

VIRTUAL DESIGN AND CONSTRUCTION IN MUSEUM PROJECTS

Applying Virtual Design and Construction to complex museum construction projects to protect expensive artwork, create accurate design, and enhance the future visitor experience.

Museums are unique spaces that necessitate careful preservation of precious artwork and artifacts. They require critical planning and deliberate design to create a unique and impactful visitor experience. Crucial elements include lighting, air quality, humidity, temperature, ceiling height, adaptable spaces, educational opportunities and the flexibility for visitors to create their own unique experience. The creation of these spaces are intricate undertakings that need pre-planning, collaboration and repeated testing to provide respect to the display of these stunning pieces, while delivering cost and schedule certainty.

Virtual Design and Construction (VDC) supports the seamless and safe delivery of museum projects. Technology provides sophisticated insights prior to execution, which confirms accurate design, eradicates errors and saves time and money over the life of a project. Gilbane Building Company has a comprehensive VDC team that supports projects from the planning stage of a project, through to completion. The below elements showcase potential areas for the application of VDC to achieve client value.



MECHANICAL AND ELECTRICAL PLACEMENT TO MINIMIZE DISTURBANCE AND MAXIMIZE SPACE

Museum spaces are unique from a mechanical and electrical standpoint; it is critical for all components to function and be serviced to meet the design criteria. Gilbane's VDC team spends time at a museum site at the beginning of a project to undertake scanning in order to understand the building intricately. They squeeze into crawl spaces, enter man lifts and access ceilings through access panels in order to gather accurate 3D representations of a museum building. Once the scans are gathered, mechanical and electrical trades can be engaged to work with the VDC team to finalize unfinished designs. VDC input at this stage not only provides accurate scans, but can also determine the best position for mechanical, electrical and plumbing elements. For example, this phase can result in the decision to run electrical conduits through the crawl space, rather than the museum rooms to eliminate any potential impact on visitor experience and save money. Providing designers with the exact locations of existing mechanical, electrical, plumbing and fire protection more accurately informs the decision-making process and allows architects to design to exact locations and specifications.



VISITOR EXPERIENCE IMMERSION THROUGH VIRTUAL MOCK UPS

Cultural projects require a higher design criteria. The right design enriches artwork and provides visitors with a lasting memory of the experience. Cultural renovation design considers the coordination of spaces to allow flexibility for future exhibits, incorporating shifting lights, additional access panels and an ability to expand and contract spaces. These designs must be repeatedly checked to examine the visitor experience and avoid any negative impacts. Virtual mock ups create an immersive environment that pre-empts the visitor experience and provides a museum facility with comprehensive knowledge to either confirm or adjust a design feature. The replication of the volumetric visitor experience allows a museum to understand the true impact of a design change.



LASER SCANNING TO PROTECT SURROUNDING ELEMENTS

Museum institutions are dedicated to preserving culture and exhibiting new art and ideas. During an expansion, many museums require a solution that involves working in occupied buildings and requires the preservation of surrounding buildings or nature; while still achieving the intended design. Gilbane's VDC team use Light Detection and Ranging (LIDAR) to map out a surrounding element and then create a strategy to build around it without any disruption. The VDC team scans the surrounds and then uses these scans to help the construction team, museum and any specialist consultants to understand the impact of design on an element. The design is then amended to ensure conservation of the element and determine appropriate sequencing of construction activities and installations to further eliminate impact. This complex laser technology sustains and transforms construction projects. It changes the way project strategies are approached and elevates a museum's ability to preserve art and culture, while cutting costs, saving time and preventing unwanted damage.



PROTECTING PRECIOUS ARTIFACTS THROUGH ENVIRONMENTAL SENSORS

Sensitive museum artworks and artifacts require an investment into the environment in which they are housed. This delicate atmosphere can never be compromised, making it critical that environmental factors are maintained during the construction period.

Just as priceless artworks line the walls of museums, environmental monitors are installed by Gilbane. Remote sensors monitor humidity, temperature, dust, vibration and noise to measure the impact of construction and provide control mechanisms to maintain the atmosphere. These sensors connect to a larger database in a complex network that reaches every site worker's mobile phone. Threshold temperatures, humidity and dust allowances are set in collaboration with a museum at the beginning of a project. The technology then provides notification if a factor is reaching the defined threshold, allowing the construction team time to address issues before they become a problem. This monitoring technology is invaluable in protecting a museum's priceless assets during an expansion project.



INCREASED COLLABORATION WITH ALL PROJECT STAKEHOLDERS

All construction projects require collaboration between the client, architect, contractor and other consultants to achieve positive outcomes. The use of VDC can support increased team collaboration, and assist a project team to overcome any obstacles caused by geographical distance.

Gilbane's VDC team uses a collaborative approach to positively influence the accuracy of design and the team's ability to meet the client's criteria. This attention results in clearly-defined, shared goals for all project stakeholders. It allows project teams to complete construction while keeping a museum facility fully operational to the public to avoid a loss in revenue. Sharing scans with the architect ensures that the design incorporates accurate as-built conditions and avoids costly redesigns due to incorrect as-builts. The constant communication and ongoing collaboration with design teams, facilities managers and consultants solve issues before they become problems and ensure all stakeholders always have updated and consistent information.



INFLUENCING AND ACHIEVING ACCURATE DESIGN

Accurate scans completed at the beginning of a project provide the perfect platform for an architect to complete a design accurately and avoid costly and time-consuming redesigns. Collaboration can then take place with an acoustician to confirm that a design meets a museum's acoustic requirements. The data from laser scanning allows for the creation of 3D mock ups which avoids confusion and provides modeling for architects. This detailed pre-planning work results in a cost-effective construction phase that severely minimizes RFIs and change orders. The implementation of VDC and accurate scans ultimately result in an early design process that consists of multiple RFIs, therefore eliminating the need for RFIs later in the construction process to save time and money.



ELIMINATING SURPRISES AT PROJECT COMPLETION

The implementation of VDC ultimately ensures that the client's expectations are identified and met prior to construction taking place. Client confidence can be achieved through a detailed understanding and subsequent delivery plan in line with the needs of a museum. The use of technology allows a construction team to provide an immersive virtual reality experience to confirm the design and boost the visitor experience, as well as protect the priceless artwork and the surrounding external elements. A clear strategic vision and use of VDC ultimately eliminates surprises from occurring during the project journey, realizing client goals and essentially benefiting a museum's visitors and their future cultural experience.



SUMMARY BENEFITS OF APPLYING VDC TO MUSEUM PROJECTS

- ✓ Save money;
- ✓ Save time;
- ✓ Protect the surrounding environmental;
- ✓ Increase collaboration;
- ✓ Enhance the visitor experience through virtual mock ups;
- ✓ Able to understand and meet client expectations before construction began, eliminating surprises at the end of the project;
- ✓ Protect artwork through environmental monitors;
- ✓ Enhance the aesthetic through smart mechanical and electrical placement;
- ✓ Achieve accurate design before construction begins; and
- ✓ Eliminate RFIs during construction, further saving time and money.



Please contact [**Neil Heyman**](#) for specific Gilbane project examples and to understand how the implementation of VDC can benefit your future museum project.