Baker Engineering and Risk Consultants, Inc. (BakerRisk®), has extensive experience both in designing new buildings for blast loads, as well as strengthening existing buildings through blast resistant structural upgrades. These blast resistant designs are the product of our understanding of how structural systems respond to blast loading—knowledge gained through our involvement with structural blast testing, advanced analysis, and accident investigations.

Following is a small sampling of representative projects that highlight a variety of construction methods, upgrade techniques, and building applications for both new construction as well as upgrades. The buildings are distributed world-wide within oil and gas refining or chemical processing facilities.
Administration Building – Refinery – Mississippi – 2019

New two story administration building designed as a blast resistant, toxic shelter in place. The exterior shell of the building consists of blast resistant windows and doors. Design effort included developing shelter-in-place criteria and designing engineering systems to protect building occupants during a toxic release. The administration building is part of a multi-building replacement and upgrade effort.

Specific Role: Design project manager, blast resistant design, toxic shelter in place

Blast Load: Risk based criteria

Control Building – Chemical Plant – Texas – 2018

Blast resistant pre-engineered metal building with enclosed area of 14,000 square feet. The exterior finish of the building was specifically designed to serve as focal point for the entrance to the facility. The design includes blast resistant windows and exterior doors. In addition to developing the structural design, BakerRisk worked with the selected window and door vendors to design the blast resistant components.

Specific Role: Blast resistant structural design, blast resistant windows, blast resistant doors

Blast Load: 1 psi, 566 msec

Process Building – Chemical Plant – Louisiana – 2015

Blast resistant pre-engineered metal building with enclosed area of over 60,000 square feet and a building eave height of 36 feet. The design of the building considered multiple overhead rollup doors and the interaction of the metal building with the adjacent precast concrete office complex. The peak applied blast load approached 5.0 psi.

Specific Role: Blast resistant structural design
Blast resistant pre-engineered metal building with enclosed area of 6,600 square feet. The blast resistant building houses critical equipment that will need to be functional after the design basis event, therefore, the structural response criteria was specified as Low. Effort included the design of custom, blast resistant sliding door.

**Specific Role:** Blast resistant structural design

**Blast Loads:** Risk based criteria

Administration and Warehouse – Gas Plant – Texas – 2017
Blast resistant pre-engineered metal building with enclosed area of 18,000 square feet. The building is divided into two sections: a high bay warehouse and a two story administration office space. BakerRisk worked with the general contractor and owner to design building retrofits to enhance the blast resistance of the building after steel erection had commenced.

**Specific Role:** Blast resistant structural design

**Blast Loads:** 0.6 psi, 100 msec

Blast resistant control room with an enclosed footprint of 12,000 square feet. Construction consists of a steel frames with reinforced concrete block exterior walls. Blast resistant exterior doors are present at all building entrances and blast dampers are located at wall penetrations into the mechanical room.

**Specific Role:** Blast resistant design review

**Blast Loads:** 1.6 psi, 130 msec
Blast resistant, thermal shelter in place maintenance and office complex. Construction of the building consists of a steel frame with tilt-up concrete panels. The building is divided into two sections: a high bay maintenance shop and a two story office section. There is a defined shelter-in-place within the building, separated from the high bay portion.

**Specific Role:** Blast resistant structural design

**Blast Loads:** 2 psi, 150 msec

Administration Building – Gas Plant – Indiana – 2016
Blast resistant pre-engineered metal building with enclosed area of 8,000 square feet. In addition to the design of the structural system, BakerRisk worked with the owner and the design architect to arrange the interior layout of the building to minimize the potential for hazardous debris during a blast event.

**Specific Role:** Blast resistant structural design

**Blast Loads:** 0.9 psi, 270 msec

Control Room – Chemical Plant – Texas – 2014
Blast resistant control room with an enclosed footprint of 7,500 square feet. Construction consists of a steel frames with reinforced concrete block exterior walls. Design includes blast resistant exterior doors.

**Specific Role:** Blast resistant design review

**Blast Loads:** 1.2 psi, 200 msec
Lab Building Upgrade – Refinery – New Jersey, USA – 2014

Blast analysis and design of retrofits for a lab building with non-load bearing unreinforced masonry walls. Due to the lateral system of the building being insufficient in response to the design blast loads, a reinforced masonry shield wall was designed exterior to the building to minimize the blast reactions transferred into the existing lateral system.

Specific Role: Blast resistant upgrade design

Max Blast Loads: 3.6 psi, 100 msec

Control Room – Refinery – Louisiana – 2014

Blast resistant upgrade for an existing building that served as a control room and break area. The upgrade consisted of new secondary steel framing at the second level and structural reinforcement of the masonry wall at the first level. Upgrade was completed in conjunction with the replacement of the building’s mechanical systems.

Specific Role: Blast resistant upgrade design

Blast Loads: 1.3 psi, 60 msec

Shop Building Upgrade – Refinery – Louisiana – 2010

Blast resistant upgrade for an existing pre-engineered metal building that served as a shop and storage building. The upgrade consisted of new secondary steel framing, rebuilt moment frames in a portion of the building and new exterior metal cladding. Additional effort included the design of restraints for non-structural equipment secured to the underside of the roof.

Specific Role: Blast resistant upgrade design

Blast Loads: 2.1 psi, 50 msec