

Using a Smoke Control & Fire Modeling Analysis to Solve Building Code Challenges for **Atomic Golf**

How Summit Fire Consulting helped Atomic Golf resolve the city of Las Vegas's building design concerns through fire modeling, an alternate means and methods request, performance-based design, and egress modeling.



Atomic Golf wanted to build a brand-new golf entertainment facility on the Las Vegas Strip. The building would be four stories, approximately 100,000 square feet in area, and permanently open on one side of the building facing the golf range. An additional exterior opening on the opposite side of the range would open to the interactive putting area. To obtain construction permits, Atomic Golf shared its plans with the city of Las Vegas for review. Based on the **2018 International Building Code (IBC)** with amendments adopted by Las Vegas, the city had concerns about prescriptive building code requirements as there was no mechanical smoke control system design for the atrium. The city also had issues with building code requirements for height limitations based on the occupancy classification of the building.

Summit Fire Consulting (SFC) helped Atomic Golf develop a technical approach that addressed the city's concerns. Through a smoke control rational analysis and a fire and egress modeling analysis, SFC saved Atomic Golf significant construction and long-term maintenance costs by gaining building construction approval from the city of Las Vegas, preventing further delays to the grand opening timeline.



ABOUT

Atomic Golf

Atomic Golf is located next to the STRAT Hotel, Casino & Tower on the Strip in Las Vegas, Nevada. The golf entertainment facility has over 100 golf bays, interactive putting areas, tap rooms, lounges, and luxury suites. Construction for Atomic Golf began in December 2022 with the goal of opening in the first quarter of 2024.



PROBLEMS

While most buildings can accommodate prescriptive building code requirements, Atomic Golf's proposed building faced two main issues:

- 1. The city of Las Vegas determined that a vertical opening through the building's four stories should be classified as an atrium.*
- 2. The city was concerned that the prescriptive requirements of the building code didn't support the occupancy classification of some assembly spaces based on the building's height.*



Problem 1: Atrium Classification

During the city's plan review, it determined that the vertical opening through the four stories of the building should be classified as an atrium. The IBC requires a smoke control system to maintain tenability throughout occupiable areas exposed to that atrium. Therefore, a smoke control rational analysis was required.

The challenge was that the project was in the late design stages, and a mechanical smoke control system was not included in the building design. The project's design team felt that because the building was open to the environment, smoke would escape without needing a mechanical smoke control system. However, fire modeling would need to be performed to confirm this, and the building code didn't include prescriptive exceptions for smoke control in that case.

Problem 2: Occupancy Classification

The design team and the city of Las Vegas also discussed the occupancy classification of some of the assembly spaces in the building. Due to the unique nature of the activities within the building, arguments could be made regarding whether the general golf bay areas should be classified as Group A-3 or Group A-5 occupancies.





Additionally, the lounges and bars throughout the facility were classified as Group A-2 occupancies, including those located on the fourth floor. However, the building code posed a challenge: for buildings with Type 2B construction and sprinkler protection, the prescriptive requirements limit Group A-2 and A-3 occupancies to a maximum of three stories. This created a potential compliance issue, as the building was designed with a fourth-floor Group A-2 occupancy.



Prescriptively, the building code would require an upgraded building construction type, which would involve changing the design from Type 2B to Type 2A, requiring fire-resistant rated construction. The building structure primarily consisted of concrete, but the upgrade in construction type would require the exposed steel roof structure to be protected with intumescent paint or spray-applied fireproofing. Concerns for adding intumescent coatings or spray-applied fireproofing included not just cost but long-term challenges with maintaining those coatings, especially because of their exposure to a wide range of weather conditions and temperatures in Las Vegas and maintaining the integrity of those coatings over time.



These problems threatened to prolong the building construction, impacting Atomic Golf's grand opening timeline. To avoid delays, SFC got straight to the tasks at hand.

SOLUTIONS

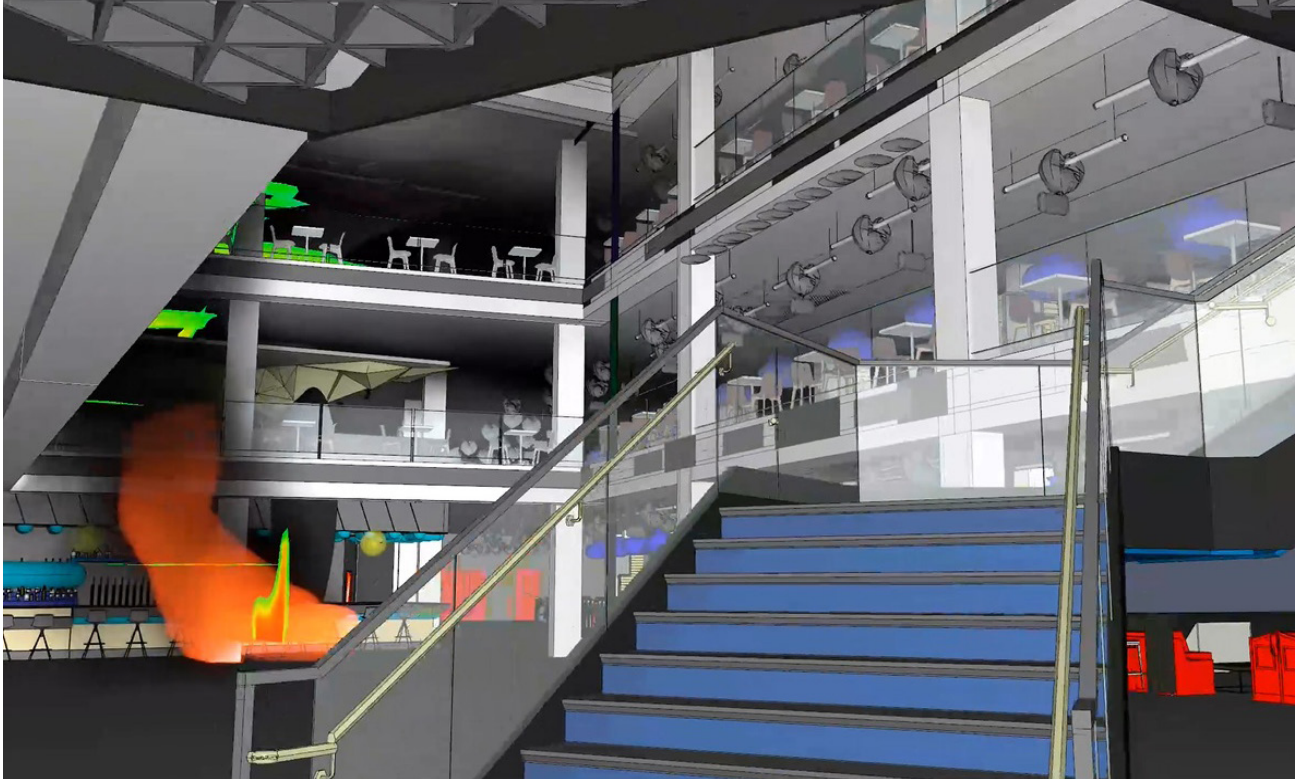
SFC performed two types of analyses to address the issues with the building's design:

- 1. Smoke control rational analysis:** A performance-based evaluation that determines the design, operation, and effectiveness of a smoke control system to ensure it meets safety objectives and complies with building code requirements.*
- 2. Fire modeling analysis:** An evaluation of computational simulations to predict fire behavior, smoke movement, and the effectiveness of fire protection systems, helping to inform design and safety strategies in buildings.*

Solution 1: Smoke Control Rational Analysis

SFC conducted a smoke control rational analysis to address the building code's atrium smoke control requirements. Using Fire Dynamics Simulator (FDS), SFC modeled smoke movement through vertical openings and into various building areas under different fire scenarios. These fire models were then integrated with Pathfinder egress models to simulate tenant safety conditions along egress paths.

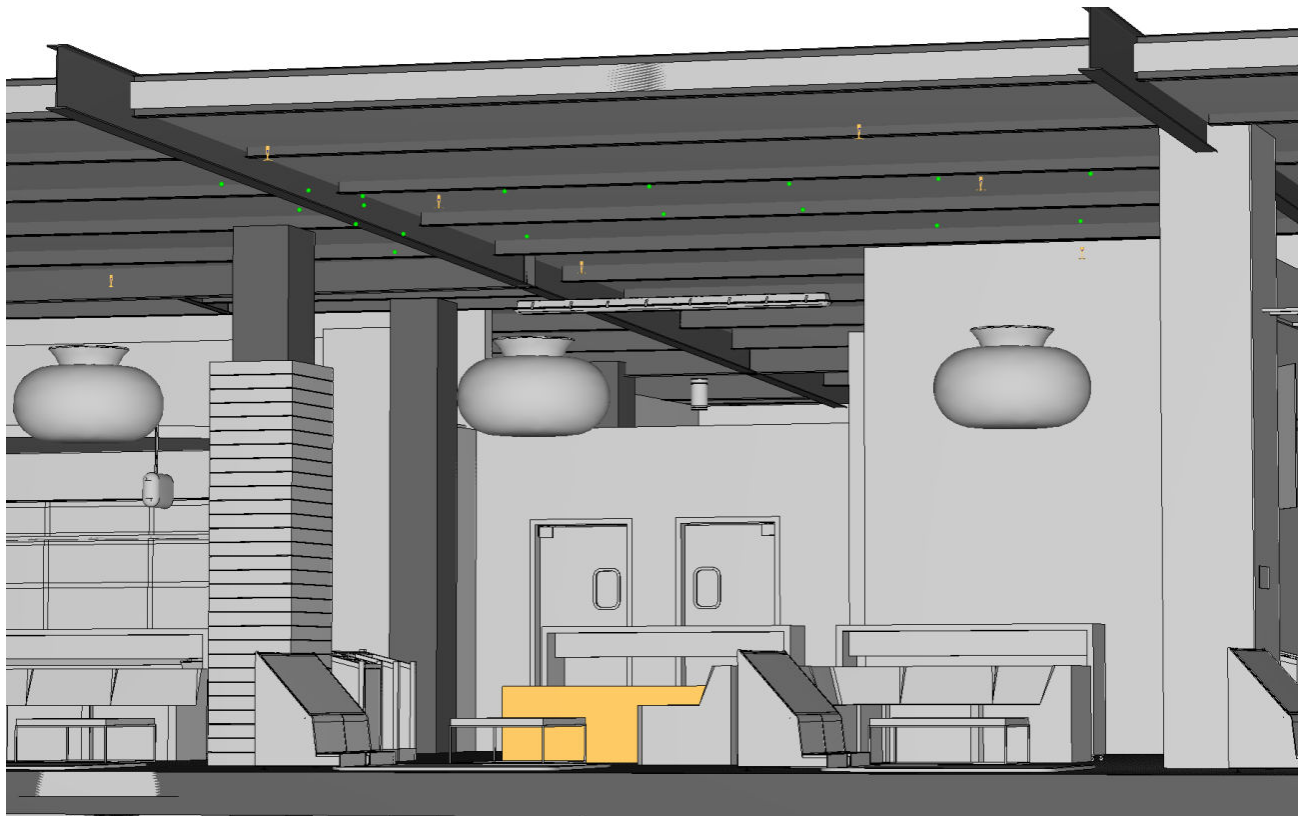
As seen in the image above, smoke and heat could spread between the floors through these vertical openings in one fire scenario. For that analysis, SFC modeled a five-megawatt fire in the center of the atrium, which was considered an axisymmetric fire plume.



Fire Scenario 1: Astrocade Fire Location Rendering

Solution 2: Fire Modeling Analysis

A performance-based design approach was adopted to address the occupancy classification and construction-type challenges posed by the building code. SFC used fire modeling to evaluate how various design fire scenarios would impact the exposed steel roof structure and other building structural components. This modeling enabled the team to simulate the temperatures that different steel components would be exposed to during a fire. The performance goal was to ensure the steel temperatures stayed within safe limits to prevent structural failure.



Fire Scenario 1: Point Source Adiabatic Surface Temperature Device Locations (Green Dots)

In the above image, steel beams supported the roof structure at the top. The green dots represented the locations where SFC placed temperature sensors within the model. This allowed SFC to monitor the temperatures above the fire and assess the level of heat the steel roof structure was exposed to. Additionally, activation times of automatic fire sprinklers were assessed, which affected alarm notification time as well as the fire's peak heat release rate.

RESULTS

Smoke Control Rational Analysis

The smoke control rational analysis focused on ensuring adequate visibility for occupants to navigate exits and minimizing exposure to high temperatures and harmful gases, including carbon monoxide.

Using this modeling approach, SFC demonstrated that occupant safety could be maintained throughout the facility without requiring a mechanical smoke control system. Instead, SFC relied on natural ventilation to meet the building code's smoke control requirements.



Fire Modeling Analysis

As a result of the performance-based design that stemmed from the fire modeling analysis, SFC made minor adjustments to the automatic fire sprinkler system, such as placing sprinklers closer together in specific areas.

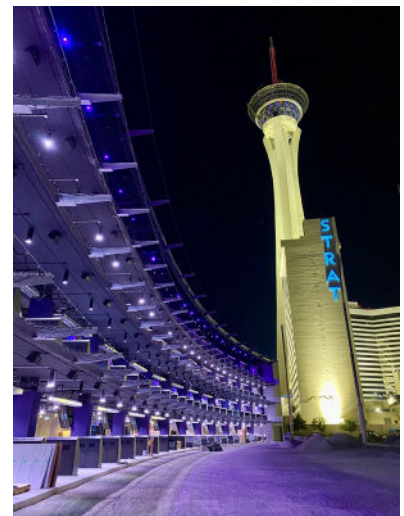
These changes allowed SFC to demonstrate that the expected temperatures would remain well below the structural failure threshold. SFC submitted an alternative means and methods request (AMMR) to the city, which was approved.



BOTTOM LINE

SFC's engineering services helped Atomic Golf secure approval from the city of Las Vegas to move forward with construction, while the team's design strategies prevented delays and significantly reduced costs.

The smoke control rational analysis demonstrated that tenability throughout the atrium areas could be maintained through natural ventilation, eliminating the need for costly and complex mechanical smoke control systems. By avoiding the installation of smoke control fans and the associated detection, controls, and emergency power requirements, SFC saved the client a substantial amount of money.



SFC's performance-based design approach also allowed for greater flexibility in the building's use and height, enabling bars and lounges to be located on the fourth floor despite the building code's prescriptive limitations. Additionally, the approach eliminated unnecessary fireproofing on exposed steel structural members.

Ultimately, SFC's services helped the client avoid significant construction and long-term maintenance costs. The team also allowed the project to receive city approval without further delays and stay on schedule for Atomic Golf's grand opening.

ABOUT SUMMIT FIRE CONSULTING

Summit Fire Consulting is a team of licensed fire protection engineers and code consultants partnering with owners, architects, and developers to solve complex code challenges, accelerate approvals, and unlock designs others say can't be built.

In addition to timed-egress evaluations, Summit Fire Consulting has experience with modeling structural fire resistance, sprinkler detection times, smoke detector spacing, device activation times and smoke and heat venting.

Going beyond compliance, Summit Fire Consulting designs safer, more efficient buildings that maximize long-term value. Backed by the strength of the full Summit Companies network, our team delivers responsive, code-aligned solutions wherever your project takes you.



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