



CASE STUDY

FEED DESIGNS FOR MITSUBISHI PLANT

**CLIENT: MITSUBISHI
CHEMICALS UK**

**LOCATION: LOUISIANA
USA**

Highlights:

- Buildings & Security
Masterplanning
- RIBA 1-3+



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CONTEXT

Arthian was appointed by Mitsubishi Chemicals UK to carry out the Front-End Engineering Design (FEED) for the buildings on the proposed world's largest Methyl Methacrylate (MMA) production plant in Louisiana, U.S.A. The proposed \$1Billion plant was designed to deliver a long-term supply of MMA to market with the lowest possible carbon footprint. Arthian was engaged to provide Civil, Structural, Architectural and Building Services design services for:

- Master planning of the site entrance security and landscaping.
- Mixed-use Control and Administration building
- Security gatehouse
- Fire station
- Chemical handling building
- Stores building
- Workshop building
- Drum store
- Contractor's welfare facility
- Toxic refuge
- Associated civil infrastructure

THE CHALLENGE

It was Mitsubishi's intention to achieve a cost estimate of +/-20% cost certainty for the buildings based on the FEED design package. To achieve this, the multi-disciplinary Arthian team progressed the building design to the RIBA Plan of Work. We targeted a level of detail between stages 3 & 4 to provide adequate information to support accurate costing of the works and procurement of a local design & build contractor. As part of the design process, we were presented with the following challenges:

- Occupied buildings are designed to withstand a range of environmental conditions and process hazards including hurricanes, tornado, seismic, blast overpressure and pool fire.
- Occupied building designs should provide shelter-in-place and toxic gas refuge facilities.
- The building & landscape designs should adhere to the Mitsubishi sustainability philosophy, particularly around the health and well-being of occupants.
- All infrastructure was required to be coordinated and aligned with the process site strategy.
- The site is located on very soft swamp land requiring substantial earthworks.
- The site is constrained with limited space requiring effective spatial planning and land use.



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THE SOLUTION

Alongside our architectural and Building Services partners, Wellwood Leslie and Hoare Lea, Arthian collaborated with Mitsubishi and their process designers to ensure that the delineation of interfaces for the project had a clear, well defined and standardised approach to design.

Arthian delivered the access, security and buildings scope through RIBA stages 1, 2 and 3 with partial development of stage 4 to increase cost accuracy. The key scope of items required included:

Process, Control and Administration (PCA) Building

Due to the number of occupants and limited space, the main PCA building evolved into a 2-storey building. The main building structure and envelope were designed to be fire, blast and hurricane resistant as well as being a toxic gas refuge. The process site control room was also housed within the PCA building within a hardened core which was designed to be tornado-resistant and low response in the event of a blast event.

Arthian engaged with the Mitsubishi site operators and end users to ensure that functionality and operational efficiency were at the forefront of the building layout and configuration. This included ensuring that the control room was laid out considering industry best practice ergonomic standards.

Arthian supported in the preparation of the tender documentation which require detailed and careful consideration of the scope split between various contractors and designers. This was particularly important within the PCA building due to the volume of process control and instrumentation cables connecting to the server and control room. This was managed through the development of detailed technical scope of works documents and responsibilities matrix developed in liaison with the Mitsubishi project team.

Security Gatehouse and Site Access

Site security and access were critical aspects of the project. Arthian ensured compliance with best practice US standards by adopting the Deter, Detect, Delay philosophy for managing security incidents. Our design included ballistic resistance, hostile vehicle mitigation measures, security checks and processing of visitors, perimeter fencing, CCTV and people/vehicle movement assessments.



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THE SOLUTION

Emergency Response Building

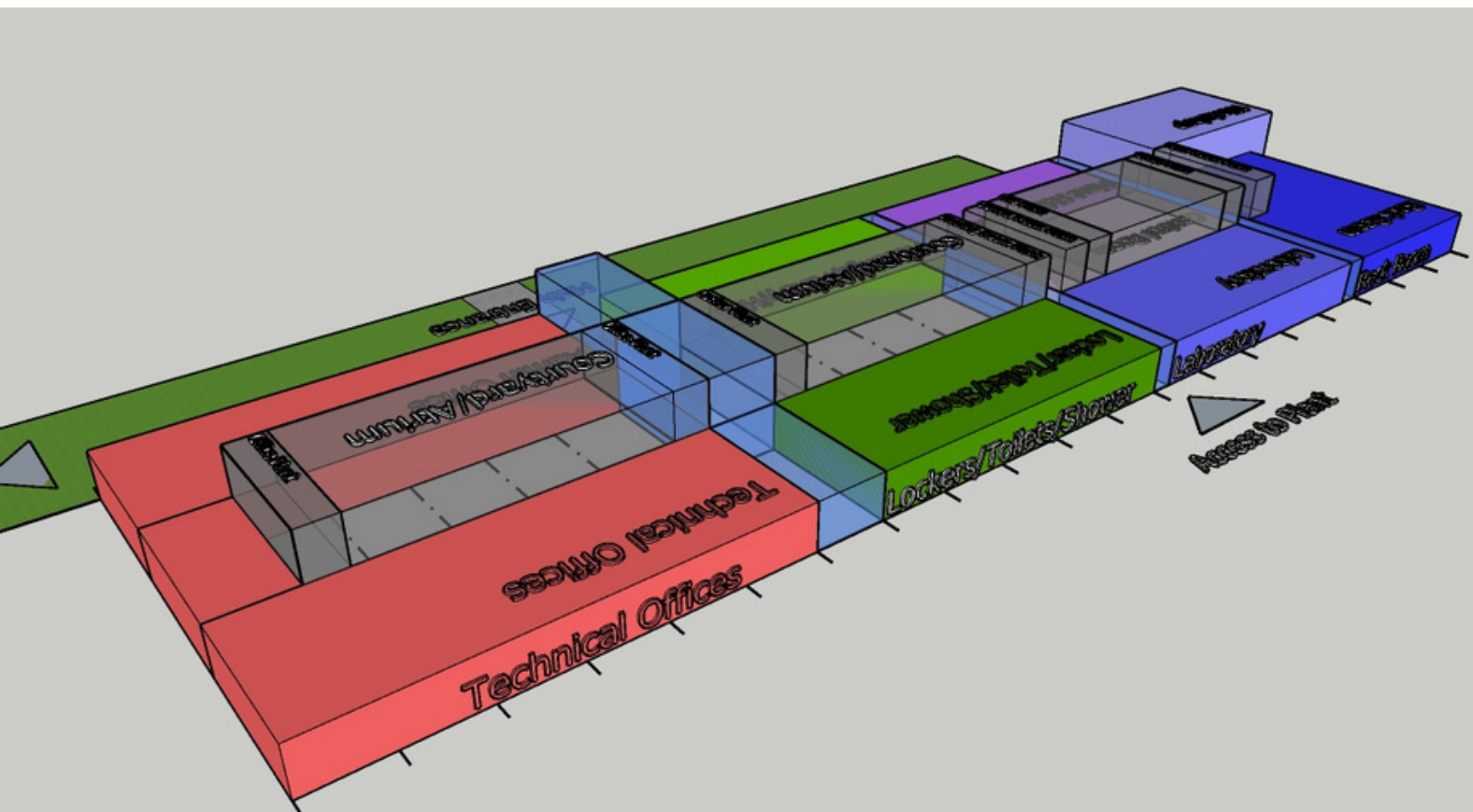
As the first responders to any incident onsite, it is critical that this building was designed to be fully operational post-incident. Hazards and functionality were considered through all aspects of the design including location for a speedy response, located an adequate distance from key hazards; functionality of doors in the event of a blast, and operational layout for vehicle movements and training.

Industrial Buildings

The design of the non-occupied industrial buildings was operationally driven. These included Chemical Handling Building, Stores and Drum Store and Workshop. These buildings were designed for required trafficking, deliveries and lifting operations.

Contractor Welfare Facility

Due to the scale of the plant, a dedicated facility was required to house contractor staff. This included canteen, messing, office space, changing, toilet and shower facilities. The building was of modular steel construction and was designed to protect the building occupants from blast and toxic hazards from the plant process.



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THE SOLUTION

Toxic Refuge

Due to the scale of the facility, a toxic refuge was required within the process plant area to provide a shelter-in-place solution for any plant operatives in the event of a toxic gas release. We proposed a pre-cast concrete modular solution which was driven by the additional thermal and blast requirements due to the proximity to the process plant.

Landscaping

Following the Mitsubishi philosophy, the landscaping was designed to create a calming and relaxing environment for the staff to enjoy. This included sheltered fabric walkways, seating areas, water features and gardens. The Arthian project team successfully completed the FEED package to US standards while meeting the client's operational and sustainability expectations for the project.



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