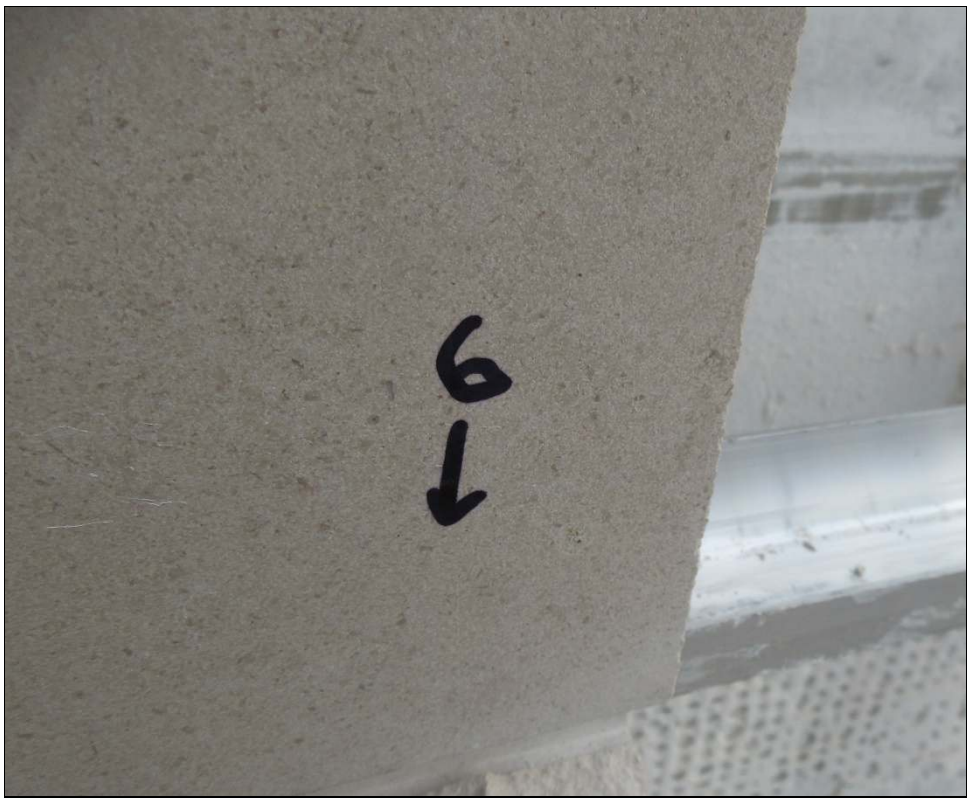


PHOTO 7218

HARD BODY SERVICEABILITY IMPACT AT LOCATION 5

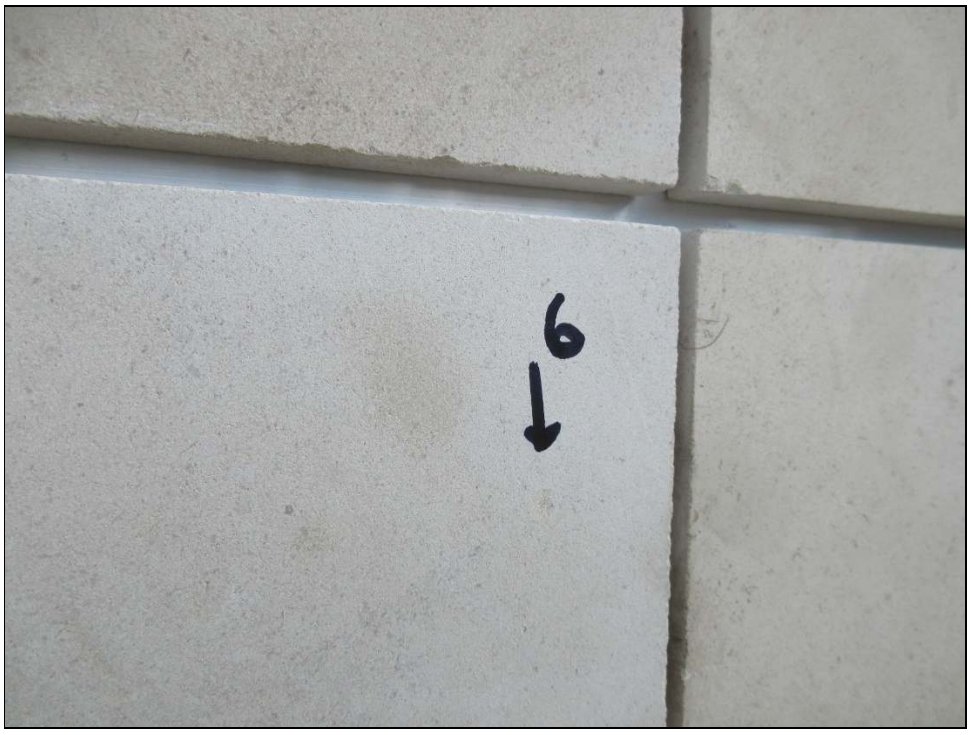


PHOTO 7219

HARD BODY SERVICEABILITY IMPACT AT LOCATION 6

PHOTO 7223

HARD BODY SAFETY IMPACTS

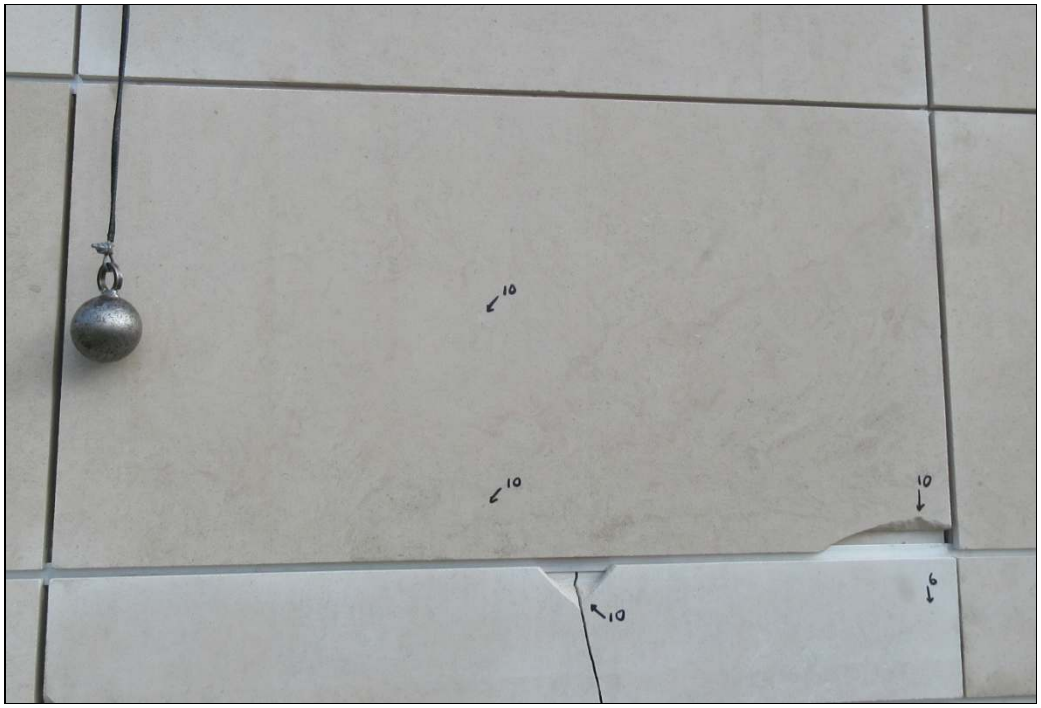


PHOTO 7222

HARD BODY SAFETY IMPACT AT LOCATION 7

PHOTO 7224

HARD BODY SAFETY IMPACT AT LOCATION 8

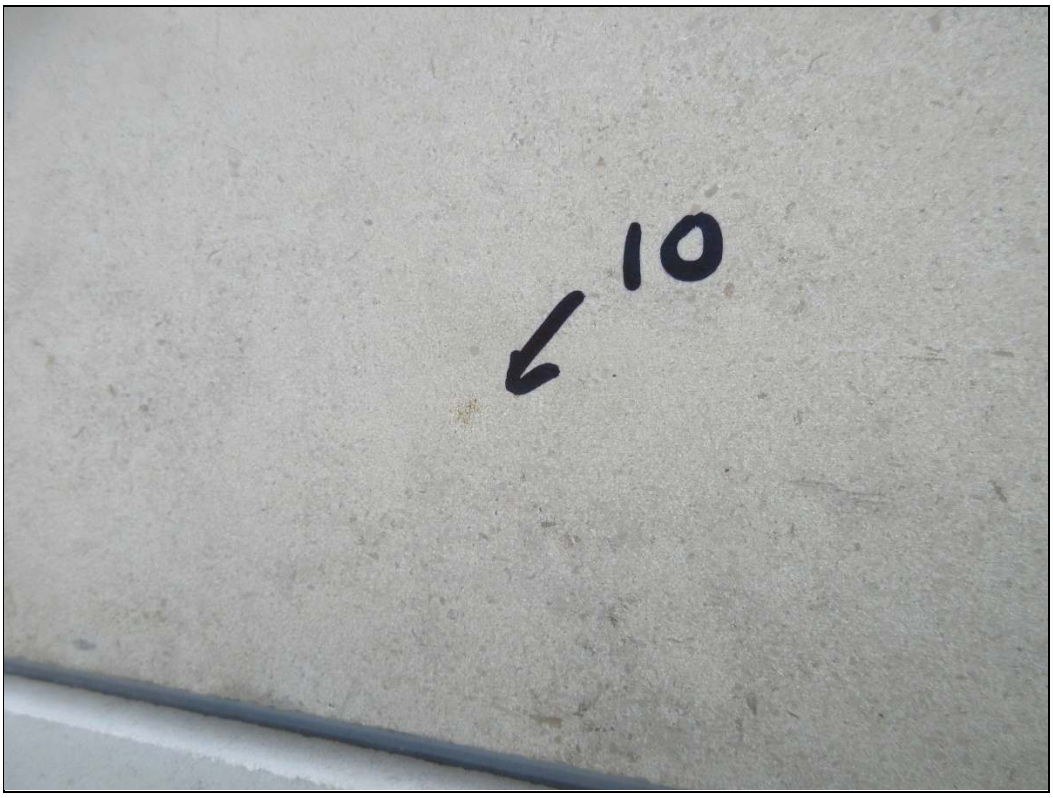


PHOTO 7225

HARD BODY SAFETY IMPACT AT LOCATION 9

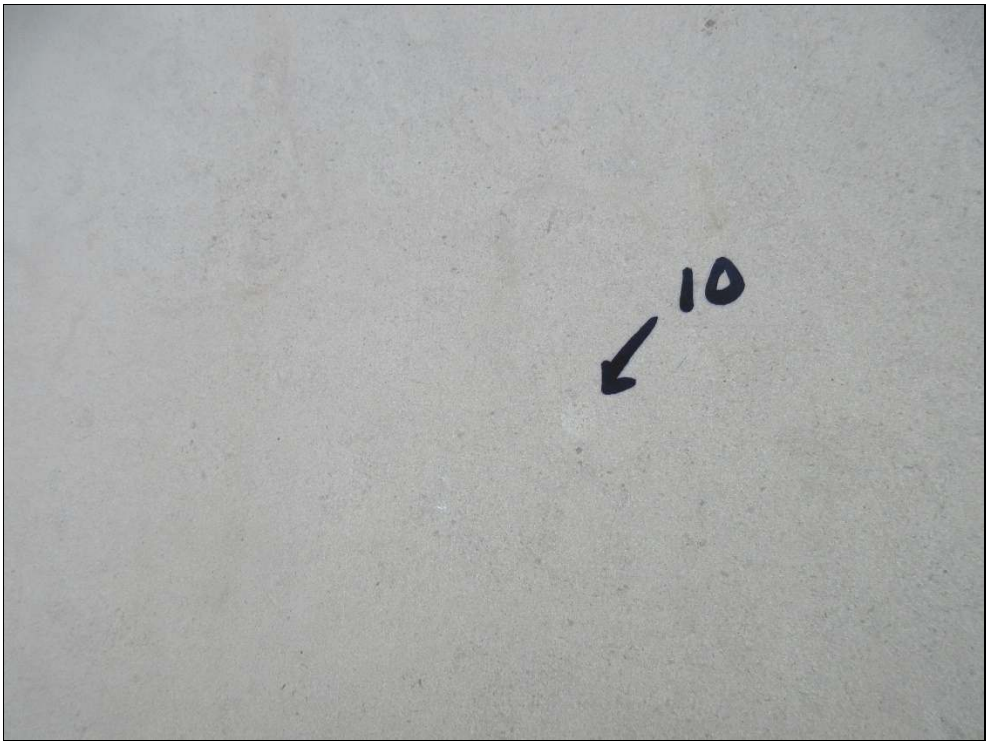
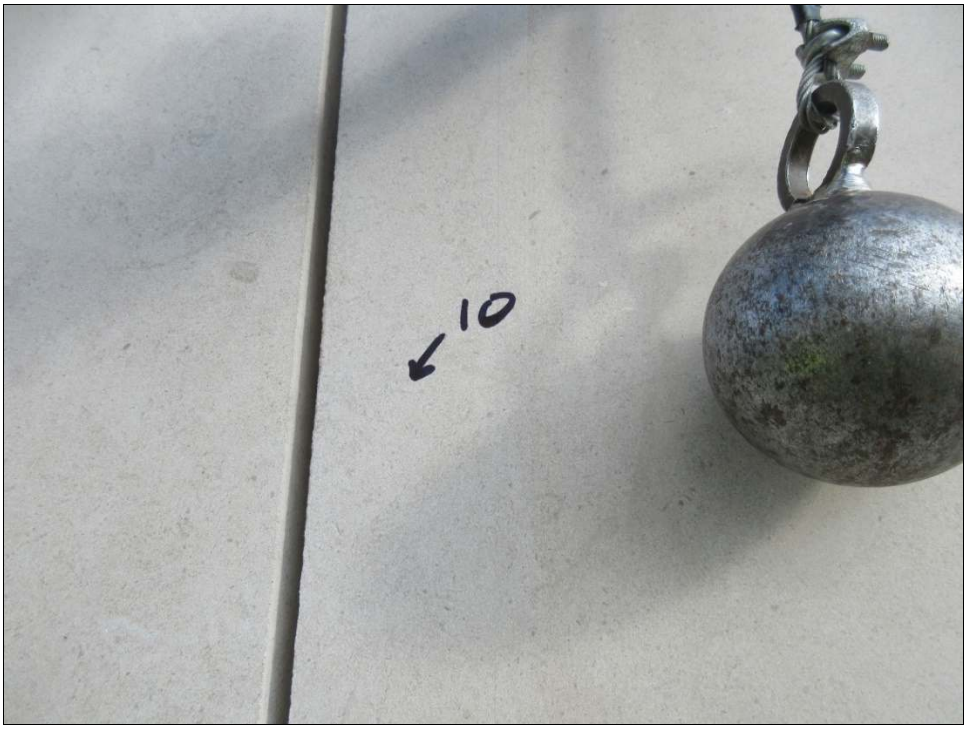


PHOTO 7226

HARD BODY SAFETY IMPACT AT LOCATION 10



Test Date: 17 March 2021

Ambient temperature = 7 °C

FIGURE 2

SOFT BODY IMPACT LOCATIONS

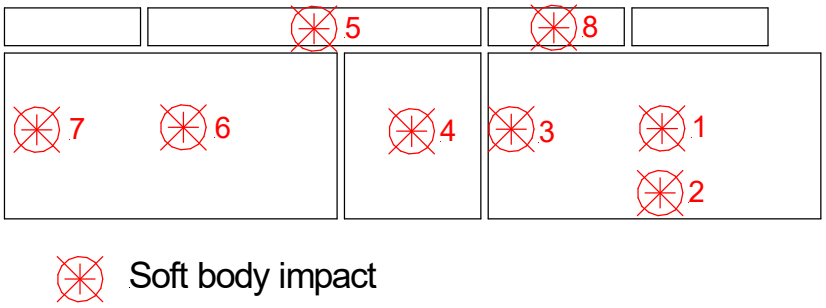


TABLE 4

SOFT BODY IMPACT TEST RESULTS

Location	Impact energy (Nm)	Observations	Classification
1	120 x 3	No damage observed	Class 1
2	120 x 3 350	No damage observed 48 g corner fragments	Class 1 Low risk
3	120 x 3	No damage observed	Class 1
4	120 x 3 350	No damage observed Edge fragments 62 g	Class 1 Moderate risk
5	120 x 3 350	No damage observed Vertical crack	Class 1 Low risk
6	350	No damage observed	Negligible risk
7	120 x 3 350	No damage observed 38 g corner fragments	Class 1 Low risk
8	350	No damage observed	Negligible risk

PHOTO 7230

SOFT BODY IMPACTOR

PHOTO 7238

SOFT BODY SAFETY IMPACT AT LOCATION 2

PHOTO 7234

SOFT BODY SAFETY IMPACT AT LOCATION 4

PHOTO 7237

SOFT BODY SAFETY IMPACT AT LOCATION 5

PHOTO 7232

SOFT BODY SAFETY IMPACT AT LOCATION 7

PHOTO 7233

SOFT BODY SAFETY IMPACT AT LOCATION 7

PHOTO 7241

FRAGMENT FROM LOCATION 2

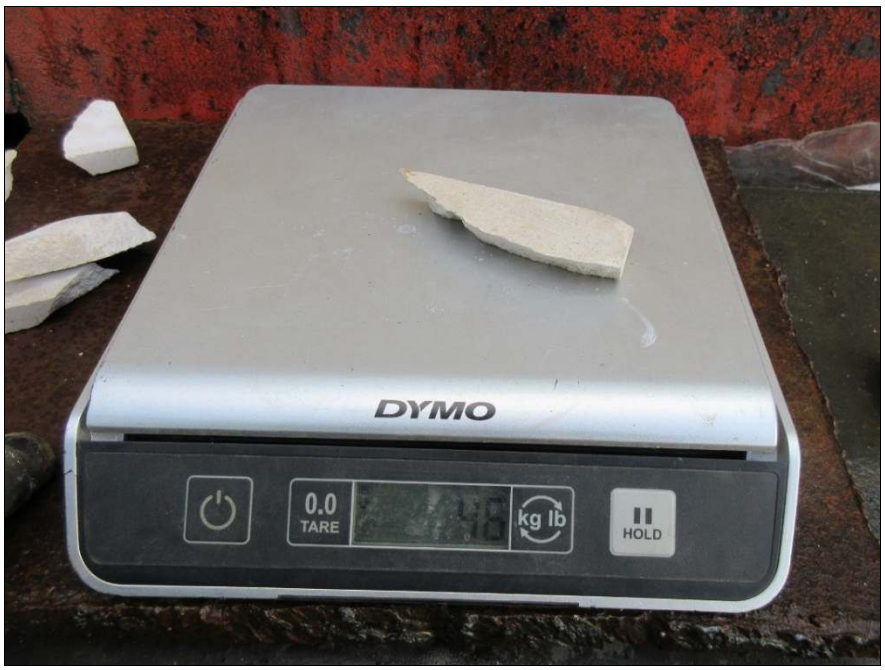


PHOTO 7242

FRAGMENT FROM LOCATION 4

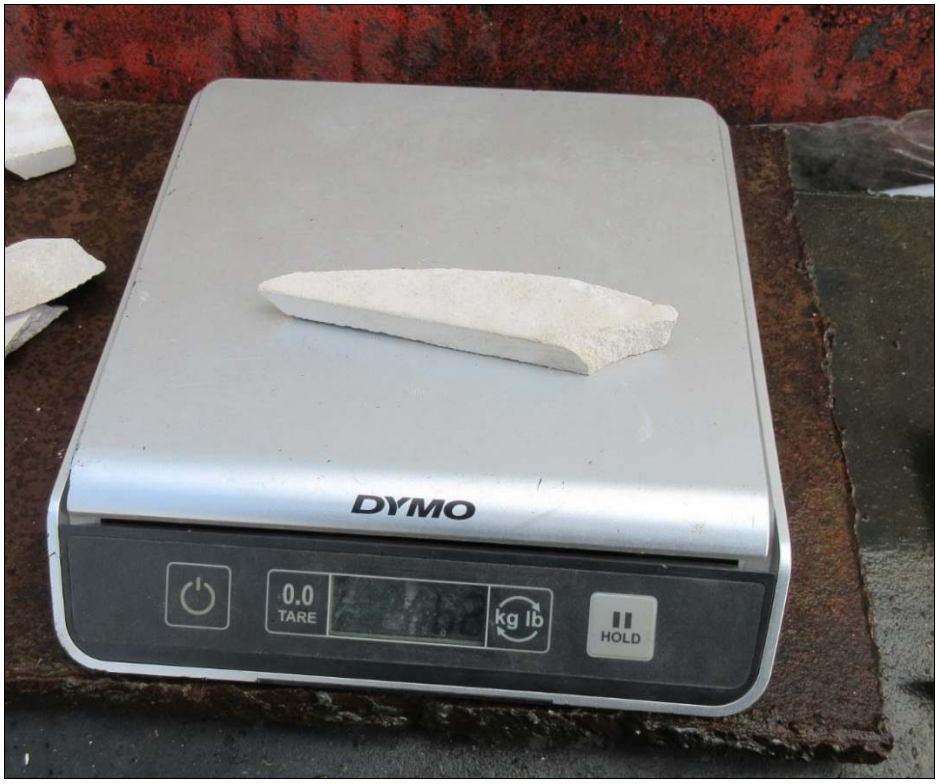
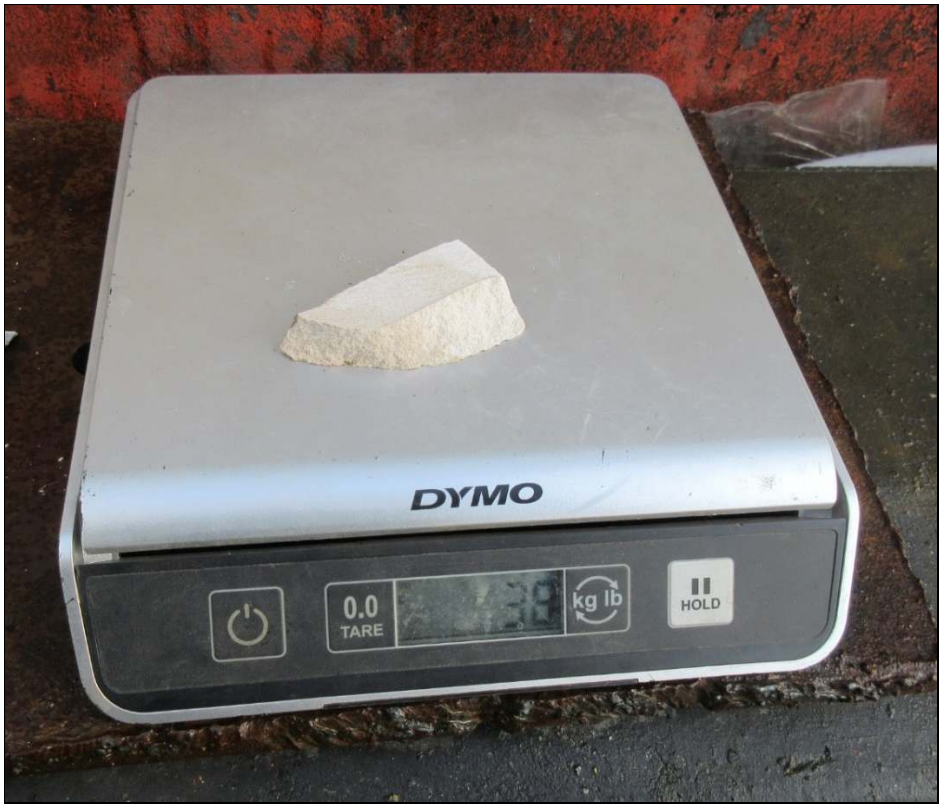


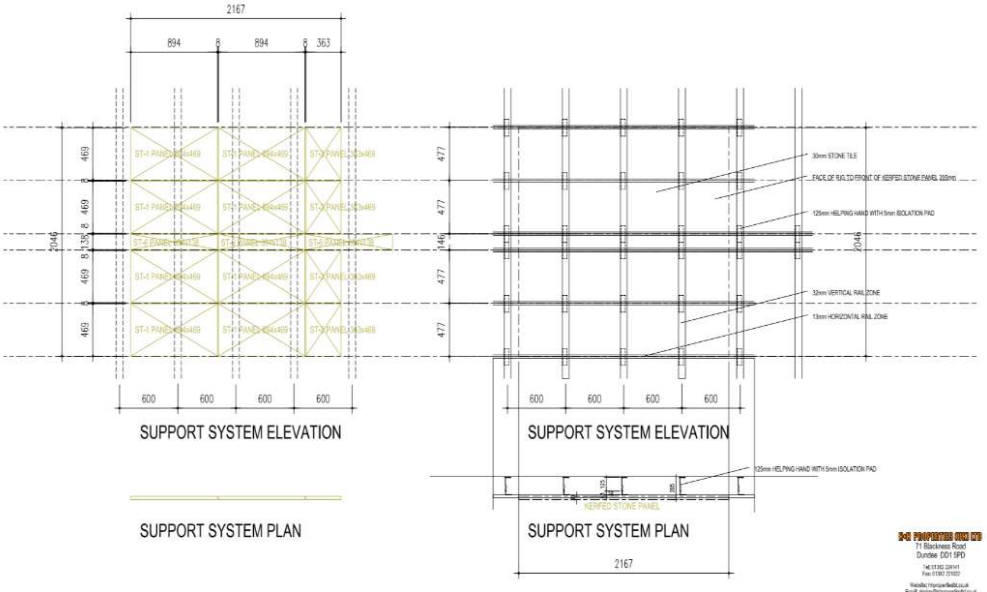
PHOTO 7240

FRAGMENT FROM LOCATION 7

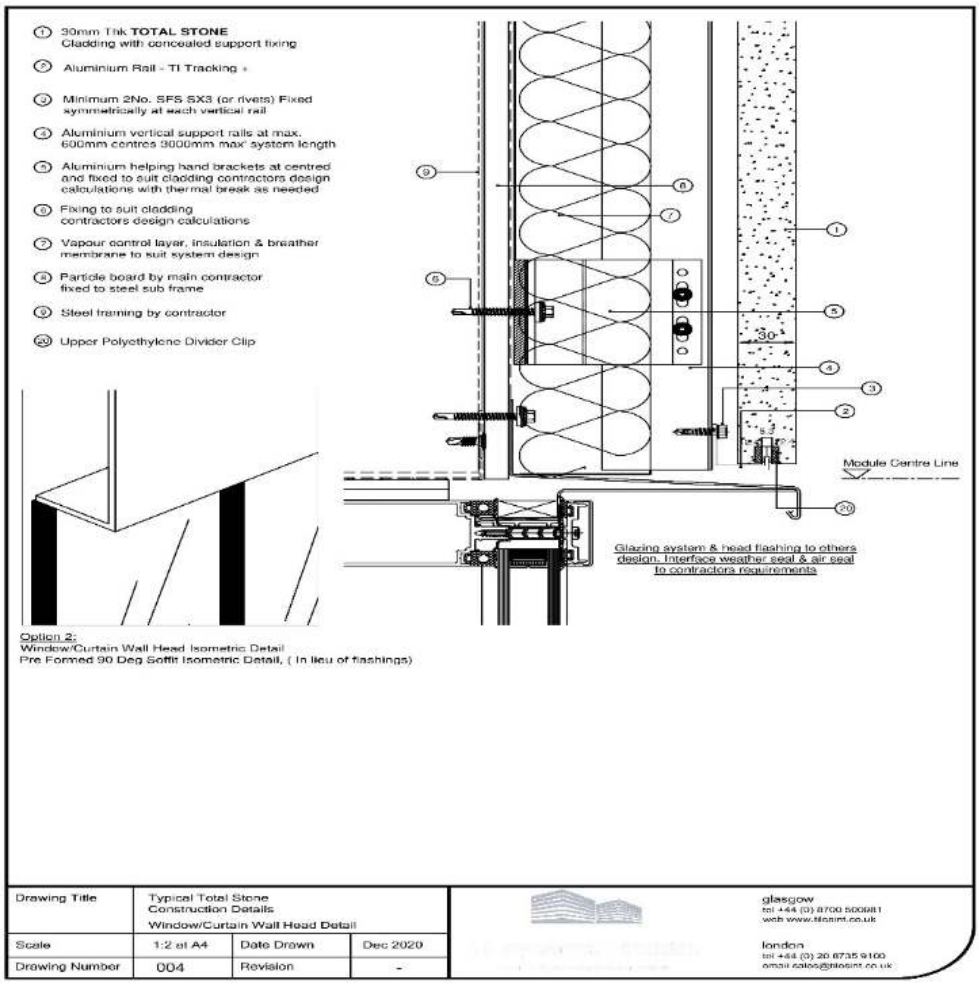


7. DRAWINGS

The following two drawings show the support system arrangement and the construction details.



BLOCK D RIVERSIDE DRIVE DUNDEE TEST RIG ARRANGEMENT SCALE 1/25@A3 ISSUED 20/01/2021



END OF CERTIFICATE