FORTRESS
PROTECTIVE BUILDINGS

CASE STUDY

Safeguarding Personnel and Critical Infrastructure at a U.S. Gulf Coast Petrochemical Facility

Project Timeline: August 2022 to April 2023

OVERVIEW

In May 2021, a major petrochemical company announced plans to add a new production unit at one of its manufacturing facilities on the U.S. Gulf Coast. To meet industry standards and compliance regulations, the facility required a protective building to safeguard its people and critical equipment.

CHALLENGES

While the facility's industrial setting, operational process areas and hurricane-prone location posed familiar potential hazards, a variety of facility-specific factors expanded the spectrum of threats:

1. Operators as First Responders

Operators within the facility are the first line of response to any incidents. This means that in the event of an emergency, such as a fire, operators equip themselves with personal protective equipment (PPE) and quickly address the situation.

2. Critical Equipment Shutdown Protocol

Operators would be situated within the protective building. If something goes wrong, they must shut down equipment before evacuating. This requires a supplied breathing air system to ensure operator safety during critical response procedures.

3. High Blast Hazards and Proximity to Refinery

The facility itself faces very high blast hazards, but also faces toxic threats due to its close proximity to a neighboring facility. The potential for major fire hazards associated with facility operations heightens the need for enhanced safety measures. Operators must remain in close proximity to respond quickly in emergencies while ensuring the safe shutdown of systems before evacuation.

4. Safe Haven Requirement

Due to the full exposure opportunity to multiple potential hazards and the need for personnel to be close enough to respond quickly, corporate criteria required a specific level of protection: a multi-hazard resistant Safe Haven. This requirement narrowed the permissible options to either a FORTRESS protective building or a built-in-place concrete structure—which would take three to five years to construct.

SAFE HAVEN:

A structure, or protected area within a structure, that provides protection from man-made threats, natural threats or combination for short durations and infrequent intervals.

Unified Facilities Criteria (UFC)

Also referred to as: Shelter-in-Place Building, Toxic Refuge (API)

All three terms are used interchangeably and provide the highest possible level of protection.

In the context of this facility, a "Safe Haven" is a building required to provide immediate protection up to one hour after an incident, offering protection against potential blast, fragment, fire and toxic hazards during that time.

ADDITIONAL CONSIDERATIONS

Project Deadline

The facility's new production unit was targeted for startup in 18 months. An operational protective building would need to meet the same schedule.

Reinforced Concrete Requirement

As a participating company in BakerRisk's Explosion Research Cooperative, the facility's owner had witnessed testing on metal buildings and knew firsthand the safety shortcomings of such structures. As a result, they developed a standard that prohibits metal buildings within a certain distance of the processing unit when used as permanent occupancy buildings. Based on the protective building's siting distance for this specific project, their standard mandated a reinforced concrete structure.

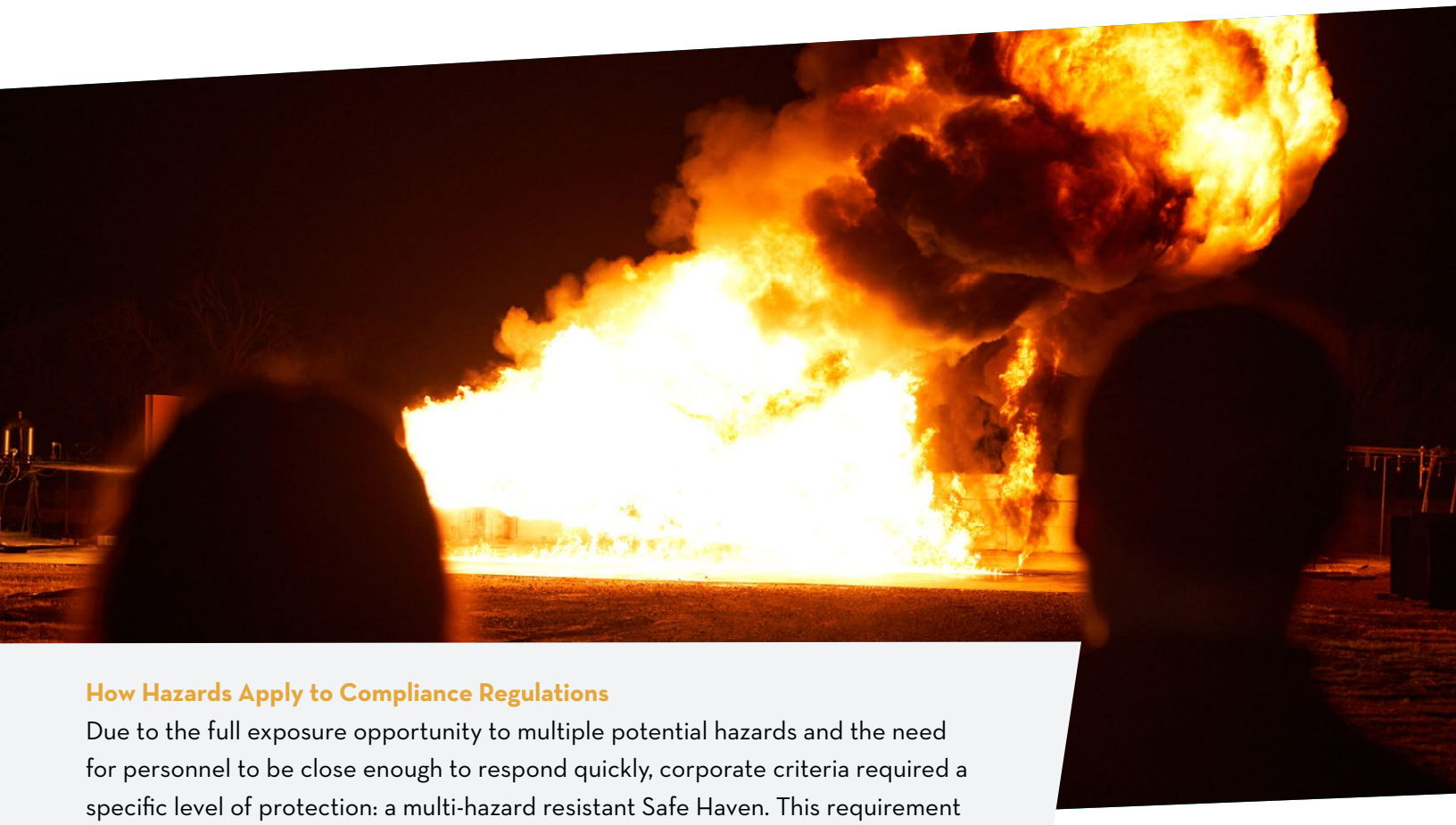
BAKER RISK

BakerRisk Partnership: Industry Experts Behind FORTRESS

Learn More

The Domino Effect of Hazards

In industrial settings, it's crucial to understand how different hazards interconnect, setting off a chain reaction of potential threats. From blasts, fires and fragments to toxic gases and severe weather, each hazard has the potential to trigger others, escalating the overall risk and challenging safety protocols. Safeguarding against multiple threats is essential to providing a secure environment for personnel and critical assets.



How Hazards Apply to Compliance Regulations

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FORTRESS: THE RESPONSIBLE CHOICE

FORTRESS stands as the only company with proven multi-hazard resistant protection, offering comprehensive defense against various threats including blasts, fires, toxic gases, fragments and extreme weather. This facility faced all of these potential hazards, emphasizing the need for a robust, tailored solution.

PROJECT COLLABORATION WITH EPC

An Engineering, Procurement and Construction (EPC) firm, tasked with constructing the new unit at the facility, led the project and contracted with FORTRESS to provide the protective building.

THE SOLUTION: A TRULY UNIQUE SAFE HAVEN

To effectively mitigate the risks associated with this complex multi-hazard scenario, FORTRESS implemented a range of innovative features within the facility's Safe Haven, distinguishing it from conventional protective structures:

- **Reinforced Concrete**
  The building's construction material ensured unparalleled durability and resistance to multiple potential hazards.
- **Modular Design**
  This feature, which allows for design flexibility and quick installation, enabled the building to be designed, engineered, and constructed within the 18-month timeline.
- **Breathing Air System**
  Equipped with mask drops, the system ensured a continuous supply of clean air for control board operators, enhancing their safety during critical response procedures.
- **Fortress Gas Sentry**
  With 28 gas detectors for flammable and toxic hazards, this control box seamlessly and automatically initiates safety protocols, such as shutting down the HVAC and air intakes and sealing the building, to enable occupants to shelter safely for one hour.
- **Self-Contained Breathing Apparatus (SCBA) Packs**
  Responders equip themselves with these packs before venturing out to address incidents safely.
- **Permitting and Security Features**
  The Safe Haven includes provisions for contractor access control, security access on doors, self-actuating pushed door openers/closers and implements lockout-tagout procedures.
- **Climate Control Systems**
  The main HVAC system and a separate mini-split system work in tandem to recirculate clean air in the building and maintain a comfortable environment inside, even during shutdowns.
- **Environmental Alarm**
  When the internal temperature exceeds 80 degrees Fahrenheit, an alarm system prompts evacuation considerations.
- **Amenities**
  The Safe Haven includes a full kitchen, complete with two stoves and a refrigerator, and a locker room.

PRECAST CONCRETE FABRICATION BY TINDALL CORPORATION

As with all of their protective buildings, FORTRESS collaborated with **Tindall Corporation**, an industry leader earning the highest certification from the Precast Concrete Institute. For this facility, Tindall fabricated and shipped 16 modules to the project site in one month.

For more fabrication details including structure specifications, resistances and ratings, **see the Tindall project profile**.

RESULTS & FEEDBACK: IN THEIR OWN WORDS

Facility Personnel

"Wow, this actually looks like a normal building inside, but look a like a bunker outside and feels so safe."

"Man, this feels so much safer than those metal buildings."

"I really like the look and feel of the kitchen. And those vinyl non-slip floors are great."

"I've been working in the industry as a roofing inspector for over 30 years and have never seen a building like this."

"Impressive! The doors are 5 1/2 inches thick of insulation and stainless steel."

"We don't feel like we're in a petrochemical facility. We can't hear anything from the outside. It's like we're in our own little universe."

"The building feels like an actual office building inside, not like a refinery control room."

"It's almost too quiet. I'm used to hearing the hum of the equipment outside. I had to peek outside to make sure it was still running."

"When we worked in the metal buildings, we were told we're safe. And we expect to be safe. But it never really felt safe. It just felt like a shipping container."

"I actually feel safe. I can see the thickness of the concrete, the 5 1/2 inches thick door, the control panel with live detectors."

EPC Firm

"The FORTRESS design and construction process was extremely smooth. We've never seen a blast-resistant building project with such a great process and package of drawings."

"In the pre-construction process, FORTRESS goes deep into details with subcontractors and the owner. From the building design to a 3D model, they make sure everything fits properly, is in the right places and make any adjustments the client wants in terms of design and layout."

"It was easy to work through the building with FORTRESS. Their closeout package was very nice."

"Our client, the facility owner, is looking at FORTRESS buildings for another one of their facilities. They really liked the FORTRESS process."

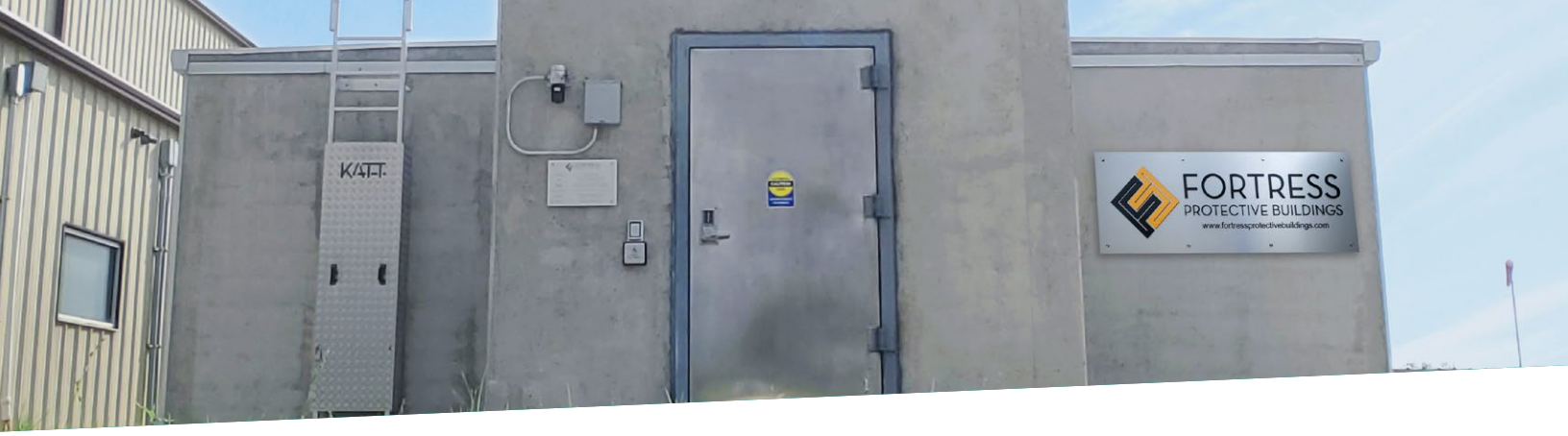
"They're looking at expanding and putting another one of these units in and are already talking about using a FORTRESS in that new expansion, even making it bigger because they like it so much."

FORTRESS Team Response

"As an owner, normally you have an architect, a structural design engineer, a general contractor and tradesmen you're trying to work with. The process is a juggling act. For us and our buildings, that's not true. It's all centralized. A process that would typically take 8+ months, was 1-2 months on this project for us."

"We've gone back and done some check-ins on the building. The people at the facility really seem to love it. They keep it really clean, which means they're proud of it. They even cook big meals in the kitchen."

"Because of this client's corporate guidelines, the operators are able to be close to the unit in our building. If they had used a metal building, they'd have to be an extra quarter-mile away due to corporate criteria. From an efficiency standpoint, it's really easy for them to go and do their routine daily tasks."



CLOSING

This FORTRESS protective building has proven itself in terms of safety, enhancing operational efficiency, ensuring employee well-being and peace of mind, and providing the highest level of protection against a multitude of potential hazards.

Additional Insights

Comparative Life-Cycle Assessment (LCA) of Precast Concrete Commercial Buildings

High-performance structures require high-performance materials. These are materials that are inherently versatile, efficient and resilient. They help designers optimize structures to meet high-performance challenges and requirements, both in the short- and long-term. Precast concrete inherently offers many high-performance attributes, and is being used to help projects meet and exceed their high-performance goals during design, construction and operation. The LCA research shows that the benefits of precast concrete can be utilized to meet high-performance goals with similar environmental burden relative to other materials and systems.

SEE THE FULL WHITE PAPER

2023 Precast Concrete Institute (PCI) Design Awards Winner: FORTRESS Nameplate #1

For this project, precast concrete proved to be the right choice for the protection from major industrial site hazards. It was durable enough to withstand sustained thermal loads, resilient enough to handle fragmentation damage and could withstand extreme weather conditions, maintaining the life safety of its occupants.

SEE THE FULL PROJECT PROFILE

Save Lives and Protect Critical Assets

For unmatched hazard protection and to safeguard your facility against a spectrum of threats, contact us today. Our experts are ready to discuss your specific needs and provide tailored solutions for long-term safety and resilience.

Contact Us