The Diligence of Design

VIQC Middle School –
Career Readiness Online
Challenge

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Location: Queen Elizabeth's
School, Barnet

The Diligence of Design

The company I identified for this challenge was **Hoare Lea, a Tetra Tech company**. It is an award-winning engineering consultancy which provides innovative solutions to complex engineering and design challenges for buildings. I came across this company while researching future career options. Not only do I want to become an architect, but I would also like to be associated with a company like Tetra Tech which is combining science and engineering expertise with advanced analytics and technology to solve the world's most complex challenges. Not only this, but Hoare Lea is catering to my generations' future in other ways with primarily human–centric and planet–conscious designs.

An image of CSU and Tetra Tech's effect on its GHG emissions

Tetra Tech is well known for its pioneering designs of building structures that help reduce natural gas consumption and meet the carbon neutral aims. In fact, Tetra Tech was awarded the Project Merit award for supporting California State University's decarbonization and climate action efforts. They did this by developing a system-wide decarbonization framework to reduce the greenhouse gas emissions of fossil fuel-based systems by 70% (as shown above).

Shanghai Tower, the tallest building in China is another example of sustainable design and technological innovation by Tetra Tech

To learn about professionals in this company and how they use the engineering design process, I established contact with Hoare Lea. They very kindly forwarded to me their generic Gantt project planner along with the design framework (BSRIA BG6-2018) approach which they apply to their designs.

The flow chart provided below captures the company's design process.

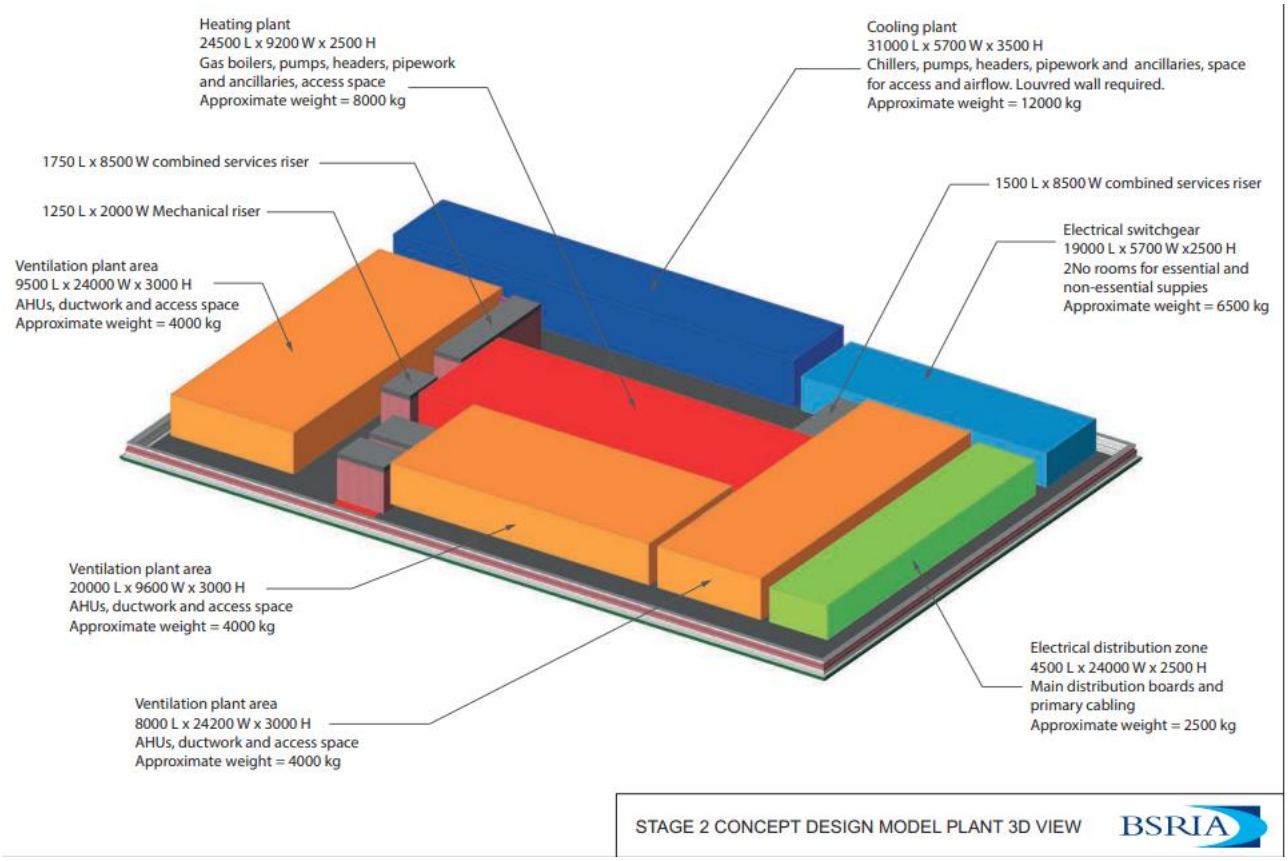
Figure 1: The RIBA Plan of Work 2013 stages.

Proforma 1 – Preparation and brief (RIBA Stage 1)

This stage covers the initial project brief including advice on feasibility studies and the development of the project objectives including functional performance of the project, sustainability, and budget.

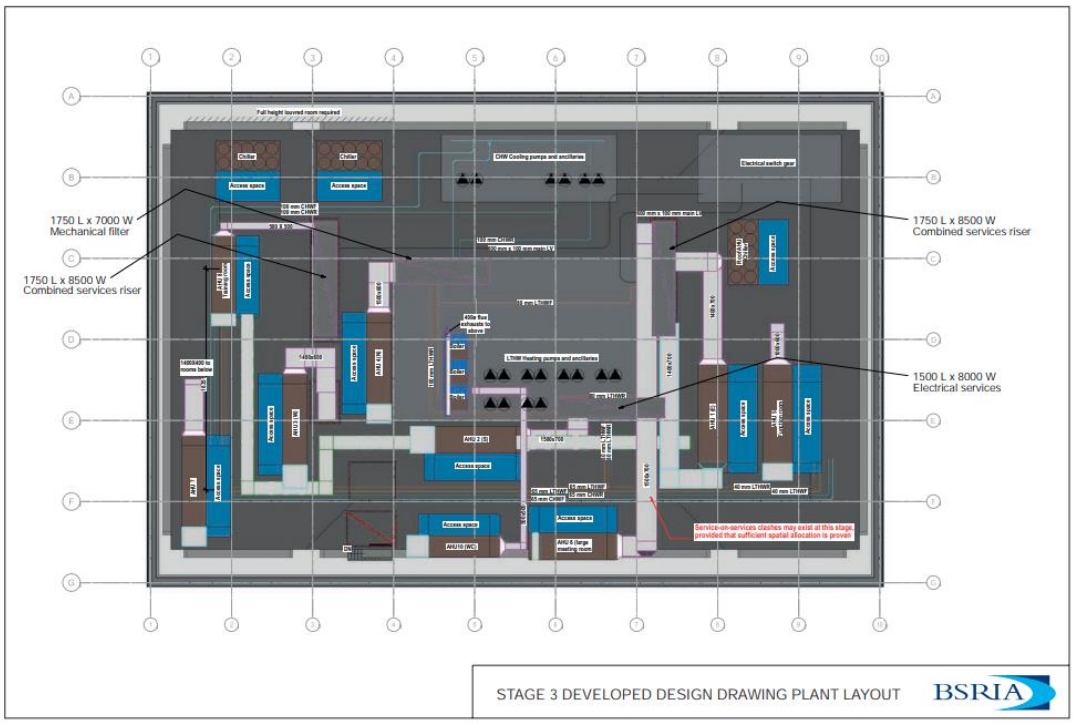
Proforma 2 – Concept (RIBA Stage 2)

At this stage concept designs are produced in line with the initial project brief. The level of detail is limited but does allow for some key decisions regarding choice of site, building orientation and overall form to be made.

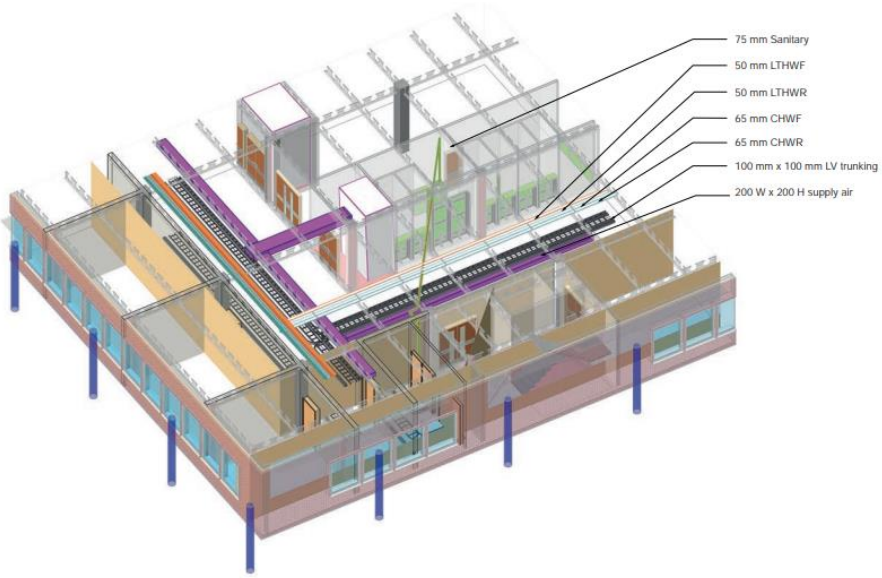


Proforma 3 – Developed design (RIBA Stage 3)

This stage covers the Developed Design stage. This is a collaborative design stage where any remaining concepts from Stage 2 are decided. This is when the planning application can be submitted with emphasis on external matters rather than internal co-ordination.



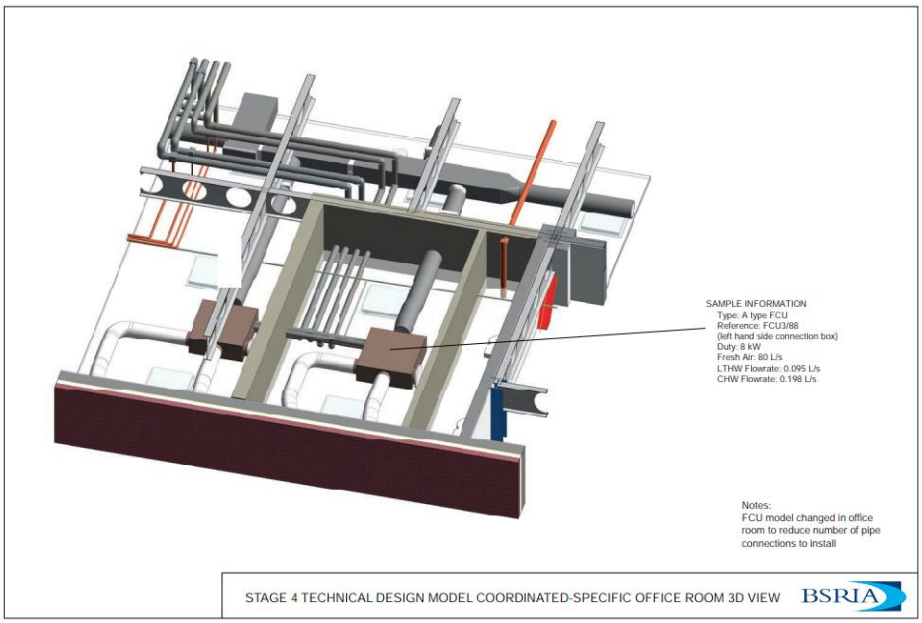
STAGE 3 DEVELOPED DESIGN DRAWING PLANT LAYOUT BSRIA



STAGE 3 DEVELOPED DESIGN MODEL DISTRIBUTION 3D VIEW BSRIA

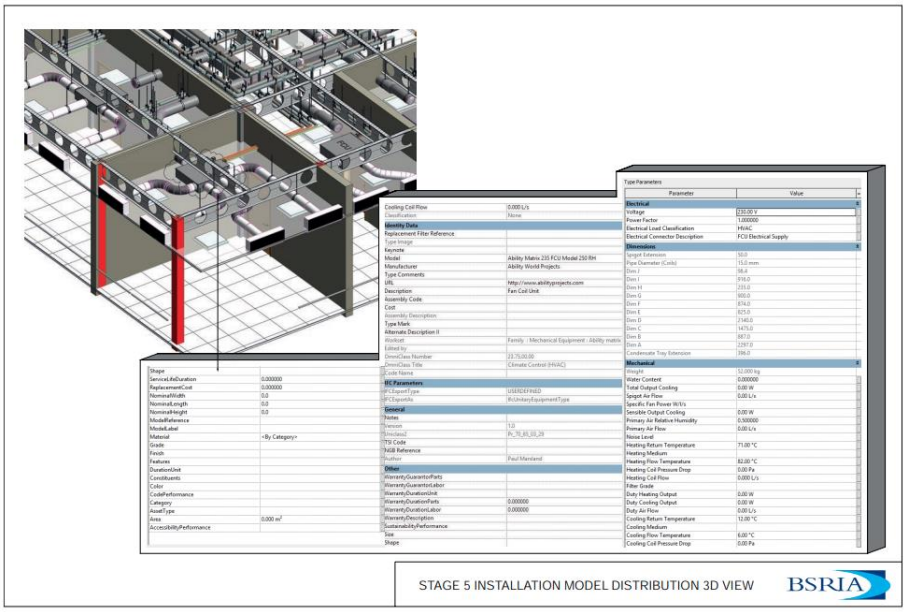
Proforma 4 – Technical design (RIBA Stage 4)

This stage covers the building services technical design which includes detailed calculations or modelling, to arrive at an engineering design and layout for each service from which coordination and installation are feasible.



Proforma 5 – Construction (RIBA stage 5)

This stage covers the design related activities that occur after the building services contractor has been appointed. It covers the onsite installation of services and their commissioning, to take the project to the state where handover can occur.



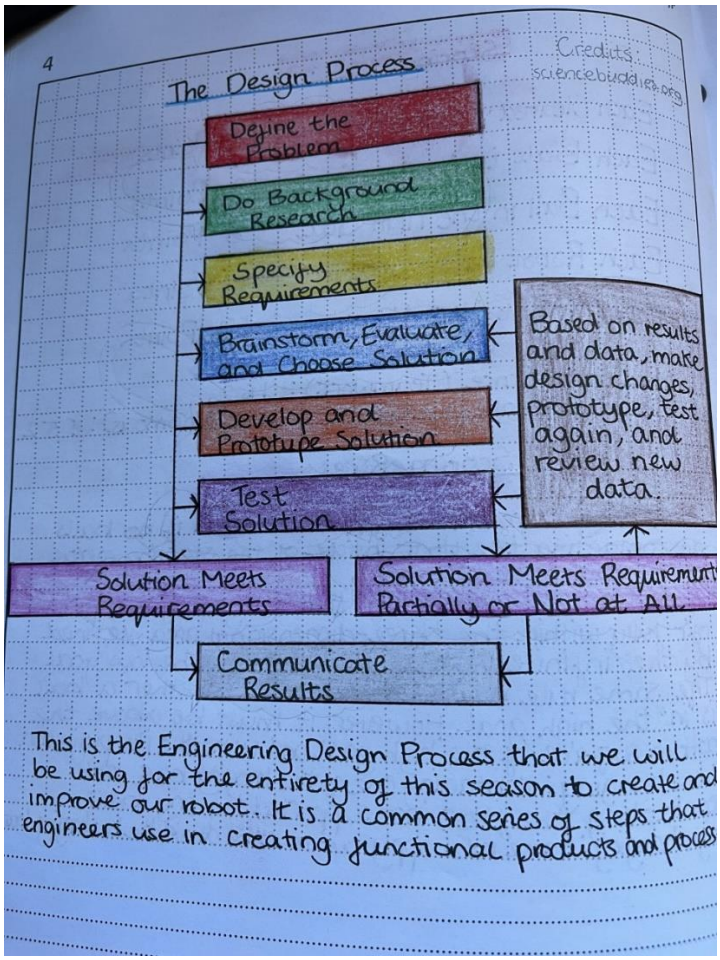
Proforma 6 – Handover and close out (RIBA Stage 6)

This stage covers the handover of the completed works to the client.

Proforma 7- In use (RIBA Stage 7)

Proforma 7 covers any post occupancy activities in the second and third years of occupation.

Comparison of RIBA design process (followed by Hoare Lea) **with our design process** (under)-



Points of similarity in the Design Processes

The engineering design process that we followed is remarkably like the RIBA plan of work in that both start at **the Design Brief stage, progress through initial and final design and finish with the working end product**.

Additionally, the design tasks are **planned and recorded** in detail following the Gantt project planner which is similar to the process that we used to create the Design Book.

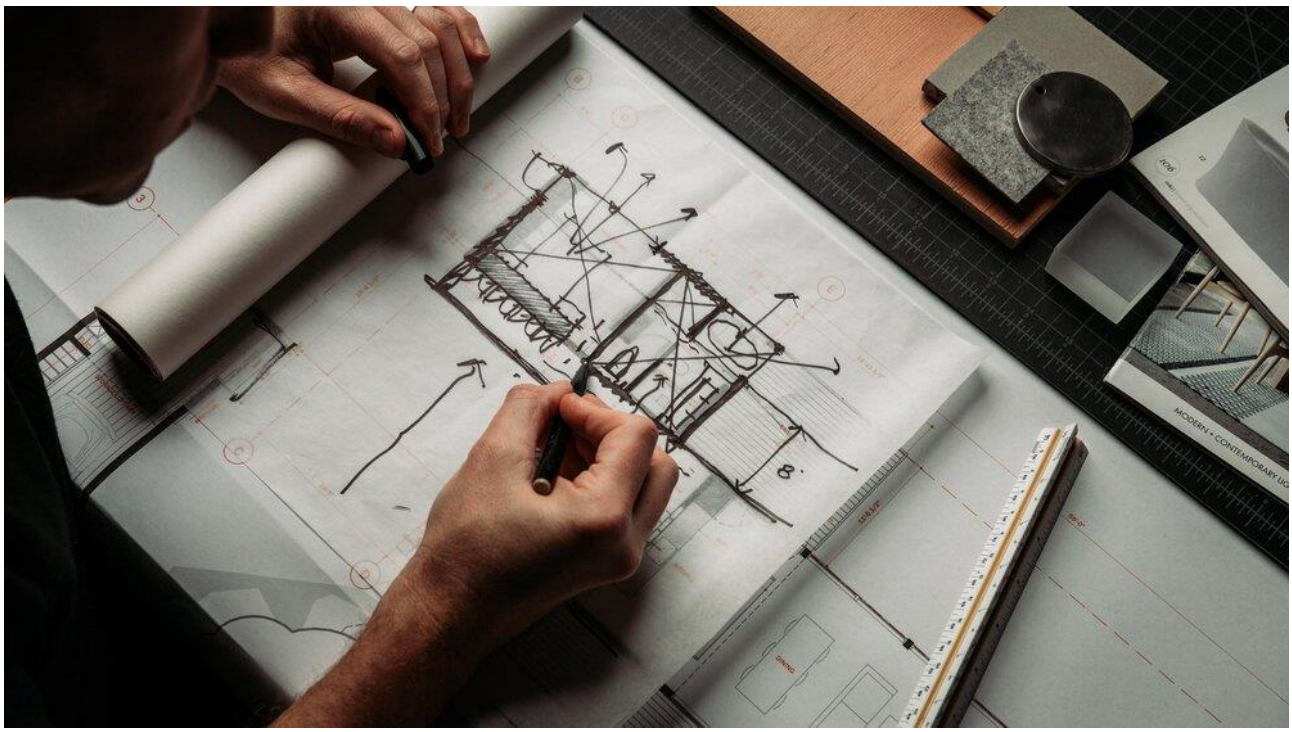
<u>Points of Difference in the Design Processes</u> - There are however some marked differences between the two processes above, some of which are owing to the difference in the product type.

The design process that we used was **completely iterative** – This means we could return to any stage to amend our design and build again. However, in construction design process, iteration is limited to certain stages only and it is not possible to revert to the original position once construction begins.

Developing a prototype - The design process is also different because in the construction industry there is no stage for developing and testing prototypes. The design process is therefore incredibly detailed and has little room for error.

Evaluating environment impact - In our design project, we did not have to consider the impact on the environment or conform to a budget or conduct feasibility studies. Nor did we have to think about sustainability.

Overlap between various elements of Design process - In our design, there was no overlap. For instance, in a Hoare Lea project, while the flow chart shows a linear path, often the design process has overlap and the building process has already started before the design process is complete, contrasting with our engineering design process where the continuation of a project relies on the completion of the previous stage.



Conclusion:

Researching into Hoare Lea's design process gave me an insight into complexities and practicalities of the real world which cannot be simulated in a school environment. Entering this challenge has made me realise that involvement in VEX is preparing me for a future career. The design process that I have learnt while participating in VEX IQ not only helps me in learning the core subjects of science and maths but opens up opportunities and gives me a taste for future careers which I might pursue. Despite only using one example during this challenge, there are tens of thousands of workforces that use the engineering design process in some form which I found during my research. My aspiration is to become an architect but VEX is allowing me to give myself a head start in not only this branch of career but so many more. I believe that I can apply the engineering design process in any of the future roles I choose whether it be that of a graphic designer, photographer, animator, art director, promotions manager or film editor. An involvement in VEX uniquely positions me to become a future innovator and develop transferrable skills for STEM–related careers.