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LEVEL 4 ASSESSMENT

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Building Survey

Introduction

A systematic process employed to obtain accurate information regarding the architecture of a structure, condition, as well as the design of the interior space is referred to as building surveying. It is essential in documenting, analysing, renovating, as well as managing the structure. Currently, in surveying techniques, technology is replacing the use of manual techniques.

3D laser scanning is one of the recent digital technologies being applied in building surveying. The technology makes it possible to record a large amount of data on a building's spatial points at a high level of detail. Compared with traditional surveying methods, 3d laser scanning has a high degree of accuracy and completeness, and it saves a lot of time when done in a building interior.

The purpose of the current study is to document and analyse the building survey that was carried out at the Dylan Thomas centre using ground penetrating laser scanning. The study is divided into three major sections. Section 1 is dedicated to the planning that takes place in the building survey. This includes the objective, technique, site evaluation, and risk factor. The activities that take place in the field are discussed in section 2.

The report below aims to cover learning outcomes for this unit by showing an understanding of contemporary surveying methods, using practical surveying skills, and critically assessing current surveying practice.

Planning the Survey

We also had initial consultation with the qualified surveyor that we quickly gather some information related to the property (Dylan Thomas centre), surveying equipment, as well as the area that we went to survey. In the first week, we made use of the terrestrial laser scanner. This equipment makes use of a high-pre surveying tool that applies laser pulses to record millions of data points.

(Point Clouds) of landscapes, buildings, and objects from a ground-based view.

The purpose of the survey is one of measurement.

The university will benefit from the findings of this survey.

Manual Measurement: These involve traditional measuring methods where the measurement is made using optical or contact devices such as callipers, Clinometers, or total stations to record individual discrete observations or readings of distance, angles, Or height.

Survey Area Definition

The object which would be scanned in the corridor.

The reason why this region was selected as the field for the survey is its capacity to provide quick, accurate, and comprehensive information.

Survey Methodology and Equipment

The use of digital scanning technology is prevalent in the built environment sector. The 3D laser scanner used in this project is a Leica RTC360, a high-quality device developed for fast and accurate data collection in both indoor and outdoor environments.

The Leica RTC360 Scanner uses LiDAR technology. The LiDAR system works by the scanner shooting laser pulses to surrounding surfaces and the reflected pulses returning to the scanner. The return time of the pulse determines the distance to the surfaces, and the scanner captures millions of points, which form a cloud of points called a 3D point cloud.

Apart from range measurements, the RTC360 features Inertial Vision (VIS), which is responsible for tracking the movement of the scanner between individual scanning points. This helps achieve automatic alignment of scans without requiring manual data recording. The device is also capable of capturing high-resolution images to colour the point cloud for better visualization.

Limitations of the Survey Plan

The time allocated for the survey was limited, with only two hours allocated in a week for laser scanning and other measurements. Although it was open for everyone, having people around was a factor that affected the continuity of the survey.

Technical limitations included the possibility of obstacles that could be present because of the pathway layout and the movable objects. This implied that the problem required more cognitive thought and strategic planning.

Practical Survey Execution

Survey Dates

3rd, 10th November

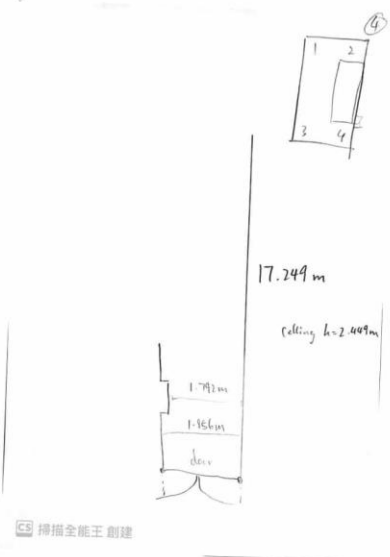
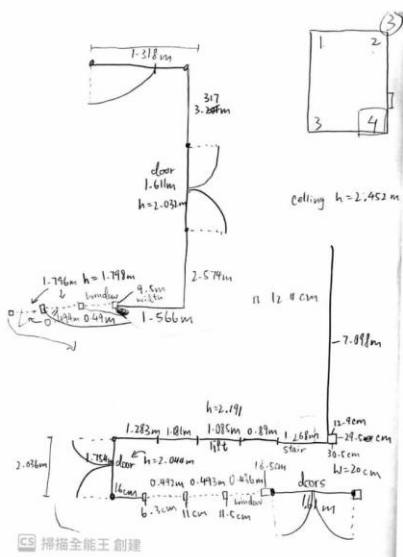
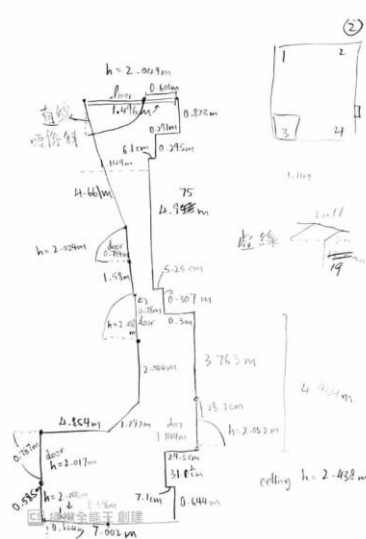
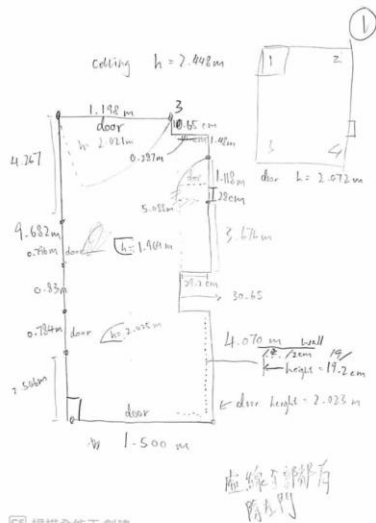
Work Duration

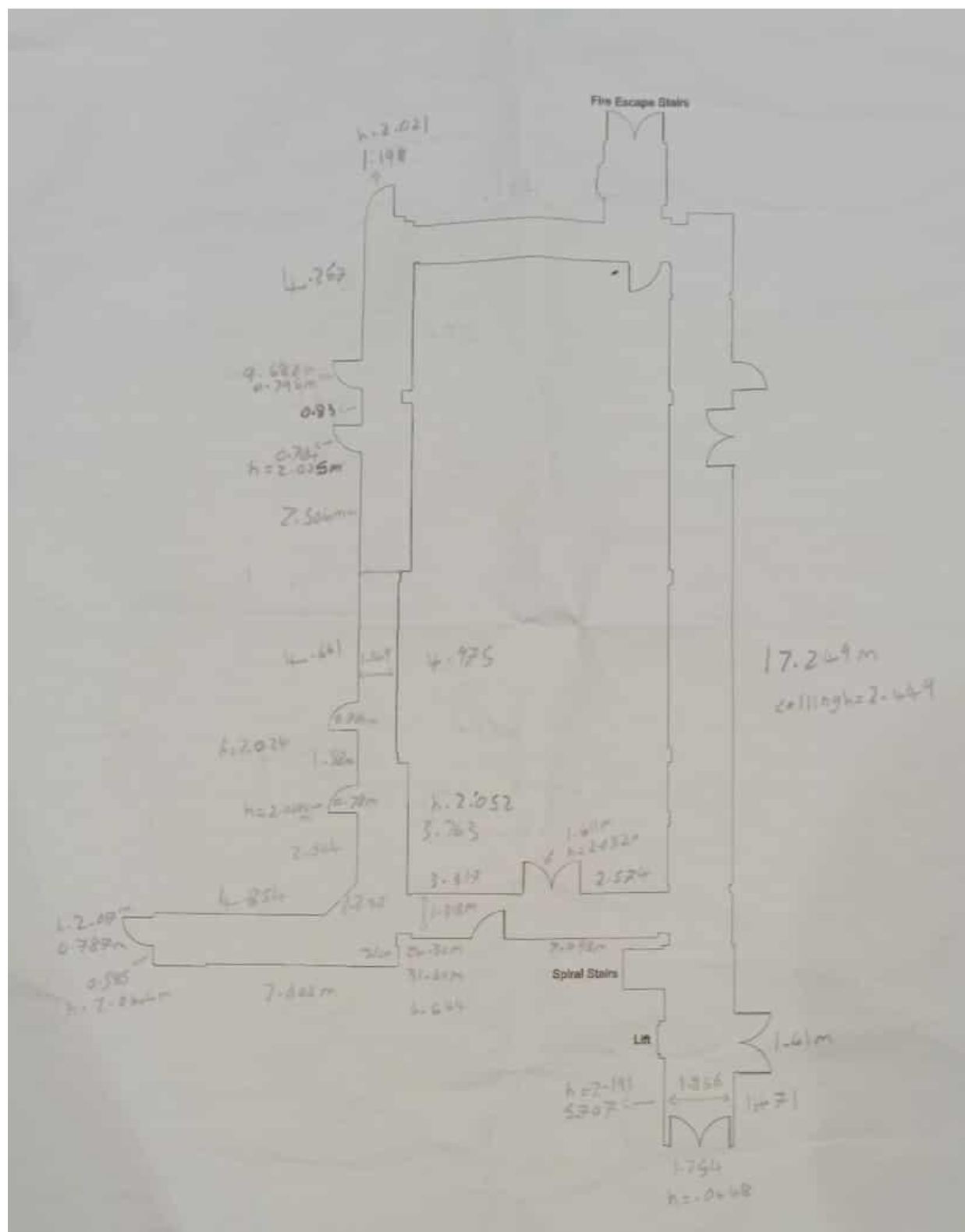
4 hours

Number of Survey Sites

1 site

Evidence of Site Work





Survey Execution Review

The scan was done as scheduled. This included a laser scan in the first week while measurements were done in the second week.

Problems Encountered and Solutions

The major challenge we faced in this study involved pedestrian flow in the corridor. This challenge was eliminated by waiting until the area is clear prior to undertaking the survey. Other sites could also be employed as needed, in order to account for obstacles encountered.

Measurement and Analysis

Extracted Measurements

Corridors dimensions:

4.267

2.6506

4.661

1.58

2.044

4.854

0.585

7.002

3.317

2.574

7.098

4.975

5.707

1.471

Ceiling height: -

H: 2.449m

Door dimensions: -

H:2.021m

1.198 m

H:2.025m

0.784m

H:2.617m

0.787m

H:0.448m

1.754

The measurements were taken manual.

Accuracy and Reliability

Manual Measurement Using Terrestrial Laser Scanning

Data Collection High-density, volumetric capture. Millions of points automatically. Records everything in line of sight. Selective, discrete points. Only points selected as needing measurement are scanned.

Speed of Capture It's very rapid when scanning an area. It takes minutes for an entire complex scene to be scanned. It's very slow and linear. The time taken varies linearly, depending on the measurement needed.

Data Type & Output 3D Point Cloud (dense, visual). Main outputs: spatial data files (las, e57, pts). Derivatives: 2D drawings, 3D models, cross-sections, volumetric calculations. Numerical Data & 2D Sketches. Main output: a list of coordinates, distances, and angles. 2D drawings are created based on the data.

Resolution & Completeness

High resolution and completeness. Captures the details in the image as well as the context of the scene, facilitating re-interrogation of the image later.

Poor resolution and incomplete.

Captures only what was planned for. Does not record context unless measured explicitly.

The Measurement Process

Indirect and non-contact. Safe for dangerous and fragile surfaces. Operator configures and controls; scanner does all data acquisition. | Direct (Contact) or line-of-sight.

Tends to require physical proximity to the target. This can be dangerous or simply not possible.

Human Factor & Error

Low in data capture.

Automatic process reduces errors. The errors are systematic (calibration, registration).

High degree of data capture.

Vulnerable to error (tape misreadings), Parallax Errors, Transcription Errors.

Cost

High Capital Cost.

Costly equipment and software.

Low Operating Cost

per project once owned.

Low capital costs.

Inexpensive tools

High Operation Cost

in person-hours for large and complex projects.

Skill Requirements

High for processing and analysis.

Needs expertise in point cloud processing tools, registration, and data extraction.

Very high for field capture. It also demands some level of expertise on what exactly needs to be measured.

Best Application

Recording complex geometry, As-built validation, Deformations monitoring, BIM, Forensic analysis, Precision volumetric scanning.

Simple projects of a limited nature that require the verification of one or two specific attributes, low budget projects that require sparse data. According to the Royal Institution of Chartered Surveyors. [RICS], (2019),

Comparison with Traditional Methods

Key Advantages & Disadvantages

TLS Advantages:

- *Comprehensive Record:* Creates an immutable, digital 3D record of the "as-is" condition at a point in time.
- *Reinterrogation:* New measurements can be taken from the point cloud long after the site visit.
- *Safety:* Can operate from a distance, ideal for unstable structures, busy highways, or hazardous environments.
- *Visualization:* Directly enables stunning visuals, animations, and immersive models.

TLS Disadvantages:

- *High Initial Cost:* Barrier to entry for small firms or occasional use.
- *Complex Processing:* "Data overload." Turning raw point clouds into usable information requires significant time and expertise.
- *Line-of-Sight Limitation:* Cannot see through objects. Requires multiple setups (scans) to cover an entire site, which must be precisely aligned ("registered").
- *Environmental Sensitivity:* Performance can degrade in heavy rain, fog, or on very shiny/dark surfaces. Leica Geosystems (2023)

Manual Measurement Advantages:

- *Simplicity & Accessibility:* Easy to understand, deploy, and get immediate results.
- *Low Cost:* Minimal investment required.
- *Targeted Accuracy:* Can achieve very high accuracy on a specific point (e.g., with a high-end total station).
- *No Data Overload:* You only collect what you need.

Manual Measurement Disadvantages:

- *Incomplete Data:* Risk of missing critical details not noticed on site. No going back without a revisit.
- *Labor Intensive:* Extremely time-consuming for large or complex objects.
- *Safety & Access Risks:* Often requires physical contact or proximity.

Conclusion

This report records the planning, implementation, and findings of the survey of the building of the Dylan Thomas Centre using 3D laser scanning technology. The survey proved the applicability of digital surveying techniques in an academic environment.

The application of terrestrial laser scanning offered precise and valid information on space, which proved very beneficial in comparison with conventional methods of observation. Time limitations and foot traffic obstacles were overcome through effective planning and problem-solving. This survey highlights the ever-increasing role of digital technology in actual professional practice as a building surveyor. The project bridges the gap between theory and practice, thus enhancing both academic and practical knowledge.

Reference

Leica Geosystems (2023) Leica RTC360 3D Laser Scanner Available at: <https://leica-geosystems.com/products/laser-scanners/scanners/leica-rtc360> (Accessed: 05 January 2026).

Royal Institution of Chartered Surveyors [RICS] (2019) Measured Surveys of Land, Buildings and Utilities, 3rd edition. Available at: <https://www.rics.org/profession-standards/rics-standards-and-guidance/sector-standards/land-standards/measured-surveys-of-land-buildings-and-utilities> (Accessed: 05 January 2026).

