



KHS&S CASE STUDY

CONSTRUCTING A ONE-OF-A-KIND ARCHITECTURAL EXTERIOR SPHERE COLLAR

OVERVIEW

A dramatic, futuristic addition to the Las Vegas skyline, the MSG Sphere is located at The Venetian Resort and is powered by cutting edge technologies to host a wide variety of immersive events. The exterior features a record 580,000 square foot LED display and the interior has a 160,000 square foot LED screen, the size of three football fields, that surrounds the audience making it the largest and highest resolution LED screen on the planet.

While setting a record as the largest structural sphere in the world, the MSG Sphere also set records within KHS&S. As the first of its kind, the complexity of the exterior EFIS system was challenging to construct. Installation of 142 EFIS panels required exact prefabrication and placement in order to form the spherical shape. The domed structural steel has a self-supporting roof with no columns. KHS&S excelled in schedule management, safety and interior and exterior quality while resolving unexpected challenges to meet project demand in volume and labor.

starting with panel 1 up to panel 142. A custom semi-truck rack system was designed to hold up to five panels for transport to the job site.

COMPLEXITY OF PANEL ORIENTATION

While the EFIS panels were being prefabricated, KHS&S crews worked on site installing the layout and clip system. More than 5,000 heavy gauge clips were bolted with anchors drilled into concrete at critical elevations around the sphere's exterior. Like an intricate puzzle, placement had to be correct for the multi-angled EFIS panels to fit and be installed to exact precision. Computational Design services during the pre-construction phase were essential as it required taking flat panels and configuring into a complex radius form. Detailed plans and drawings during the pre-construction ensured the accuracy of panel prefabrication and installation. Other exterior trade work such as aluminum tracking and glazing placed over the EFIS was dependent on the panel's exact positioning.

EFFICIENCIES IN OFF SITE PREFABRICATION

An offsite fabrication yard located two miles from the construction site was set up two months prior to EFIS installation. Metal stud kits completed by the Howick machine at the KHS&S main prefabrication facility were delivered to the yard. Each of the 142 panels ranging in size from 16 feet to 37 feet and featuring four unequal sides and unique angles moved through the four step EFIS process. Fabrication was completed based on order of installation and each panel was labeled with a highly visible numbering system



PRECISION IN CREATING A SPHERICAL SCULPTURE

An assembly line installation process for the EFIS panels was completed with a 40-ton crane moving around the spherical building flying the numbered panels into position. The trapezoidal exterior EFIS installation varied from 15- to 30-degree angles to make flat EFIS panels form a curved spherical shape. Panels were single story and started with a 16-foot panel at the base and increased up to 37 feet for a trajectory that sloped up and leaned out to form the middle of the sphere. Panels then reversed in length from 37 feet to 16 feet to the top of the sphere. More of a sculpture than a building, the structure is self-supporting with a compression ring at the top that holds the 336 feet tall and 516 feet wide sphere in place.

EXTERIOR PROJECT SCOPE

- EFIS
- Light Gauge Framing

INTERIOR PROJECT SCOPE

- Painting and Specialty Finishes
- Wall Coverings

BY THE NUMBERS

1,784,858 square feet of interior paint
140,651 square feet of unique specialty paint finishes
252,506 square feet of concrete sealer
34,790 square feet of wallcovering
32,000 square feet of EFIS
55,090 work hours to complete
60 KHS&S workers at peak times

QUALITY CONTROL FROM PREFABRICATION TO FINAL WELD

Each step in the prefabrication production line had its own QC inspection with photos taken and a checklist that followed each individual panel through the multi-step EFIS fabrication process. Production phases included sheathing, plaster, air and water barrier, foam, mesh, skim and finish coat. A final QC inspection was completed prior to each panel leaving the prefabrication yard. Once the panels were flown into place, a sticker located on each panel was initialed at the final weld.

The rigor of the internal KHS&S QC management program and project specific plan reduced rework saved time and money to provide a superior work product to meet the client and KHS&S exacting standards.

EXECUTING PAINT SCOPE

KHS&S touched nearly all interior wall surfaces with 1,784,858 square feet of painting, 427,441 square feet of specialty metallic and scuff master finishes, wall coverings and floor sealer. This included an array of 20 paint colors and finishes, 8,200 gallons of materials and 5 wall covering designs. The scope also included blackout painting behind the LED screen, painting and wall covering for the queuing areas, suites, concessions and main concourse. KHS&S also installed graphics depicting mathematical equations relevant to the sphere's design. The painting team included a 40-person crew at peak times requiring the recruitment of local talent.

