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ASSESSMENT

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Programme:	BSc Civil Engineering
Module:	Digital Surveying and Highway Design
Module code:	ACBA4017
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Assignment Title:	Building Survey
Submission:	09/04/2026

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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 UWTSD the Dylan Thomas Centre, Swansea. 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 , surveying equipment (Leica RTC360 3D Laser Scanner), as well as the area that we surveyed is the corridor located in Swansea at Dylan Thomas Centre the corridor is 17m approximately as long as it includes multiple doors open all sides with artificial lighting additionally there was foot traffic in the area which had an impact on scanning positions. In the first week, we did use the terrestrial laser scanner. This equipment is a professional 3D surveying tool that applies laser pulses to record up to 2 million points per second and advanced High-Dynamic Range (HDR) imaging system in less than 2 minutes to completed. Which makes 3D reality capture faster than ever before. Automatically recorded the scans in the corridor without manual involvement our cyclone FIELD 360 data straightway published to Reality cloud studio which is powered by HxDR.

Education is the purpose of the surveys.

The university (students) will benefit from the findings of these surveys.

Manual Measurement: In the second week we had traditional measuring methods where the measurement is made using contactless device such as Leica DISTO D2 Laser Distance, steel tape to record individual readings of distance, height.

Survey Area Definition

The precise physical extent of the building recorded, and the level of accuracy needed for the digital data are specified in the survey Area Definition. The definition for this survey is based on the assignment requirements and the source data supplied: Scope of the survey focuses on the building's internal layout, specifically capturing four separate zones as shown in the building data. The reason why this region was selected as the field for the survey is its capacity to provide quick, accurate, and comprehensive information.

Zone 1: An interior area with door openings and primary wall dimensions of 4.267m and 9.682m with measured ceiling height of 2.448m and dimensions of 1.1198m by 2.021m .

Zone 2: A region with a recorded ceiling height of 2.438m that capture of wall segments like 4.661m and 7.002m .

Zone 3: A high traffic area with ceiling height of 2.452m that contains building services and access points like stairs.

Zone 4: A sizeable open area.

The data captured across these areas will be used to generate a suite of professional outputs including 2D CAD floor plans and 3D point clouds.

All data must be compatible with AutoCAD.

Survey Methodology and Equipment

Digital 3D Laser Scanning

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 extreme speed and Visual inertial System technology (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.

Traditional Manual Measurement (Manual Methods)

Metric steel tape.

Laser distance meter (Leica DISTO D2) Bluetooth Laser Measure.

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

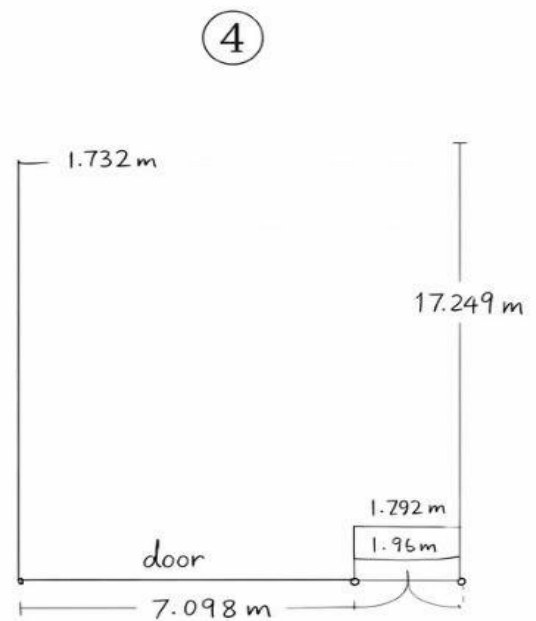
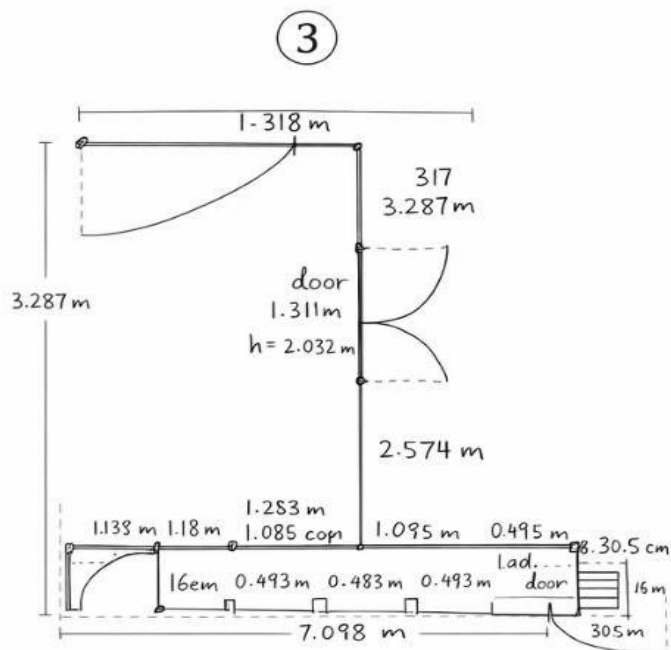
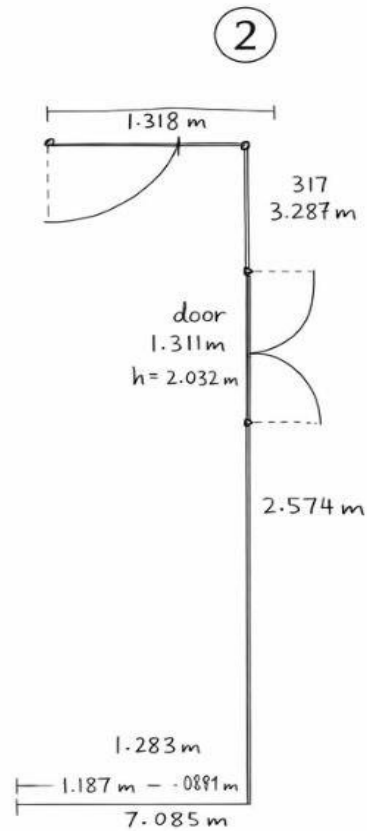
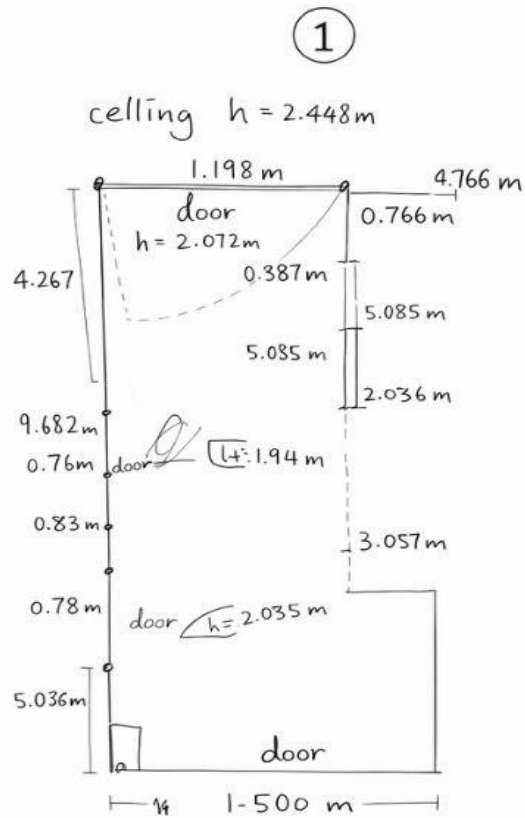
Work Duration

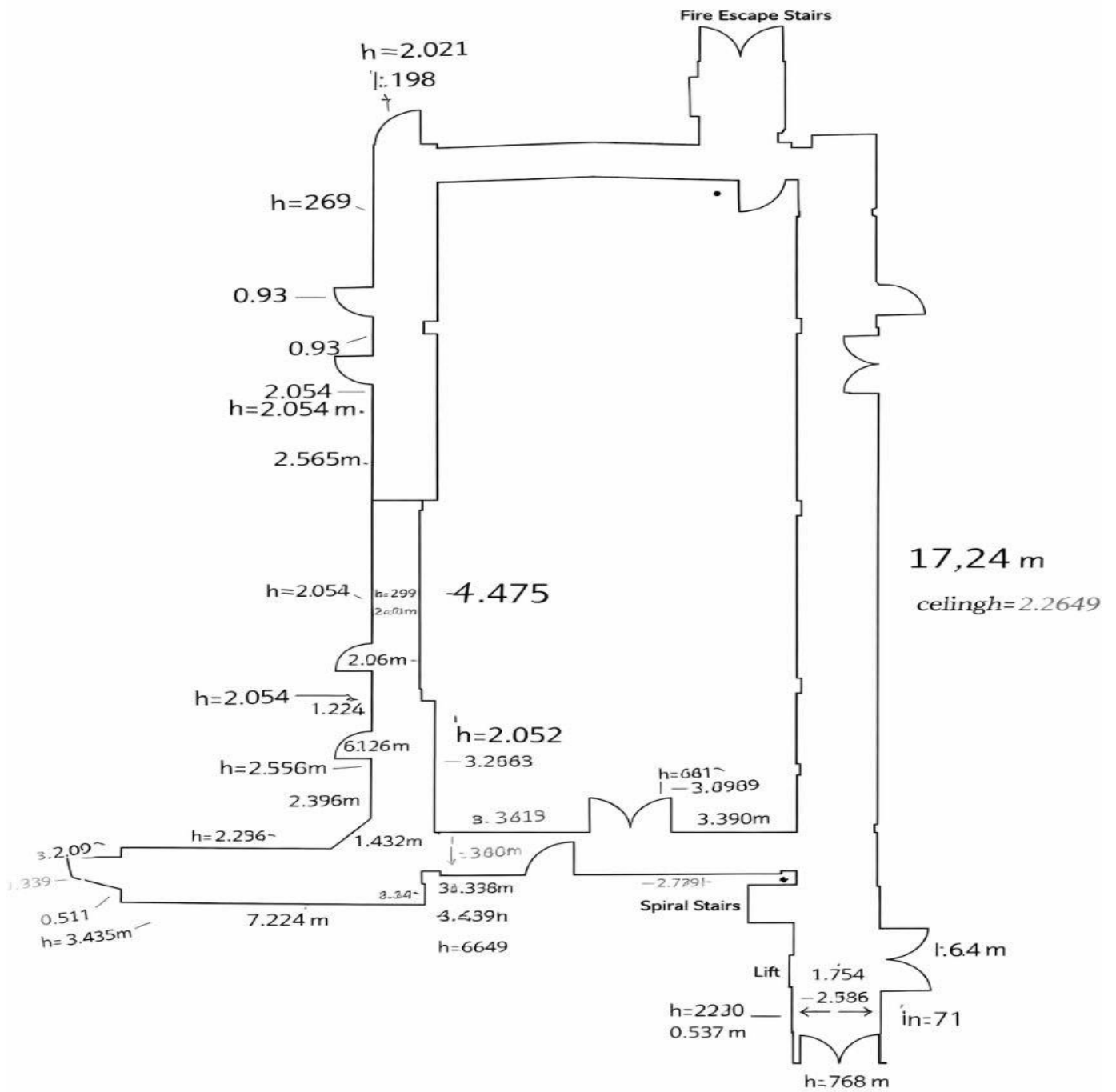
4 hours

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 survey involved pedestrian flow in the corridor and obfuscation effects which created gaps in data coverage. This challenge was eliminated by waiting until the area is clear prior to undertaking the survey. Other sites could also be employed as needed, to account for obstacles encountered, using multiple scanning angles.

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

Digital Measurement Using Terrestrial Laser Scanning (TLS)

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. The accuracy of 3D laser scan is determined by both the hardware used and the environmental conditions during data capture.

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. Laser scanning (TLS) has been shown to be significantly more precise than manual methods in determining the location of structural features with average error of only 0.16m for TSL compared to 3.9 m for manual measurement.

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:

In digital building surveys resolution and completeness are essential metrics for assessing 3D laser scans versus traditional methods.

Resolution measures the scanner's ability to capture details indicated by point density (point/cm²).

Advanced scanners like the Leica RTC360 offer higher point measurement rates.

Completeness defined as total environmental coverage results in point clouds that document the structural features and defects unlike manual measurements. Occlusion poses challenges necessitating multiple scanning positions to ensure data coverage.

High resolution and completeness capture the details in the image as well as the context of the scene making it easier to re-examine the image later.

The Measurement Process:

The measurement process in building surveys incorporates traditional manual methods and digital 3D laser scanning to accurately record dimensions.

The manual method involves systematic actions such as initial sketching, capturing dimensions along walls, recording vertical measurements. In contrast digital scanning uses laser scanners (TLS) to collect millions of data point cloud through surveying process on site followed by office data processing.

The digital method often achieves higher accuracy and faster data collection compared to manual methods.

Overall, while both methods aim for accuracy digital scanning offers extreme speed and precision.[RICS], (2019),

Comparison with Traditional Methods

The Leica RTC360 Terrestrial Laser Scanner (TSL) marks a significant advancement over traditional measurement method such metric steel tape and Leica DISTO D2 Bluetooth laser measure. The RTC360 utilizes 3D laser scanning technology, offering high accuracy (1.9 *mm* to 10*mm*) and fast data capture rates up to 2 million points/sec , in contrast to the DISTO D2 and traditional methods. Which rely on manual measurements with lower precision and slower processes. In Dylan Thomas Centre traditional methods involved painstaking manual sketches made them time consuming in contrast the RTC360 rapidly surveyed in approximately 2 hours through automated scanning reducing human error and capturing comprehensive data from various angles to enhance accuracy and minimize occlusions. Traditional methods require revisits for missed measurements while the RTC360 generates point clouds, facilitating versatile deliverables including 3D BIM models and 2D plans, with also identifying structural issues that manual methods may miss.

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/sectorstandards/land-standards/measured-surveys-of-land-buildings-and-utilities> (Accessed: 05 January 2026).