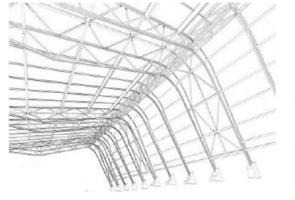


Building Analysis: Manchester Aquatics Centre

Aim

To analyse two buildings; one an aquatics centre, which will be the function of my building, and a building that considers eco-efficiency to help me consider technologies that would be appropriate and the most beneficial to use on my building. I will consider the main features of an aquatic centre, the elements necessary for it to succeed, what makes it a good design and the facilities that it needs to accommodate. I will also consider how to develop a sustainable and environmentally conscious building.



Function

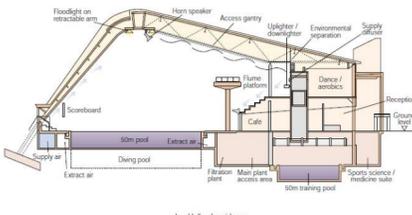
In terms of building use the Manchester Aquatics Centre was designed for the 2002 Commonwealth Games however for such a big and expensive project they wanted the building to be suitable for public use once the Games were over to increase revenue. This meant that it had to be able to adapt to the requirements of the Games whilst providing facilities suitable for the public; this included the introduction of areas such as a leisure pool, two water flumes and two bubble pools and adjustable depths of the two main 50m swimming pools for adaption to the public, whilst a 3m wide by 10m length diving platform had to be installed to allow for synchronised diving during the Games. I think that this building's function has been adapted suitably for public and game use. In terms of performance the building is fairly efficient as it successfully regulates its air to reduce evaporation rates of the pools. It makes use of natural ventilation to cool the air and also relies on the shape of the roof to store or remove the hot air that rises.

Adjustable floor of the main pool means that the depth changes and it can reach into the basement level

Shallower pool intended for younger swimmers – included in the design to make it more public friendly instead of purely a Games venue



Design changed – crèche became a second fitness suite



Aesthetics

The building form reflects the requirements of the diving platforms and controls the acoustics. The interior roof of the building forms a very aesthetically pleasing wave shape which reflects the building's use. However this shape was also designed as it maximises the air flow around the building. The exterior shows the sloping roof, again resembling a wave with the south facing elevations very straight and open and welcoming and I think this works well as this is the entrance to the building that leads to the reception. I think that this is a very attractive building that's aesthetics fit perfectly with the fact that it is an aquatics centre as the wave pattern features heavily and demonstrates the designers influence. I also think that this building fits in well with its environmental setting amid student halls of residence in the centre of Manchester. Despite the steel ribs, the facade that faces the street is concrete but due to exterior lighting its sandstone elements are highlight and this fits in with the location as Manchester is an old city with a red brick university.

Cost

The building was originally awarded a £22.5 million contract however the total building costs reached £32million. Despite there being changes in the design during late stages where the crèche was exchanged for an additional fitness suite this did not influence the final cost that exceeded the given contract as this was funded separately by the client. To help increase the revenue of the aquatics centre Manchester County Council wanted it to be suitable for public use once the Commonwealth games were over and for the use of training for swimmers hoping to compete in the 2012 London Olympics. It was due to this that the pools were made to adjustable depths to allow for greater use. However this aquatics centre contains two 50m swimming pools and a 25m diving pool, like the London Olympic Aquatics Centre however the one in London cost £269million to construct which makes the aquatics centre in Manchester seem cheap in comparison. Once the London Aquatics Centre has undergone extreme modification post-Olympics it will have a capacity to match Manchester's so these venues seem similar in terms of these facilities. However, Manchester's Aquatics Centre construction began in 1996 and since then the economy, design and materials have changed, the Olympics is also a highly prestigious event and the London designer would want to build something iconic which could account for the excessive cost and not make it a realistic option to compare the Manchester venue to in terms of price. In the construction of the Manchester Aquatics Centre a student hall of residence had to be demolished and as the site was near to one of Manchester's main sewers there were problems with the foundations of the building. However construction began in August 1996 and finished in February 1997, meaning that the building was complete within 6 months which is a relatively short time for such a large scale building and means that labour costs were fairly low. I therefore think that the reason this building exceeded its budget was because of the extra complications with the ground work of the site, the main sewer runs the length of the buildings southern elevation and special permission had to be granted for them to place the foundations of the building adjacent to the sewer's outer line. The building was funded by Sport England through national lottery funding, the City Council and three universities (Manchester University, UMIST and Manchester Metropolitan University).

Consumer

This building development has considered the consumer throughout the entire design process. When considering the cost of this building the design was important; original intended use was for the 2002 Commonwealth Games but designers considered how this venue could be adapted for public use, as such they included areas in their design such as a café, a crèche and a leisure pool specifically intended for younger swimmers and even adjustable depths on some of the pools. This building was always intended for public use eventually and as such it was placed within the centre of town and even included some funding from the universities in Manchester as the designers wanted students to use the building and have it integrated into the community. Even the ventilation system considers the consumer, maintaining that the air temperature needs to be 1°C warmer than the water in the pool so that the bathers aren't cold when they emerge. The building is suitable for its use as it contains more fun elements such as water flume instead of just the simple 50m pool and 25m diving pool that are the requirements of the games. There is an ample changing village and there is disabled access.

Manufacture



The 'L' shape of the roof was made from steel plates welded together at ground level and the lifted into place by cranes. Four pairs of these 'L' shapes, called ribs, support the main roof. The manufacture of this building was a mere 6 months considering the complications of the site, having to demolish a student hall of residence, the close proximity of the foundations of the building's foundations to one of Manchester's main sewers, and spatial restrictions of diving platforms, water treatments and electric equipment, as well as the changes in design. I think that this building was constructed quickly and efficiently due to their successful techniques of construction.

Size

The building is 110m long and 55m wide. Over the 10m high diving board the ceiling is almost 20m above ground level whilst the basement level containing the training pool is 7m below ground level. The shape and size of the roof had to meet with the spatial requirements for the diving platform but also so that there was a good view for the spectators as the building was being used for the 2002 Commonwealth Games and the events were also to be televised and a retractable floodlight was attached to the roof to increase the lighting for the television recording. With a capacity of 2,500 Manchester Aquatics Centre has ample room, with a large changing village and several different type pools. The Aquatics Centre also owns a 1000 space multi-storey car park which is for pool users, staff and students of the University of Manchester. I think that the Manchester Aquatics Centre has considered the size and space well, I think that the car park is a good size for the number of users and I think that having multiple pools will make sure that there is no swimming congestion. This was the first centre in the UK to have two 50m swimming pools and I think that the building has utilised its space well with a first floor landing using the space generated from the height of the roof due to the diving platform and the basement level allowed the depths of the pools to be changed. Despite a confined site, in the middle of Manchester and even halls of residence it doesn't swamp the surrounding buildings but fits in well.

Innovation

This building has some innovative features such as the adjustable floors and booms of the swimming pools which can be arranged to create pools of varying sizes and depths designed to increase the flexibility of the pools and increase revenue. The wave designed of the roof was designed to increase the flow of the hot air and provide better ventilation of the building to tackle immense evaporation rates. There were also innovative features such as exterior lighting that shines on the facade of the building to change the appearance of the materials, with light being shown onto simple concrete especially configured to highlight the sandstone elements that help the building remain in character with its environmental setting.

Environment

Ventilation was a major consideration when designing this building as with warmer water temperatures and the air temperature being maintained at 1°C above the water temperature evaporation rates were highly increased. The company calculated that with the water at 29°C and a maximum bather activity for every pool meant that evaporation would reach 0.5 tonnes per hour. However a complex ventilation system was developed to make sure that the air temperatures were suitable as such large evaporation rates would not have been sustainable. The durability of materials was also considered in case of corrosion. However, the building did not damage and green belts sites as it was built on already developed land. The building does not pollute the local environment in terms of noise as specially sound absorbing materials were used, however there may be some light pollution as exterior lighting is used to alter the appearance of the materials. The building has considered environmental issues, however it will have a large energy consumption with the water treatments and air regulation and large amounts of lighting.

Safety

I think that a person can comfortably use this building as there are multiple areas for recreation, there is a large enough car park to accommodate the users of the pool and has a capacity of 2,500. There were extreme fire procedures when the building was used as a venue for the 2002 Commonwealth Games however it is a building with a low risk of fire and the designers did not want to take into account this one-off situation where a lot more people would be using the pool than normal and so these measures were only temporary. There is suitable lighting and ventilation in the building to assist comfort and safety of the public.

The number of people using the pools are suitable for the size of the building, it accommodates people well due to its size even though it is the only swimming centre in Manchester.

Life Cycle

In some ways this building hasn't considered the life cycle particularly well as the main steel ribs that support the roof were welded together which works when constructing the building, but for disassembling bolting the steel together would have been more practical as it would mean that the steel could have been unscrewed and reused for further projects. However the building did consider the life cycle in terms of extending material lifespan as they used heavy duty materials to prevent risk of corrosion which are more likely in damp areas.

Materials

Steel was used for the main roof support 'ribs' and these were welded together. The south facing end of these ribs, the end that faces the main road, are supported by concrete pillars. These pillars are reddish in colour and are therefore keeping in character with the city. The materials used for this building were very considered very carefully as they had to be able to do things such as absorb sound, so that the nearby halls of residence weren't disturbed, and be able to last a long time under wet conditions due to the pools. However these materials aren't environmentally friendly as concrete releases a lot of carbon dioxide when produced however the steel for the ribs could be made from recycled steel. Exterior lighting plays a large part on the appearance of the materials used.



Cheshire Oaks Marks and Spencer

Materials

The materials that were chosen to be used in this building were done so for two reasons; the first, that they reduced the amount of the energy consumption when being manufactured and produced and the second that they don't have an adverse environmental impact. The material for the roof is a specially engineered softwood known as 'Glulam' that is meant to be as strong as concrete or steel but only uses a fraction of the energy to manufacture. 'Glulam' is also a natural material and because of this the roof absorbed CO₂ during growth, making it a very environmentally friendly material. The roof is also made from aluminium, and the white colour helps to reflect light and get rid of excess heat. 100% of this aluminium is from recycled sources and the insulation also contains recycled materials; glass bottles and glass wool. The store has not used an excessive use of materials, for example there is no suspended ceiling so the consumer sees the supporting wooden beams. The exterior walls also absorb CO₂ as they are made partly from hemp and have better insulating properties than regular brick and mortar.

Cost

This building cost £60million to develop and that is obviously a very expensive price. However, this building has been designed to be sustainable and it's planned cycle is that the building should last for 60 years. The use of unusual materials means that a lot of manual labour has gone into the building of this store, particularly as it took such a long time to build, and the labour costs will be large given the length of the development process. The fact that the materials are so specialised means that they in themselves will be rather expensive, however what these materials aim to do is reduce environmental impact but also increase efficiency of the building, this means that energy won't be wasted on things such as heating and lighting and ventilation so the store should save some money on energy bills. This is also due to the eco-technologies that the store employs such as rainwater collection and a biomass boiler.

Safety

The building considers ergonomics through stairways and the size of revolving doors. A consumer can use the building comfortably as there is ample space inside, however some of the aisles are fairly small if there is large number of consumer at any one time. There are suitable handrails and escalators for ascending to the first floor and there are clear paved sections for pedestrians so that there is no danger of people walking through the car park. The building has made good use of ventilation and heating systems to ensure that the consumer is comfortable within the store. There is also plenty of natural light instead of many artificial sources. There are doorways at different levels of the car park on both floors of the building, which decreases the likelihood of consumers walking through the car park without being on a paved area.

Size

This development covers 148,000 sq ft of selling space (the size of nearly 11 Olympic sized swimming pools). There is seating for 430 customers and car parking space for 958 cars. Not including the space designated for bikes and electric cars. From the consumer opinions that I collected I would say that the car park is a good size for its needs and that the shopping floor is also suitable for a large number of consumers to move around at any one time. However I did find when asking consumers on their opinions of the building that particularly in the food section the aisles between the shelves are slightly too small and the area is very crowded. Although this may just be because at this time, the store has only recently opened and with a large amount of publicity there is bound to be increased interest. The food section in the usual shopping centre has also closed down and the M&S food section at Cheshire Oaks is now contained within this large store. Over the next few weeks the numbers of consumers that enter the store will decrease to a suitable level and I think that there will be no issues with over crowding as the store is laid out well.

Aesthetics

One of the main concepts for this design is that it should be environmentally friendly. The building was designed purposefully to reduce waste and increase efficiency. The green wall is a very attractive feature that openly promotes the green image that Marks and Spencer are hoping to create under their 'Plan A' scheme. Consumers that I have interviewed think that the store is very aesthetically pleasing, and I would personally agree. Despite the environmental advantages of the roof I think it is an attractive shape that fits in with the surrounding buildings. This building hasn't been designed with any aesthetic influences or concepts, such as art movements, in mind. It was designed specifically to achieve a BREEAM 'excellent' rating – proving that it is highly sustainable. In terms of some influence the building is very modern on the outside, with organic shapes, but detailing being provided by the green wall, car parking layouts, stairs, and even how the walls are designed to let in natural light. On the interior the roofing of the Glulam timber provides high aesthetic detailing with the organic forms flowing to create the roofs wave shape and also intertwining.

Life Cycle

This building has a planned life of 60 years, although there is some maintenance and 'refreshing' expected within that lifetime. 46% of the materials in the building (of which there are over 100,000 tonnes) can be reused as products for other buildings without having to be modified. Most of the materials can be dismantled easily and intended for reuse or they can be recycled; 55% of the materials can be recycled into something useful with the technologies that we have available today – and these are sure to have increased in 60 years time. The favoured option by the construction group for the building use at the end of its planned life is that the building is reused to create an eco housing scheme with gardens.

Environment

This building has been designed particularly with the environment in mind, being described as the 'biggest, greenest M&S'. One of the main things that make this building more environmentally friendly are the innovations involved with the materials and the application of these materials. The main feature of the building is the roof structure, it is made using Glulam, a special softwood timber that is more environmentally friendly as carbon dioxide is 'locked up' in the wood as it was absorbed when grown. It is also bolted together so that once the building is disassembled the beams can be unscrewed and the wood reused. The exterior of the roof is covered in 100% recycled aluminium and insulated with recycled glass bottles and recycled glass wool. The white colour of the roof means that the light is reflected and makes sure that the building doesn't overheat and is more heat efficient. The exterior walls include hemp, which also has the ability to 'lock up' carbon dioxide saving it from entering the atmosphere, a total of 360 tonnes of carbon dioxide is locked up in the Hemclad panels alone. The hemp also has better insulation properties than regular walls made from brick and mortar. There are 6ft wide pipes buried under the building to allow airflow and increased natural ventilation throughout the store. Energy efficiency has been considered through the using less lighting and having more windows to let in natural light. The building also makes use of revolving doors which use less energy than the traditional automatic door. The building includes a green wall which contains over 30 species of plants and provides a natural habitat for birds and other wildlife. The building also has a rainwater collection system with a capacity of 80,000 litres and this is used to water the green wall automatically through a harvesting system. 25% of the stores water demand will also come from this source. 228 new trees have been planted and the biodiversity of the site has been increased substantially. Various bird boxes have been installed around the site and a biomass boiler meets the heating needs of 70% of the store.



Function

In terms of building use the store is very successful as it combines all of the features of Marks and Spencer under one roof; women and men's clothing, home ware, a food department and two cafés. The two floors ensure there is a wide selection of products, as everything the consumer could want from an M&S store is under this roof, especially considering it is the second largest store in the country. The car park has enough space for 958 cars and there is a large under-cover space designed for storing 100 bicycles and also charging points for electric cars. In terms of performance the building is highly energy efficient as building green was a main concept for this development. There is nothing but praise in the reviews that appeared since the stores recent opening and it seems to be very popular. The environmental performance is also something that attracts many people to the store. In terms of function, the major publicity that has been gained from this particular development can only be a good thing for M&S as there is a mass consumer interest which would tend to lead to greater sales figures.

Conclusion

I have found from analysing these two buildings the features that are needed specifically for an aquatics centre and the features of Marks and Spencer that make it highly sustainable and particularly environmentally friendly. With this information that I have collected I am hoping to combine the environmentally friendly and sustainable qualities to make an innovative building.

Innovation

This building certainly makes use of new ideas as it has generated very interesting ideas on how to make the building environmentally friendly as possible. It has considered new technologies and applied them in an inspiring way. I think that this is a very innovative building. The way the building was constructed was to consider the cradle to grave construction as they wanted the disassembly of the building to be as easy as possible, for this reason the wood that the roof is made from was bolted together so that at the end of their planned life they can be unbolted and the timber reused. Other eco-technologies that make the building innovative include the fitting of 6ft wide pipes in the foundations of the building to increase the natural ventilation of the building. The building is also partly sunk into the ground and buried under a mound of earth so that the insulation of the building is better. The building was also fitted with elements that are designed to use less energy, and also be more efficient with the energy that they do use, for example using revolving doors instead of the conventional automatic sliding door.

Consumer

This building has been designed as a premier Marks and Spencer store incorporating all of the outlets of their business, such as women's clothing and food. This means that from everything a consumer would expect from an M&S store is under this roof however from my consumer opinions I have found that this might not be the case. The building is suitable for its use with seating for customers available in their two cafés, male, female and disabled changing rooms, there is wheelchair access so that the building is suitable for use by anyone. 'Community' was one of the key areas that Marks and Spencer looked at when they considered the area of their build. Marks and Spencer have even considered the different ways that the consumer could travel to the store whether by car, electric car (for which there are charging points) or even bicycle, for which there is an undercover storage area able to hold up to 100. The building even means to educate the consumer about the environmentally friendly qualities of the building with various signs that decorate the walls.

Consumer Opinion

