Engineers Report in Accordance with IS 465 :2018

K2 Design

Consulting Structural
& Civil Engineers

1 Cullinean Manor,
Redcastle

Ref: 9919
Date: 15/06/2023

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1.0 Introduction

IS:465:2018+A1:2020 Assessment, Testing and categorisation of damaged buildings incorporating concrete blocks containing certain deleterious materials.

This is the current standard on which the testing is based upon. The protocol of the standards recommends a building condition assessment by the Engineer to categorise the level of damage and group the property within
groups 1-4. There was no damage attributable to defective blockwork evident.

This property is group 1, undamaged. The protocol in IS:465 states that no core extraction or coring should take place unless any damage to the property places the property in at least Group 2.(table 1) Group 1 properties are outside the scope of IS:465. If the property is undamaged, then no testing would be recommended.

The testing in this dwelling has been requested to prove the blockwork is not defective for a house sale. We have extracted 10no. cores from the dwelling, which I feel is sufficient to get an indication of the blockwork performance under freeze thaw conditions.

Suite A, Suite B (Petrographic and SEM testing) have been conducted.

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2.0 Brief

On the instructions of our client [redacted] we have been asked to confirm the presence of defective blockwork at the above project.

3.0 Observations

In association with Anytime Coring, we have extracted cores as follows:

Core 1	Front Elevation (substructure)
Core 2	Left Gable Elevation (substructure)
Core 3	Front Elevation (outer leaf)
Core 4	Front Elevation (inner leaf)
Core 5	Left Gable Elevation (outer leaf)
Core 6	Left Gable Elevation (inner leaf)
Core 7	Right Elevation RHS (outer leaf)
Core 8	Right Gable Elevation (outer leaf)
Core 9	Rear Elevation LHS (outer leaf)
Core 10	Front Elevation LHS (outer leaf)

Suite A simplified petrography analysis, Suite B examination and classification requirements, estimation of free muscovite mica and compressive strength tests.

4.0 Results

4.1 Suite A Analysis.

Suite A has identified one type of concrete.

Cores 1, 2, 3, 4, 5, 6, 7, 8, 9, & 10 have been classified by Suite A examination as displaying a LOW/MEDIUM
susceptibility to deterioration due to the common (trace/minor) presence of potentially problematic mica bearing lithologies / minerals.

4.2 Compressive Testing

The compressive test results have indicated strengths of

Core 1,	14.6N/mm^2
Core 4,	18.4N/mm^2
Core 9,	12.9N/mm^2

The Building Regulations Technical Guidance Booklet A ;2012 recommends a minimum strength of 7.5N/mm2. The results are satisfactory.

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4.3 Suite B Analysis.

Core 6 was submitted suite B (SEM) testing.

SEM analysis of the binder quantifies the average content of free muscovite mica at 3% by volume of cement paste. This is considered to be an underestimate as discrimination of free mica by SEM analysis is not absolute. There is also evidence of free chlorite, which is also a phyllosilicate and could behave similarly to muscovite in cement. While there are no published limits for free mica content of aggregates in European or American standards, it has been reported that in most cases of poor concrete block durability due to micaceous aggregates that the free mica content of the binder is typically >5% by volume of the paste1 . The free mica content of the binder is below the proposed threshold and associated with aggregate that normally performs well under freeze-thaw testing.

Although the levels of aggregate related deterioration are currently limited and the concrete in this sample remains sound, the abundance of problematic lithologies (micaceous quartzite, rare phyllite and free mica) means the concrete should be considered as displaying Low/Medium susceptibility to deterioration from potential freeze-thaw damage. A freeze-thaw test could be undertaken to further assess the performance of the concrete and its susceptibility to freeze-thaw degradation.

The aggregate contains trace amounts of pyrite in aggregate fragments, with rarer occurrences in the binder (visual estimate <0.25%). The sulphides display oxidation in the aggregate and binder. The presence of sulphides can be deleterious due to the potential for oxidation and subsequent production of expansive cracking and associated secondary sulphate minerals. However, in this sample the levels are too low to be a cause for concern.

5.0 Conclusions

The concrete should be considered as displaying Low/Medium Risk to deterioration from potential freeze-thaw damage.

The presence of sulphides in this sample the levels are too low to be a cause for concern.

In my opinion the blockwork is suitable for construction if all blockwork is characteristic of this test sample.

Kieran Coyle

Signed_____

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