

**Site/Project:**

Waterside Historic Railway Station, Derry  
Co Londonderry

**Industry:**

Infrastructure Project

**Client:**

Transport NI / Mott  
MacDonald

**Location:**

Derry, Co Londonderry

**Site Type:**

19<sup>th</sup> century historic railway station

**Deliverables:**

3D internal and external  
measured building survey  
Level 3 BIM Model

**Benefits:**

Cost Effective  
Quick turnaround  
Non contact – remote  
survey  
Unparalleled accuracy and  
detail

**Added Value:**

3D Data integration for BIM  
modelling

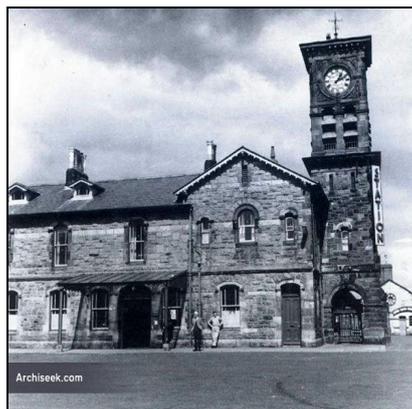


This issue  
Measured Building Survey as  
an aid to BIM design and  
Historic Building Conservation

**Introduction**

The old Waterside Railway Station is a sandstone constructed building located at the terminus of the Belfast – Derry railway line having been designed in the mid-19<sup>th</sup> century by prolific local architect John Lanyon. The building was extensively bomb damaged in 1972 & 1975 during which time the central portion of the building was destroyed and subsequently replaced with a glass structure and internally re-enforced and modernised.

As part of ongoing development of the railway infrastructure in Derry, TransportNI plan to re-development this old building as a modern transport hub for the city. As the building had previously been subject structural deformities and extensive re-modelling an accurate measured survey was carried out to assist consulting engineers to accurately model the structure as part of a BIM (Building Information Model)



Outside Waterside Station early 20<sup>th</sup> century

**Project Brief**

In 2015 FarrimondMacManus carried out a 3D laser scan survey of the building with the production of 2D CAD plan, section and stone-by-stone drawings of the building to assist in initial project design and stone conservation work. Later in 2016 we were further tasked to produce a Level 3 BIM model of the building to allow for collaborative design of the building between the various project personnel.



Initial 2D stone elevation drawing output

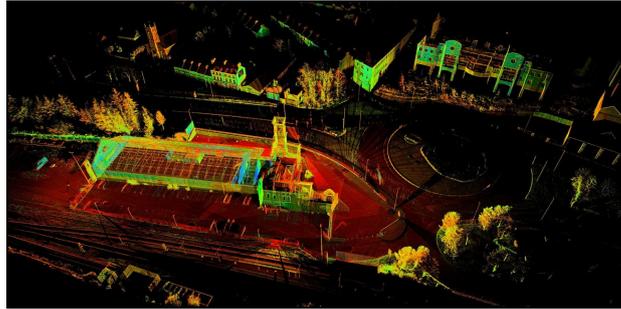
**Measured Building Survey**

The measured building survey consisted of a 3D laser scan survey of both the external and internal building structure with a Leica P20 unit.

The laser scan survey was carried out over a period of two days collecting 130 individual scans at a resolution of 3mm (at 10m) externally and within the historic warehouse portion of the site, and at a resolution of 6mm (at 10m) internally for accurate floorplan production. Onsite control provided through GPS and total station survey related to Irish Grid.



## CAD Analysis & 3D Output

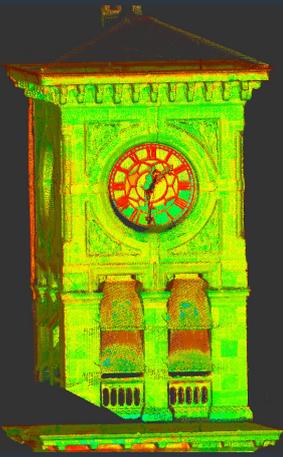


Fully registered point cloud scan of Old Waterside Station

A total of 130 individual 3D point cloud scans were registered together from a completed model of the survey area within Leica Cyclone software. The resultant point cloud was subsequently exported into Autodesk Recap format for importation into BIM software for modelling purposes.

Within the BIM software the point cloud data was sliced up along its X & Y Axis in both 2D and 3D plan/elevation/section views. The project brief was to construct a Level 3 BIM model, i.e. primary architectural data (walls, floors, ceilings, roof etc) with additional modelling of warehouse trusses and a Level of Information 3 for each model category. Architectural detail such as window surrounds, cornicing and architrave were also modelled as custom components.

All structural elements were constructed directly over the point cloud data with a modelling tolerance of 50mm over the majority of the building. Upon delivery of the model a QC report was produced outlining those areas where modelling tolerances were exceeded



Detail of clock tower from scan data

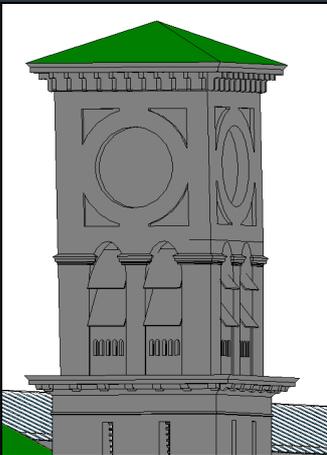


Internal building modelling of point cloud



External building modelling of point cloud

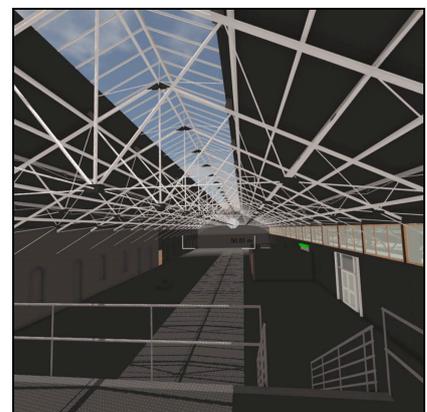
While the data was used for the production of 3D BIM modelling for construction design, it is also possible to use the model for visualisation purposes. The model was imported into virtual Reality VR software for viewing in a VR headset. This allowed the viewer to walk through the building within an immersive 3D environment and provided a useful tool for verification and quality check of the model itself.



Custom modelling of architectural features of clock tower



Rendered model of building



Warehouse view within VR environment

The 3D scan data was made available within 2 days of completion of onsite survey and final 3D BIM model made available to the client within 3 weeks of completion of the onsite survey.

### Applications:

Accurate 3D data for BIM modelling integration

Invaluable aid to building restoration and design

Complete measured survey archive