

Construction Materials

For this assignment I have chosen to report study and report on two contrasting buildings, which are Cardigan Integrated Care Centre and. I will be looking into their likely durability and climatic resistance, given the environmental conditions they are exposed to at the site. I will also investigate the likely impact of the frame material's original production process on the environment. Finally, I will investigate the frame's ease of assembly and the potential ease of its adaptation to different building shape and use, within the life cycle of the building.

The first construction is a newbuild in Cardigan, which takes the place of both the old Priory Cottage Hospital and Cardigan Health Centre. I visited the construction site as part of my Level 4 CIOB course at Ceredigion College. Plans to build this centre began in 2015 when the Ceredigion Council needed to invest in local health care as existing buildings were failing to meet with regulatory standards. A long time was taken to decide on the site for the new build on the outskirts of the town, as nearby land did have cause for concern, as was reported in the 'Cardigan Integrated Care Centre Full Business Case, March 2016.' (Hywel Dda University Health Board | Cardigan Integrated Care Centre, Wales.nhs.uk, <http://www.wales.nhs.uk/sitesplus/862/page/72916>)

Further inspection of the retaining structures on the adjacent site revealed an ongoing failure to the adjoining retaining structure along the top of the adjacent site. This has raised concerns of a risk that potentially the similar adjoining retaining structure along our common boundary could be compromised.



The 'Bath House Site' was identified as the preferred site for the new integrated development and purchased by the Health Board. The site is quite steeply sloping causing some constraint on the design. The above report points out that 'innovative design has incorporated this without restraining the accommodation required.' However, due to weaknesses in nearby land, plans to build an adjacent supermarket were abandoned.

During an interview with the local newspaper, the 'Tivyside Advertiser', the current mayor of Cardigan, Mr David Grace was quoted as saying that the new design for the integrated centre was flexible so that it could be expanded as the need arises, therefore making it sustainable, if sustainable means 'Development that meets the needs of the present without compromising the ability of future generations to meet their own needs' in the words of the former Prime Minister of Norway, Gro Harlem Brundtland.

This report also mentions that as part of being economically sustainable it will utilise 'Design for Life/Building for Wales DFL3 as a way of choosing the most suitable building resources. I trust that the above information is reliable and correct as it was reported in an official document created by Ceredigion Council.

Student id: 1911552

Module: ACBA4006

Word count: 1875

The building work was contracted to the international company 'Interserve', who, according to their website are committed to sustainability within use of building materials. It mentions that they work in partnership with 'Groundwork', who encourage the re-use and recycling of building materials such as rubble and aggregate. (Interserve.com, 2015)

During our visit it was apparent that their choice of construction material was concrete frame. It was mentioned that one of the main reasons for this choice was a lack of skilled builders in brickwork in the area in general.

Sustainable Construction aims to apply the principles of sustainable development to the construction industry. It involves the delivery of buildings, structures, supporting infrastructure and their immediate surroundings which maximise the efficient use of resources by using fewer raw materials and less energy, as well as causing less pollution and waste.

In researching the durability of concrete withing buildings and structures I read an article titled 'The Problem with Reinforced Concrete' in an academic website 'theconversation.com' which I regard as dependable as it does not have involvement with any trading companies, and is relatively current. The article investigates the lifespan and effectiveness of reinforced concrete constructions, and finds that due to many factors such as deterioration caused by sunlight and also deterioration from within the concrete because of the rusting of iron within the steel reinforcement, modern concrete buildings can only have an expected lifespan of 50 to 100 years. Therefore, I conclude that the durability and climatic resistance of the materials used in construction of the Cardigan Integrated Care Centre may limit its lifespan to less than 100 years. (The Conversation, n.d.)

The company 'Interserve' worked quickly to construct the building at Cardigan, and this was mainly due to precast concrete walls, made offsite and then transported to the site. I would like to believe that these were made from partly recycled materials as the company claims in its website. This would mean that the impact on the environment would be significantly less than if they chose un-recycled products. The impact on the local environment, well known for its scenic beauty and reliance on tourism, is significantly less as the materials would be fabricated elsewhere. However, the above article concludes with these unarguable facts:

Concrete is the third-largest contributor to carbon dioxide emissions, after automobiles and coal-fuelled power plants. Cement manufacturing alone is responsible for roughly 5% of global CO₂ emissions. Concrete also makes up the largest proportion of construction and demolition waste, and represents about a third of all landfill waste.

From this I can conclude that although steps have been made by the Health Board, the local council and the building company, there will still be significant impact to the environment in the construction of the Integrated Care Centre at Cardigan.

The second habitable building I have chosen to study is The Ritz Hotel in London, as it was one of the first steel framed buildings in the United Kingdom (the very first being the Royal Insurance Building in Liverpool). It belonged to the hotelier Cesar Ritz, and its architects were Charles Mewes and Arthur Davis, working with the Swedish engineer Sven Bylander. The design shows influences from Paris and America. Many of the materials used in construction were made in the US. In 1904, two buildings, the Walsingham House Hotel and the Bath Hotel were demolished in order to build the new Ritz hotel on that site in Piccadilly, London. By now it is a Grade 2 listed 5-star hotel and is a member of the

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Module: ACBA4006

Word count: 1875

consortium 'Leading Hotels of the World'. It opened in 1906, 8 years after the opening of its sister hotel in Paris.



Steel is one of the most sustainable materials used in construction. Its strength and durability as well as its ability to be recycled, time after time, without losing quality make it truly compatible with long term sustainable development.

When considering the Ritz's likely durability and climatic resistance, it's important to consider the conditions of Piccadilly, central London. It is no more exposed to wind, rain, and extreme temperatures than any other site in the UK, and more sheltered than the Ceredigion Coast which is the site of the Integrated Care Centre in Cardigan.

The fact that the Ritz is still considered to be a luxurious hotel in 2020 is a tribute to the building's strength and durability. Any deterioration in the condition of steel is a slow process and can be further minimised by galvanisation. When you compare this to the likely lifespan of the concrete frame in the Integrated Care Centre which is 50 – 100 years, the durability of the steel frame at the Ritz has already withstood the test of time. The versatility of the steel frame has also meant that the architects at the Ritz weren't restricted when considering the shape and style of the layout. (www.steelconstruction.info, n.d.)

The most environmentally friendly fact about steel is that it is 100% recyclable and re-usable, therefore after the lifespan of the Ritz hotel, the entire steel structure will not be entering landfill, but can be re-used in another construction project. The website 'steelconstructioninfo.com' reports that 94% of all manufactured steel currently in the UK is re-used or re-cycled. In fact, modern steel construction companies can produce a report on the carbon footprint of the steel used on their sites. However, this was not a priority to the constructors of The Ritz back in 1906. It is unlikely that the steel in the frame of the Ritz hotel had been used previously. According to historical reports, it had been shipped over from The United States of America.

The erecting of steel construction works on site is quite easy. It requires a crane, or in some cases jacking, to lift components into position which are joined with connections. These connections are nominally pinned / bolted connections that are assumed to transmit end shear only. Also, these plates have negligible resistance to rotation. Therefore, they do not transfer significant moments at the ultimate limit state. This underlies the design of multi-storey braced frames in the UK designed. This

Student id: 1911552

Module: ACBA4006

Word count: 1875

is commonly referred to as simple construction. The beams are intended to be fixed and the columns are intended for axial load and the small moments initiated by the end responses from the beams. Stability and solidity is given to the edges by bracing the solid concrete core. As the connections are being bolted, the bolts are not fully tightened yet. Similarly, the bracings may not be fully secured at the current phase in construction. The frame is then checked to ensure that they are aligned, and the beams and columns are levelled and plumbed. After ensuring that the work is to the correct standard the workers 'bolt up' the build. Which means tightening the bolts fully to ensure the whole steel construction is finished and secured. The steel construction is not only recyclable but also efficient as the work is straight forward in most cases. On average the steel work can be completed within 1-2 weeks or 10 working days (depending on the scale of the project).

To conclude I would like to state that steel construction tends to be the best option compared to concrete works as it is much more sustainable. The steel is mostly recyclable and can be reused without defects after the recycling process. The conditions of the ground can be a factor in deciding if the project would be better as a concrete or steel construction. The concrete construction has the benefit of having better price range and the price is usually consistent. Whereas steel construction can be more expensive. On the other hand, the concrete constructions tend to require maintenance later in its life cycle, which may be costly depending on the works. Steel can easily be edited later after the completion of the initial construction. This makes it easy to add extensions to the build or change the project if needs be. Personally my opinion would be that the steel construction is the best option for sustainability and the environment.

Student id: 1911552

Module: ACBA4006

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