ACEI Awards 2018: Overseas Project

High Density Prefabricated Data Centre, Amsterdam, Netherlands

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Introduction

Built within an industrial hub close to Schipol International Airport, the client titled EDEDCAMS03 Data Centre (DC) project consists of 2 No. COLO's and associated containerised electrical modules (eMODs), and back-up gensets. The COLOs house an IT load of 10MW within the existing warehouse, with an extension added to the existing structure to house a 5MW COLO. The electrical modules prefabricated pods, manufactured off site and externally positioned facilitated an accelerated construction programme.

Cooling was achieved by an indirect evaporative cooling system, utilising free cooling, supplemented by evaporative cooling or DX refrigeration depending on ambient conditions. The project involved aspects of infrastructure extension / resilience, particularly with the site MV supplies and the required connections to the telecoms infrastructure. The design process was completed from our Dublin office, while working closely with our Dutch "*First Q*" Partner in order to ensure compliance with local codes.

The project began by liaising with the warehouse's local workforce, who were being relocated to a more modern & efficient facility as part of the DC works. As part of our deliverables, Ethos were commissioned to provide the electrical design using BIM & Revit MEP information to LOD 300, with the REVIT Model being transferred to the contractor to complete.

Koolhovenlaan, Schipol Rijk

Why this project might be considered award winning

Many of the design aspects in EDCAMS03 were a first for all consultants involved. Data centre clients have stringent specification requirements, with the existing structure posing many challenges to meeting those requirements. Once the structure was vacant, the design team had to ascertain what issues the current building fabric posed to all involved. All building elements such as foundations, floor slab, structural beams, electrical and water and IT infrastructure had to be examined and identified as either suitable for use or in need of an upgrade.

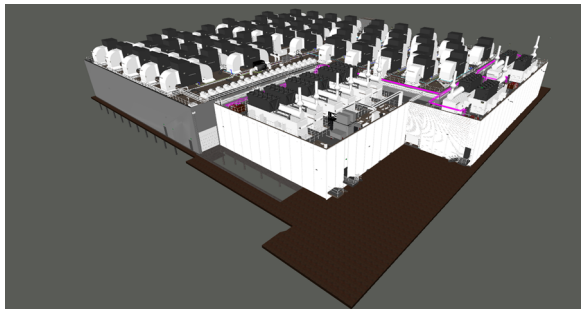
Space on site was at a premium, with the client requiring a denser IT load / m^2 than the team were familiar with. So, once the base elements of design relating to the structure and available infrastructure were completed, the next phase of the design began for Ethos, which involved space planning the required LV electrical modules, Transformer units, generator sets and load bank in such a manner which provided more internal, COLO space. An innovative LV room design was completed which utilised containerised units being manufactured off site, with the completed units dropped in to place. The main external plant items such as these "string" eMODs, the associated string transformers and generators were then stacked on top of each other, which neither the design team nor the contractor had ever done before and which required close liaison with the structural engineers. The result of this process provided an electrical infrastructure system which externally used a minimal footprint, allowing more electrical strings to be installed and therefore providing the facility with a higher IT load.

Once the main plant items were allocated space, the final design stage involved the routing of the infrastructure and containment, which due to the stacked nature of the electrical plant resulted in very innovative installation methods.

Provide further details of the project such as:

Design Elements / Procedures;

The main elements of Ethos's design involved the electrical infrastructure and associated plant items. The existing building posed problems relating to the in-situ building fabric, with the new extension being built to suit the structural requirements of a data centre, but taking up land for the required external plant. Both stages of the project posed unique problems which had to be overcome to achieve a unified structure. Many design stages were completed, with each one posing challenges not encountered on traditional "new builds".



Stage 1

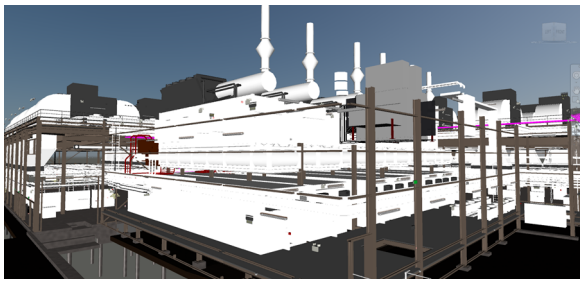
The site utilities had to be examined and identified as either suitable for use or requiring upgrade works. The local electricity suppliers were contacted with the aid of our Dutch First Q partners in order to develop a strategy to upgrade the site MV infrastructure. Space on the site was limited, so a new design was developed which involved the product of off-site MV electrical pods, which would be used to distribute power through the site to the new MV room that would be built in EDCAMS03

Stage 2

In parallel with the design works required to upgrade the site MV infrastructure, the management team working within the existing warehouse were met with regularly to ensure their company's transition to their new facility was a smooth one. All requirements within their existing facility were ascertained, with any additional requirements also being added to the M&E design of their new facility. On moving out the warehouse, the staff had gained a new, more modern and energy efficient facility, which better met their business needs.

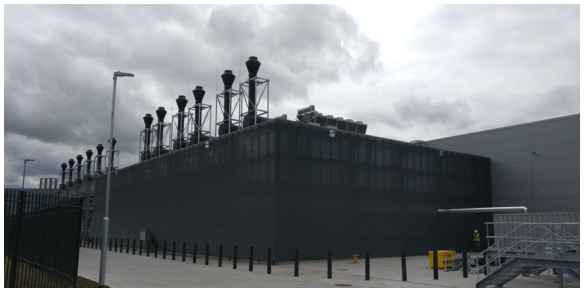
Stage 3

Space planning was a vital part of the design procedure. Traditionally, a large footprint is taken up by LV electrical infrastructure, transformers and generators. As space on the site was a at a premium, Ethos developed a primary plant layout which involved stacking plant, which resulted in a very small footprint being used per electrical string. This allowed more electrical strings to be installed and provided a denser IT load within the facility than would have been possible if a larger external footprint was for the primary plant.



Stage 4

Once the existing warehouse was vacant and space was allocated for the main external plant, the invasive inspection works began to see which parts of the building fabric could be retained, and which parts need to be upgraded or replaced altogether. Electrical design information had to be relayed to structural design team members to ensure cable and containment weights could be carried. Areas where the ceiling could not take the weight were upgraded, and where parts of the ceiling could not be upgraded, ground support systems were designed to carry the electrical infrastructure. In between all of this infrastructure, the sub distribution had to be allocated space, while the roof AHU input ductwork had to be kept free in order to ensure the COLOs were sufficiently cooled.



Complexities Involved;

The main complexities on the EDCAMS03 project related to space restrictions on site both externally and internally. Once these were overcome externally, the dense IT load within the facility posed an infrastructure problem with regard to space internally. Whichever internal plant and containment layout we used had to accommodate the large AHU input ducts which supplied cooling to the COLOs, while also providing enough electrical infrastructure and plant to achieve the required IT load. The solution involved stacking the containment systems and utilising vertical, rather than horizontal containment runs to minimise the space used in the ceilings and therefore providing more free area for the roof AHU unit duct work.

Innovation Aspects;

The stacking method used both externally with the primary plant items and internally with the containment had never been done before either by the design team nor the contractor. Externally, the stacking system was achieved through close liaison with the contractor, LV panel manufacturers, transformer and generator suppliers, as well as the structural and architectural team to ensure all plant could be safely stacked, and with enough space to install & maintain the required electrical infrastructure in to the building. The internal stacking of containment involved the design of complex ground supported containment systems, which again the contractor had never completed before.

A major aspect of Ethos's design scope in EDCAMS03 was ensuring adherence to the local municipality's strict environmental and efficiency requirement that the data centre was designed to an annualised Power Usage Effectiveness (PUE) of 1.2. PUE is the ratio of total energy used by a data center facility in relation to the energy delivered to IT equipment.

Working on the EDCAMS03 project allowed Ethos to work with a client who specializes in providing purpose-built, edge-of-network facilities that enable the fastest delivery of bandwidth intensive, latency sensitive content and cloud applications to local consumers and enterprises. This project was strategically positioned by the client to be nearest to network provider aggregation points, establishing new local peering facilities. This ensured the lowest latency data delivery with improved quality of service and increased security.

Site Management and Supervision;

While Ethos could avail of their Dutch First Q partners for management and supervision of the works, given the complex number of design firsts used on the project, we completed bi-monthly site walks and inspections in order to ensure the high levels of detailed design provided were being achieved on site. On weeks when site walks were not being completed, video calls were completed between the design teams, client and contractors to run through design queries. request for information (RFI) and submittals logs were utilised to ensure all queries and quality control issues from site tracked and closed out in a timely manner. One of the main supervisory aspects of the works related to the ground position of the electrical plant in relation to the main utility connection. Strict client voltage parameters had to be adhered to on site which affected the positioning of the main electrical plant. An important task during the site walks to inspect the setting out of the electrical eMODs and transformers.

Health & Safety Issues;

Given the manner in which internal and external plant and infrastructure items were to be installed, new installation methods and work sequences were developed. Health and safety was at the forefront of the design and construction process. While the construction process poses its own safety issues, Ethos also ensured that the finished product was safe for the end user. All plant items were designed to ensure easy access to trained personnel so the plant items could be easily maintained throughout the life time of the plant, ensuring the end user's operational staff are not exposed to any undue health and safety issues during maintenance.

Project Cost Controls

EDCAMS03 was completed at a much lower Euro/MW cost than previously encountered by the data centre's tenant. This was achieved through the use of containerised electrical modules, and through detailed build sequencing. The electrical modules were built off site and used less materials and labour than traditional builds given their compact design. The detailed nature of the design meant less waste was produced during the construction process, while the build sequences identified by the design team lead to more efficient delivery, better quality of end product and better installation times being achieved.

Any other relevant information

Design Team

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