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17<sup>th</sup> December 2018

**FAO Mark Guild**

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Dear Sirs,

Structures  
Infrastructure  
Flood Risk  
Environmental  
Hydrology  
Transportation

**SUMMARY OF HISTORICAL STRUCTURAL INSPECTION REPORTS OF LOCHSIDE LEISURE CENTRE, FORFAR**

The purpose of this document is to provide a summary of the historical Structural Inspections Reports carried out at Lochside Leisure Centre. We have reviewed the following reports that were issued to us by email on 27<sup>th</sup> November 2018:

- Angus Council Structural Survey Report (9<sup>th</sup> July 1998)
- Angus Council Structural Survey Report (26<sup>th</sup> July 2001)
- Angus Council Structural Overview (9<sup>th</sup> July 2008)
- Morgan Associates Letter Report MA18104 dated 19<sup>th</sup> October 2018

It is understood that at least two further Structural Survey Reports regarding Lochside Leisure Centre were issued by Angus Council in July 1996 and October 1997, neither of these reports were made available during the preparation of this document. We have focussed this document on any issues regarding settlement and ground movement, and any associated effects on the superstructure.

Structural Survey Report (9<sup>th</sup> July 1998)

This Structural Survey Report was issued on 9<sup>th</sup> July 1998 by the Angus Council Roads Department Consultancy Unit – Structures Section. This report provided a summary of the Maintenance History of the Building and discusses the existing condition of the structure in 1998.

The structural maintenance summary first makes reference to settlement in July 1977. During 1984 and 1985 significant correspondence was noted regarding cracking potentially caused by differential settlement, including a period of crack monitoring. The result from this period of crack monitoring noted that the cracks moved in the order of 0.5mm to 2.5mm during July to September 1984.

A further crack monitoring campaign was undertaken between February and July 1998 which showed that the cracks moved between 0.1mm and 0.2mm during the inspection period. The report also identified the trend that the crack movement was cyclic and was likely related to foundations rising and falling with the water table level.

A dimensional survey of the first-floor steel beams above the café area was also discussed in this report. This survey noted that the end of the beam supported on the sports hall wall was 56mm lower than the rest of the floor therefore it was “surmised that the sports hall wall had settled approximately 55-60mm relative to the adjacent floor slab”.

#### Structural Survey Report (26th July 2001)

This Structural Report was issued on 26<sup>th</sup> July 2001 by the Angus Council Roads Engineering and Design Services. This document contained the results of a comprehensive dimensional floor survey carried out within the building.

The findings from the survey were that there were three localised "soft spots" located within the footprint of the building. The report also stated that "monitoring of the building has revealed that ongoing building movement to be very slow" and "settlement may have happened during construction and does not pose a threat to the building's fabric in the future".

#### Structural Overview (9<sup>th</sup> July 2008)

This document was prepared by the Angus Council Roads Department and provides an overview of the condition of the building in July 2008. It provided further discussion regarding the vibro-compaction foundation system and conjectures that the installation methodology was not executed in accordance with modern day best practise techniques.

The report presents findings from a visual inspection carried out on 25<sup>th</sup> June 2008. It concluded that "although there is ongoing foundation movement resulting in failure of previous repairs, I do not feel there is immediate concern from a structural point of view".

This document also recommended that annual inspections are undertaken and that a structural monitoring system is installed. It is not known if this work was carried out, and any results were not made available when preparing this summary document.

#### Morgan Associates Letter Report MA18104 dated 19/10/18

This letter report was prepared by Morgan Associates and was issued on 19<sup>th</sup> October 2018. This report presented the findings of a non-intrusive visual inspection of the building and concluded that there was "no indication of recent dramatic movements. Movements are not severe, but in places are significantly worse than normally expected or considered acceptable".

#### Overview

The reports appear to show a consistent trend of differential settlement and foundation movement throughout the life span of the building. The report dated July 1998 noted evidence of differential settlement was noted as early as 1977, culminating in extensive inspection and monitoring work which was carried out between 1984 and 1985.

This evidence suggests that the building has been subjected to significant ground movement with the majority of this settlements occurring very early in the lifespan of the building. This is reinforced by both the 1998 and 2001 reports noting differential displacements in the order of 60mm. Settlement in new building structures is normally most significant during the early life stages and then there is a tendency so progressively slow down. This is also the case for the leisure centre.

The July 1998 report discusses a crack monitoring campaign that was undertaken in 1985 which noted crack movements between 0.5mm and 2.5mm during the inspection period. Subsequent crack monitoring carried out in 1998 suggested that cracks were moving in the order of 0.1mm to 0.2mm during the monitoring period. The July 1998 report also discusses that the movement of the cracks appeared to be cyclic depending on the season, with the foundation system moving depending on the water table level. Following our recent inspections we likewise agree that due to cyclic influences although there appear to be on-going crack movements they are extremely minimal with a tendency to open and close. This again is typical in situations where there are cyclic influences which impact on foundations.

The general conclusion from each of the reports was that the building presents evidence of significant foundation settlements; however, any ongoing movements are very gradual and do not present an immediate threat to the stability of the building. All reports suggest that the building is monitored on a regular basis.

## **CONCLUSIONS**

It should be noted that not one of the reports state that the building is in a dangerous condition that poses a threat to public safety.

The information discussed corroborate the findings of our survey report carried out in September 2018. We stated that the building does show evidence of structural settlement; however, the defects noted are relatively minor and are not anticipated to compromise the long-term stability of the building. Cyclic movement of the foundation system will require a general maintenance programme to be implemented to preserve the building fabric condition. Such maintenance regimes have already been employed in the past to preserve the aesthetic appearance of the building.

**We can conclude that the building is in a structurally sound condition with any general foundation movements only affecting the internal / external finishes and not causing any material impact on the main structural elements of the building itself. With a proper maintenance and inspection regime put in place we do not anticipate that there is any reason why the building cannot remain in a structurally sound condition with its lifespan extending for a further 30 years and beyond.**

We trust that this provides you with an accurate summary of the structural inspection regime of the building, however, if you have any queries please do not hesitate to contact our office.

Yours faithfully,

A handwritten signature in black ink, appearing to read 'Ken Pirie', written over a light blue horizontal line.

Ken Pirie CEng MICE  
Managing Director