

FINN GALE- 2326098

DIGITAL SURVEYING

ASSIGNMENT 1

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Introduction

This document is a generic building survey plan focusing on Fire Safety and compartmentalization in Milford Haven Secondary School. This is currently a project I am working on right now and I believe is a good example to use to showcase the different types of digital surveying techniques and requirements.

The initial building survey is crucial to the development of any construction project, no matter the scope or size of the proposed project. The goal of a building survey is to identify any and all defects that will require work in order for the building to be considered 'safe'. This can include high reading damp marks, subsidence/cracks and general disrepair. A survey will also include all preventative measures that the surveyor should recommend such as old roof felt, (Black) that will need to be replaced sooner rather than later due to the age. Safety is the number one priority in construction since the various legislative Acts from 1970's/80's, any issues such as faulty wiring, potential gas/water leaks and structurally unsafe elements of the building are protected in law. Everything in a chartered building survey is to help the client future proof that property regardless of the next steps for the building.

The role of digital technology is crucial compared to the previous generation methods. LiDAR (Light detection and ranging) scans using lasers to sketch a high-definition 3D model of any building is a very useful tool and allows for designs to be created to a very high point of accuracy. Having a digital model of your building allows for surveyors to most likely only attend site once, they can then work from photos and models to re-take measurements and locate hidden issues that may not be visible using the traditional methods. This transfers well to the usage of aerial drones, with a high-resolution camera and thermal sensors. The ability to survey aspects such as roofs, chimneys etc is now far safer and more reliable.

The purpose of this report is to demonstrate and plan a superficial building survey to display usage of modern digital surveying tools. This can include LiDAR, Building Information Modelling (BIM) , Artificial Intelligence, Aerial drones and how they can be utilized in the real world within precarious survey locations.

SURVEY OBJECTIVES AND SCOPE

To begin, my survey would consist of making all necessary background checks. As mentioned in the survey plan below, this would include previous maintenance records, relevant certificates and local regulations. For reference, my assignment will focus on Milford Haven Comprehensive School, built in 1964. This is due to the fact that I am currently working on site following an external fire safety and compartmentalisation building survey. Once attending site, I would insist that the building is out of current use due to the high capacity of students and check the weather beforehand. Before entering the building, looking out for any external defects that could be causing problems inside the building. When inside, I would take a tour of the building, gather bearings all the while searching for any signs of wear. Once I have seen the building, I would start my measured survey. This would consist of using the LiDAR sensors to map out each location/room and using laser measuring devices to gather accurate mm measurements of each room. Arranging for a drone survey to be taking place, by myself or by an outside contractor, which can be reviewed at a later time. This would also include a thermal imaging camera. When the on-site survey has been completed, before raising any in-person concerns I would take my findings back to my place of work to enable searching through all current photos, records of work and documents, the drone survey footage and creating a floor plan or 3D render to make an hypothesis of ideal maintenance work and essential current remedial work. This is then when I would create the report, starting with identifying the client and what the survey would benefit, including all photos, recommendation's, drawings, and expert opinions.

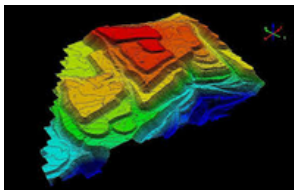


This is the schools photo of the building I am planning on surveying. As you can see it largely consists of traditional brick construction and a flat roofing detail

SELECTION OF DIGITAL TOOLS & TECHNIQUES

There are 3 most common modern digital tools used in building surveys.

These three are LiDAR, Drone Surveys and computer aided designs such as CAD and BIM.



LIDAR

laser scanning using light detection to create 3D Models of the building. The lights bounce off of all surfaces very similar to sound with echolocation, returning to the device and taking off measurements to accurately determine the room/building size. This is a very useful tool as it creates a high-definition model that can outline defects of any structural details on a model space computer. This is a very expensive but high-speed method of surveying and allows for minimal room of human error.



DRONE SURVEYS

Drone surveys are becoming very popular, enthusiasts who have decided to gain from their investment. The drones with thermal imaging cameras are very sought after, as previously mentioned they can save a lot of time from locating where there is lack of insulation from identifying heat loss from the building, this is shown by heat signatures and or the lack of. The usage of a drone allows for ease of access to rooftops and hard to reach areas. There is a good example of this from our survey at Milford School, there was an influx of pigeons gathering inside the sports hall changing rooms and was proving difficult to figure out where they were infiltrating the building from. The use of a drone would have been very helpful as the culprit was a rusted fascia and barge board in a very inaccessible location. We also used the drone to survey a flat roof, roughly 70 metres off the ground. This was very useful and helped identify the scope and scale of works required. Without a drone the need for tower scaffolding which can prove to be very expensive and dangerous.

CAD / BIM



Computer aided designs such as "CAD" are also very helpful when designing construction details for building contractors on site. We use this tool frequently in my role, from kitchen plans for medium size houses to full floor plans of schools. This digital tool was also used in our survey for this project. In the drawing there were twelve new fire doors, all to scale with the necessary preliminaries. The building contractor had no issues with take offs for measurements and scaling. This is a small example to show that it is a trustworthy and accurate tool for building surveyors to create details.

SURVEY PLANNING

METHOD OF CARRYING OUT A BUILDING SURVEY

The main goal for this building survey is to assess the current condition, structure and present recommendations of best practices for remedial work.

A survey of this magnitude can also be used for real estate opportunities, estimating the overall worth of the building. This can be useful for both sellers and buyers. The scope of what will be carried out during the survey, to include, which specific areas of the building will be focused on, elements of the construction details and more such as the facades. This is however all subject to the client's needs which will have been outlined.

Preparation for the survey is as important, reviewing current revision plans and maintenance records is almost a requirement to understanding the history of the property. Depending on location, there will be different rules and regulations for elements such as fire safety, disabled access and more. Gathering necessary documents is crucial also, this can include the energy performance certificate (EPC), electrical test certificate (EICR), Gas safety certificate and planning permission. All of which are vital and need to be in date/accurate. Not as important, however, is ensuring the building is as empty as possible, moving objects can massively disrupt the digital tools such as thermal imaging cameras and the LiDAR lasers, one or two persons present is best to answer any questions you as the surveyor may have.

Once the pre-checks have been completed, the on-site survey can begin. Immediately. The surveyor will check all external defects before entering the property, a first glance at the roof to check for missing tiles, ripped felt or worse can give a good indication as to what the remainder of the buildings condition will be. Subsidence can be a major issue, any horizontal cracks in the render can possibly be from the foundations moving with the ground and this can cause massive problems in keeping the building watertight and structurally sound. When inside the building, moving large furniture is helpful to the surveyor as they may hide defects such as damp/mould and infestations from certain insects/rodents like woodworm. Similar to the outside, the surveyor will be checking for any defects within the property. This can include damage to surface elements such as plasterboard and skim, damp marks and identifying where the water is originating from, rising damp or leak from above etc. To do this, the surveyor will go room to room, making notes of all defects, he will be looking for any means of heat loss, from single pane windows to mould in upstairs rooms which can be signs of no insulation in the loft. This is visible due to the significant temperature change between internal and external areas. To accurately assess this, the thermal imaging camera can be used from the outside of the building, typically from the loft - the camera will highlight all areas which are in need of investigation.

Using LiDAR both inside and outside the building allows the surveyor to create a 3D render of the building which can be used to further their inspection when back at the office. This then allows the user to take measurements from this 3D plan, which is crucial when offering recommendations at the end. To do this, for example, using a static sensor, the surveyor will place it on the floor of each room, allow time for the sensor to gather all necessary data and move to next room. This can also be used to show the client what you have found, physical proof of heat loss or lack of structural integrity further than just your opinion. This also allows for the chance to create sections of the building; these are essentially cut throughs of the building which help identify the details in place.

Using a drone to take pictures from all angles can provide very accurate information of the building, allowing the surveyor to only need camera pictures of the internals. This process can typically take up to 2 hours, and then a further several hours depending on if this was a sub-contractor's tool or your own, for the report to come back, which will include the images from either a point cloud or fly over video footage.

Carrying out your own measured survey allows the surveyor to draw up a CAD plan of the layouts and floors, useful for understanding the accurate quantities required for current U-values and potential recommendations for repairs.

CHALLENGES AND SOLUTIONS

POTENTIAL CHALLENGES THAT MAY BE PRESENTED CARRYING OUT THIS SURVEY AND HOW TO COMBAT THEM

01

AERIAL DRONE USAGE

Weather conditions – Will massively affect when and where drones can be used, high wind and heavy rain is a no go for usage. 30mph winds are the maximum for then drones to safely take flight and carry out a survey, however, for more detailed HD photography it is advised to not take flight with winds pushing over 21mph. Cold weather can also impact the battery life, a tip to combat this is too warm up the battery before hand which increases the flight time. Under current CAA (Civil Aviation Authority) rules, you must never fly higher than 120m (400ft) above the surface and depending on category license, A1, A2 or A3, mitigates how far, the weight and where you can fly. To counter this, have written permission on private land so you can fly as close the building as possible and ensure that the property is empty so to ensure that you would not be breaching category A3, which is flying too close to the public. For the weather issues, it is as simple as checking the forecast beforehand and arranging for the drone survey to be done when the weather is steady.

This can include any presence of asbestos, lead or any other harmful substance no matter the quantity. Inhaling any asbestos fibre from damaged insulating boards can be very harmful to health. To challenge this, ensuring a full management survey has taken place of the building (Useful for report also) and wearing full asbestos survey PPE such as a P2 half face respirator and type 5 / 6 European standard overalls. Harmful or dangerous areas such as rotten floorboards/joists from woodworm can be very high risk, especially if in the loft. Having a structural surveyor investigate will help with this. Other living creatures such as rodents and birds have a large impact on where you can survey, depending on the time of the year, birds and bats nest in roof spaces and are very common in the UK. As they are protected species, this can put a hold on schedule of works due to waiting for the animals to leave the nest on their own, this can stop any old roof tiles being removed and allowing for further investigation. If the roof has a loft space, it would be ideal if the survey was done out of season.

Balancing repairs advice with the clients budget can be a significant issue, for instance, old felt and missing roof tiles proves for a new roof. However, this is a very expensive endeavour for the average home owner, finding out alternatives such as responsive repairs is a great way to combat this. This also applies to the survey itself, discussing how much the use of each digital tool is a must before carrying out the survey. A membership of AutoCAD for one year is roughly £2,000, a drone survey can typically cost between £300-500, and between £1,000-2,000 for the larger surveys. All of this can massively change the survey and its cost, to avoid this a helpful price sheet on your website or pamphlet for the client to view and make an informed choice on whether to go ahead or not.

CONCLUSION

The objective of this survey is to evaluate the buildings current condition, based on fire compartmentalisation and potential safety hazards. This scope includes all external and internal details/assessments, from water ingress (Damp & Mould) to structural integrity. This survey is to highlight the importance and effectiveness of using modern technology for building surveys and to illustrate how I myself would plan for a survey. The use of advanced modern tools such as AutoCAD, Thermal imaging cameras, drones and LiDAR highlights all of the benefits including accuracy and overall reduced site visits. Each one of my chosen tools have special attributes from creating a 3D render of the building to employing drones to inspect difficult to reach areas, they each collect individual and unique data that are a must for a chartered building survey. I have outlined risks involved with using each one, from precarious weather conditions, natural health and safety risks, cost restraints and potential disruption of the buildings condition.

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