This award submission has been prepared by **John Sisk & Son** as the Main Contractor and Building Information Manager in partnership with **RKD Architects** as Design Team Lead.
Building Excellence for the Client

The development of a large datacentre campus has been awarded to John Sisk & Son (Holdings) Ltd. as General Contractor (GC) by a multinational client. Sisk have been awarded the contract through a longstanding relationship and the level of experience they bring in the delivery of datacentres.

This award submission has been prepared by John Sisk & Son as the Main Contractor/Building Information Manager in Partnership with RKD Architects as Design Team Lead designers, Hanley Pepper as the Civil & Structural Designer and Ethos as the MEP Designer for the project.

The Building Excellence Innovation on this multinational data centre project is it’s designation as the pilot scheme project of good BIM practice for any future data centre projects for this client. It will be used as a benchmark project to record benefits and successful practices resulting in efficiencies in the full life-cycle of the facility.

A significant element of this initiative is that the whole project team are working more collaboratively through use of the Common Data Environment platform (VEO) and a Collaborative Environment on site (BIM Hub). This project will also focus on understanding and meeting the Client’s end user requirements through a process of “beginning with the end in mind”. This approach will ensure information can be used and re-used effectively throughout the project and life of the asset.

The benefits already identified through this initiative include:

- A significant reduction of RFIs on the project largely due to the collaborative BIM process
- Use of the BIM Model for any setting out considerably reduces paper on the project.
- 3D visualisations allow clear communication of spaces and features to all stakeholders regardless of their ability to read drawings.
- Working in the BIM Hub increases the speed of resolving any site issues.
- Centralised project information offers efficiencies in design and construction phases with future wider opportunities to improve facilities management systems.
The Project and our Client

The buildings have been designed as single story steel framed structures with a parapet above roof level, clad in structural insulated metal cladding. The roofs of the buildings have been designed as an insulated mineral felt membrane (BUR) sitting on a concrete substrate.

These roofs have a 150mm concrete slab sitting on a metal deck with roof finishes above. The concrete slab in this area and associated upstands allow the AHU’s to be mounted on the roof without the need for a separate steel structure.

The main buildings will each house 4 Co-located Server Rooms of circa 1630m², 4 number Electrical Rooms of circa 1100m², 1 No. Electrical Reserve Rooms and 2 number MDF Rooms. Each Electrical Room will house the MV and LV electrical equipment along with back up batteries running down the centre aisle.

There is an administrative block located to the North West of each building which will include stores, a loading bay, workshop, welfare facilities and a hot desk area. The standby generators are located externally to the south of the main buildings and will be containerised.

The external ancillary works will include a new Sprinkler Tank and Pump House and extensive site development and underground services installation.

Client BIM Objectives 3D Excellence
- Design
- Construction
- As Built

Project BIM Objectives
- Design IFC Model
- Collaborative Environment
- Construction Model – Fully co-ordinated
- Level 1 BIM Model to LOD500 – As Built
- Methodology, Logistics and Safety

Fig. 1: Client Visit to site (Soil Turning Ceremony)

Fig. 2: Construction Model in VEO

Fig. 3: High Graphic Rendering Images of the Data Centre
Future Innovation

We are aware that the construction industry is consistently developing new & exciting innovation. To ensure we are at the forefront of this innovation we have selected a plant room in one of the datacenters in which we will demonstrate the following:

- Laser Scanning
- Assets tagging (Barcodes/QR Codes)
- Tracking equipment delivers / commissioning
- Building monitors
- Link To BMS (building management system)
- Access project data via mobile platform
- Access project data via Augmented reality (AR) scanning of QR code
- Whole life cycle management

Client & Project Team Support

In order to get project support and funding from the client we developed our BIM Strategy which covered our proposed Hardware, Software and Accommodation requirements.

After a project team demonstration and BIM Strategy review the client agreed to run our BIM Innovation as a Pilot project for the future construction delivery process of datacenters across the world.

We have presented and demonstrated the Project BIM Process & Strategy to our client’s Design Team’s and General Contractors from around the world.

Our Experience and Reputation

Sisk have a long standing working relationship with this Multinational Client on large scale cloud infrastructure projects. We have been successfully delivering similar datacentre projects for decades with a world class construction delivery process. Each individual operational datacentre is evidence of our reputation.

BIM has been embedded as part of our traditional construction delivery process since 2007 and we have embraced the benefits of working in a 3D Environment with a better understanding and greater appreciation of the project across the project team.

At concept stage of the new proposed campus Sisk worked with the Design Team to develop the BIM Strategy. We examined how we could further develop the delivery of our exemplary construction process.

BIM is a specialised area in which we have industry leading expertise therefore we took the approach to “begin with the end in mind” and from our knowledge of datacentres we considered where we could bring innovation to the project with design and construction benefits.

Sisk have recently received BRE BIM Level 2 Business System certification in which we implemented BIM Level 2 Elements to this Project.
The Project BIM Execution

Sisk have a detailed BIM process which is supported by our Standards, Methods and Procedures (SMPs) which have been developed by the BIM Site Team with support from RKD, the design lead for the project. Having being awarded the contract Sisk’s Corporate BIM Manager Cillian Kelly, Project BIM Manager Nick Chan and RKD lead BIM Architect Nuala Farrell developed the Post-Contract BIM Execution Plan (BEP) together with the Master Information Delivery Plan (MIDP). This BIM Execution Plan (BEP) is a live document that will continue to evolve through the life of the project.

The BIM Objectives and Goals

The use of Building Information Modelling has reduced construction costs and RFI’s, alleviated the risk of project delays and increased the project participants understanding of the details of the project.

The BIM Goals for this project:
- To improve communication and presentation
- To produce a clash free BIM model with the appropriate level of detail
- To improve and validate constructability
- To co-ordinate designer’s and contractor’s information
- To reduce overall project time frame
- To reduce the overall project cost and improve predictability
- To reduce the number of RFI’s
- To minimise construction waste
- To incorporate DfMA initiatives
- To create an as-built model for better Facilities Management post construction
- To provide 4D Model - Methodology, Logistics, Schedule and Safety
- OFCI Vendors and Sub-contractors - Improve Capabilities
- To improve end user staff training
- BIM Flexibility - Open to change and new technologies
- Better safety and minimise Risk and Hazards

Collaborative working environment

Key to the success on this project has been the Common Data Environment Platform (VEG) and Common Data Environment (BIM Hub) which allow the team to work in a collaborative environment and share/transfer project information aligned with the BIM Execution Plan (BEP).

Package Management

Sisk’s Estimating Team with support from their on-site BIM Engineer have been able to develop a complete procurement schedule for domestic works based on the information within and extracted from the design models. Each package was assigned a Sisk package owner to plan, coordinate, set out and quality check the works. The package owner then, with aid of the BIM model, was able to extract the required information to allow him to carry out his task more efficiently than before. This information also allowed sub-contractors to clearly interpret their project scope and requirements along with being able to easily identify any issue which might occur during the course of their works.

Quantity Take-off

Having these principles in mind, the estimating team on-site were able to use the model, either federated or single disciplinary models (SDM), to better understand the separate package requirements and specifications clearly and efficiently, allowing for more efficient appointment of sub-contractors. These processes were carried out through the use of scheduling and visual representation within the model.

Setting out using BIM Model

Sisk’s site engineers are using the BIM model which is loaded on the latest setting out equipment to set out on site. The Trimble S3 Robotic total station with logger, Trimble R5 GPS Rover with logger, offers faster, more accurate construction results, drastically reducing errors and resulting rework.

BIM Station on site

Sisk are currently using a mobile BIM Station on-site. This is a Mobile Jobox. It is equipped with a 40inch TV that is connected to a BIM laptop on which is loaded all the latest Design Models for setting out and a virtual federated model (Naviswork NWD file) for walkthroughs and other uses. This is used by all the Site Team and Treads onsite. We carry out daily white board meeting and any site issues we have can be resolved onsite.

Progress Reporting

Progress report meetings are held every fortnight on-site involving all project managers, the design team and the Sisk team. Planned Construction vs. Current Construction progress is reviewed using the Project Information Model (PIM).

Clash avoidance and Coordination Process

Weekly BIM coordination meetings are held with the supply-chain in order to eliminate clashes within the virtual model before works start on-site. The rules of this ‘Clash Avoidance’ process are outlined in the Sisk BEP, with hard-clashes (object vs. object) and soft-clashes (object vs. clearance) i.e. clearance and maintenance zones clearly identified.

Health and Safety

Through daily white board meetings on-site, BIM has been incorporated to demonstrate the constantly altering locations of works at the particular time/day/week. All new staff at site induction are shown the 4D Construction Sequence Model which is linked to our construction programme. This highlights site set-up, logistics, temporary works and gives an overview of site and the live working environment.

Fig. 5: BIM Station on site

Fig. 6: Site Logistics

Fig. 7: Progress Reporting Image

Fig. 8: Planned vs. Current Construction Programme

Fig. 9: Clash Avoidance and Coordination Process

Fig. 10: Setting out using BIM Model
BIM Collaboration Platform (VEO)

M-SIX designed the VEO Platform to facilitate cross-discipline collaboration throughout the building lifecycle, from design to construction to operations. VEO is built upon a database and messaging infrastructure that has had true integration in its DNA from day one.

VEO is comprised of a suite of office and mobile applications, all of which interact with this integrated database, but each application is fine-tuned to the varying needs of different roles. The VEO Platform offers solutions for: design reviews, design and construction coordination, QA/QC, commissioning, asset management, and close-out.

VEO stores data on their servers and syncs it to your local hard drive whenever you are online. This means that models, information, and documents are shared and synced across project teams. Individuals can choose to view and interact only with the information that pertains to them.

Useful work can be done in the field or any other place without internet service. The offline mode lets you save your work locally and publish your changes to the team when a connection is available.

VEO imports information from model authoring tools such as Revit and AutoCAD. It allows users to view, modify, organise and contribute information in a variety of ways. The built in tools allow users to aggregate models, manage documents, contribute and recall field information, perform coordination tasks and more.

Tools we use in VEO:

- VEO Archive Library: This is accessible to all project users and includes the latest design, construction models and other project information. This makes the sharing of information easy.
- Viewing the latest model information at all times (Live Stream Model).
- Ability to access model information such as dimensions and coordinates.
- Ability to create master presets and create mark-ups of issues, save them and share.
- Comparisons between the Design Models and the Construction Models.
- Other tools like clashes detection and tagging files to model objects are available.

Weekly Coordination Meeting

During this meeting the design team and construction team discuss any issues from the previous meeting and also examine new issues for the week. These meetings can also be hosted online.

Meetings also include the following:

- Master presets and mark ups during the week are assessed and the required actions are minuted and recorded in the BIM Coordination Schedule.
- A walk through is usually performed and use made of the sectioning tool to closely examine any issues on the live stream model on VEO.

Data Management

Key to the backing of VEO is the fact that all project information is stored on the client’s cloud infrastructure.

VEO Initiation

Project roll out of VEO was carried out over a one week period in which M-Six delivered training to over 70+ Staff from project board level to site trades men from each discipline. The training covered Admin. Super user which became Train the Trainer, Daily User for Site Management and basic user for read only training.

Following our training week we carry out ongoing monthly training onsite to train new all users.

Construction Model Review

All sub-contractors are obliged to upload their work in progress construction models to VEO bi-weekly. The models are uploaded to the VEO archive library and the live stream virtual model.

Following upload, a BIM transmittal sheet is issued by the subcontractor and a notification email is sent to the General Contractor (GC).

The General Contractor & the Design Team (AE) have weekly construction model review meetings where they check the construction model Revit file for the correct naming conventions and the correct LOD requirements as per the BEP. A Construction Models Review Schedule with comments is then sent to all the sub-contractors for their action.
The Project BIM Team

Design Team Lead

Utilising BIM for this project has enabled better collaboration with all disciplines. The major advantage has been the early coordination with the MEP coordinator and design team for coordination of CSA/MEP interfaces, eliminating clashes through early detection in coordination reviews, reduction in RFI volumes, better visualisations through improved design & constructability reviews, health & safety improvements through safer coordination of activities on site and complex integration of electrical/mechanical services with communications & security install. Working within a common data environment has ensured a better working environment to achieve excellent BIM standards.

RKD’s global innovation and expertise makes it a leading European design company that responds to large scale challenges, both human and environmental, through integrated thinking across many disciplines. They are unmatched in providing bespoke complex process integration and architectural solutions. RKD address their clients’ aspirations by providing unique, long-term flexible designs that seamlessly integrate future technologies and adapt to change.

RKD

“Our highly specialised expertise and innovation in this area allows us to deliver energy efficient facilities that optimise people, material and product flows. We possess extensive technical experience, developed through close relationships with global industry leaders.”

Nuala Farrell, RKD BIM/Manager

 MEP Consultant

Due to the design and construction timelines, we found by utilising BIM software, process & procedures that we could achieve a better more collaborative outcome for both the client, design team and contractor. The software used enabled us to work closely with both the client and other design team members regardless of where people were physically based. It enabled our team to work with client team leads and design team partners on an almost daily basis. This resulted in better co-ordination between the MEP & CSA interfaces as well as being able to utilise BIM with the MEP Contractors & specialist vendors to carry out constructability reviews of the model at an earlier stage than normal. By utilising a common Data Environment we were able to have one single location for models, thereby reducing the risk of team members working from incorrect information.

Anthony Condon, Hanley Pepper BIM/Manager

Civil and Structural Consultant

Since 2012 Hanley Pepper have continually developed our BIM experience and have completed a number of large scale projects of a similar scale. Projects are generally delivered to LOD 300 models, however this varies depending on client and project requirements.

Anthony Condon, Ethos BIM/CAD MEP Manager

Sisk Main Contractor – Site Staff

Sisk were engaged from the very start of the project in the design process and BIM played a significant role in this. Using the very high standard models produced by RKD the Sisk Datacentre team were able to carry out very detailed analysis of the design and bring our extensive datacentre construction expertise to design meetings, assisting RKD in delivering the very best design to the client in the shortest possible time.

BIM is assisting our onsite activities with the use of 4-D software to link the programme to the model elements allowing weekly look aheads to identify clashes in activities on site. It is then a very easy exercise to reschedule activities to optimise production whilst keeping good separation of high risk elements. Using high quality graphics and animations we are able to disseminate this information in a clear manner to the wider site teams.

Keith Lloyd, Contracts Manager

Lead MEP Coordinator

As lead services contractor Mercury Engineering have found the BIM collaborative process implemented by Sisk on this project to be invaluable in resolving co-ordination issues prior to construction. This has virtually eliminated the occurrence of onsite clashes, an outcome unachievable using a traditional 2D co-ordination approach.

Typically for data centre projects the design and fabrication of the services support structures represents a substantial portion of the MEP contractor’s scope of works. From Mercury’s perspective a key benefit in utilising BIM on the project is the opportunities it has presented with respect to the design & offshore fabrication of the electrical services support structures. Leveraging BIM for offshore fabrication has saved a significant amount of time versus traditional onsite fabrication methods.

In collaboration with other disciplines Mercury are conti...
**Why was the BIM initiative necessary?**

Our client recognise the much publicised benefits of the introduction of BIM in the efficient design, construction, operation and decommissioning of their facilities. Recognising also that this is a relatively new method of working and keen to see how this actually plays out in practice, it was considered essential that a new project be used as a pilot scheme. The would provide an opportunity to expose all stakeholders to the processes, procedures and practices of a BIM Innovation project in an open and collaborative environment fully backed by the Client.

With no equivalent benchmark BIM environment buildings to measure improvement against, it was decided to develop appropriate key performance measures in the course of the pilot scheme, to suit the unique nature of our client’s data centre specific requirements across the world.

**Project Benefits**

The benefits and sustainability gains on the on this project have been seen across the design team and construction team from the initial start of the project. RKD have found significant benefits in utilising the collaborative BIM Platform and the onsite BIM Hub. We have seen a significant reduction in the amount of technical queries. The 3D visualisations helped achieve clear decisions from the Client and improve the quality of the building design.

The Design & Construction team have seen efficiencies including faster production of information, through better understanding of the Project using 4D Construction sequencing and easy access to the latest construction information.

**Client Benefits**

The client has seen the added value our BIM Innovation brings to the project and will use the Irish data centre project as a benchmark for BIM across their datacentre campus location globally going forward. The client can already see the future benefits they will have when provided a data rich BIM Model at hand-over.

This will be used for Facilities Management for the whole life-cycle of the building which can be managed from one central location using the BIM collaboration platform.

The Project BIM Strategy and the BIM Innovation will be used to be a benchmark BIM Globally. We have demonstrated our BIM Process & Strategy to our client’s Design Team’s and General Contractors from around the world.