

# Mitigating Risks of Explosion & Fire within BESS

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**VIGILEX ENERGY<sup>®</sup>**  
By **STIF**

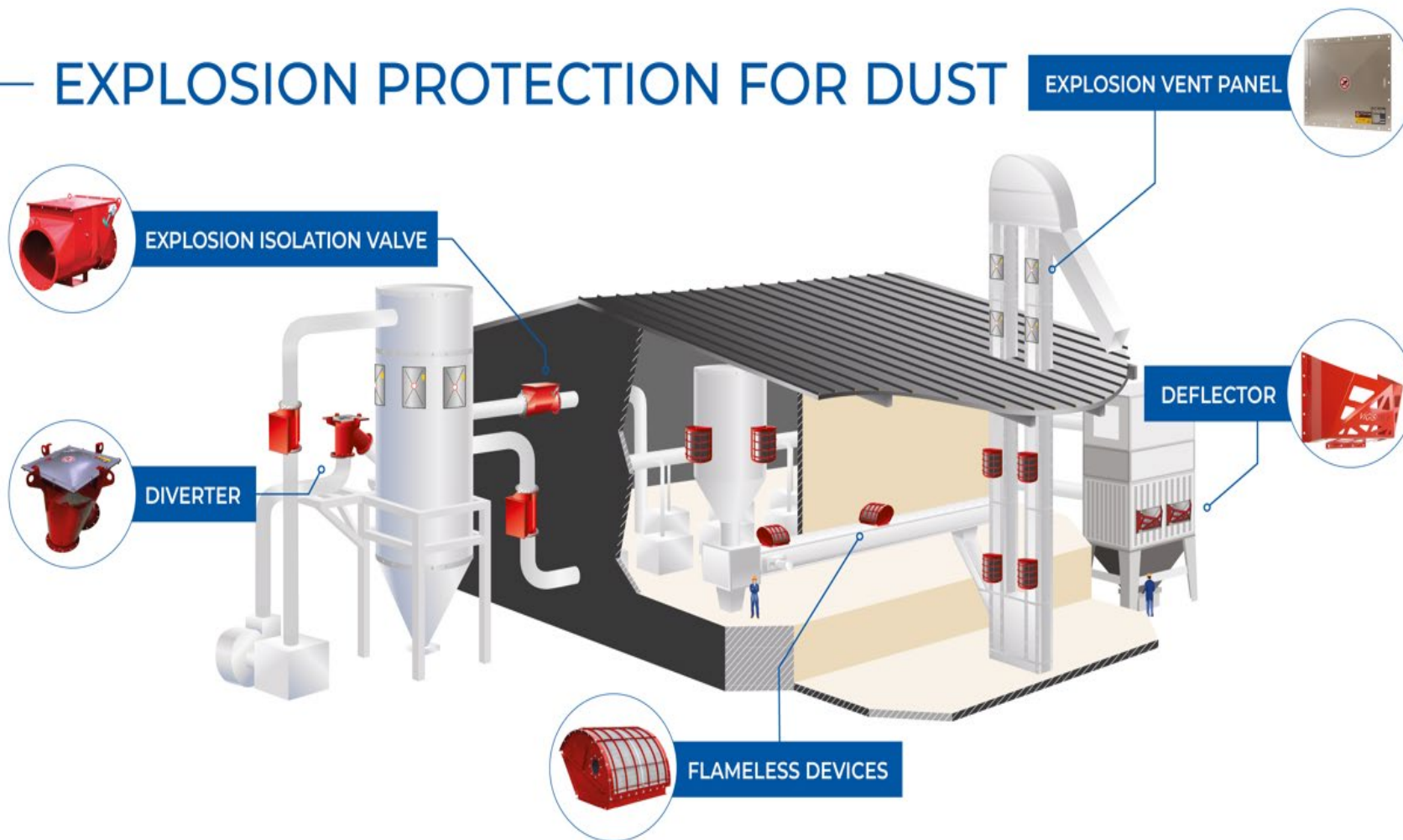
## NEW DIVISION (BESS)



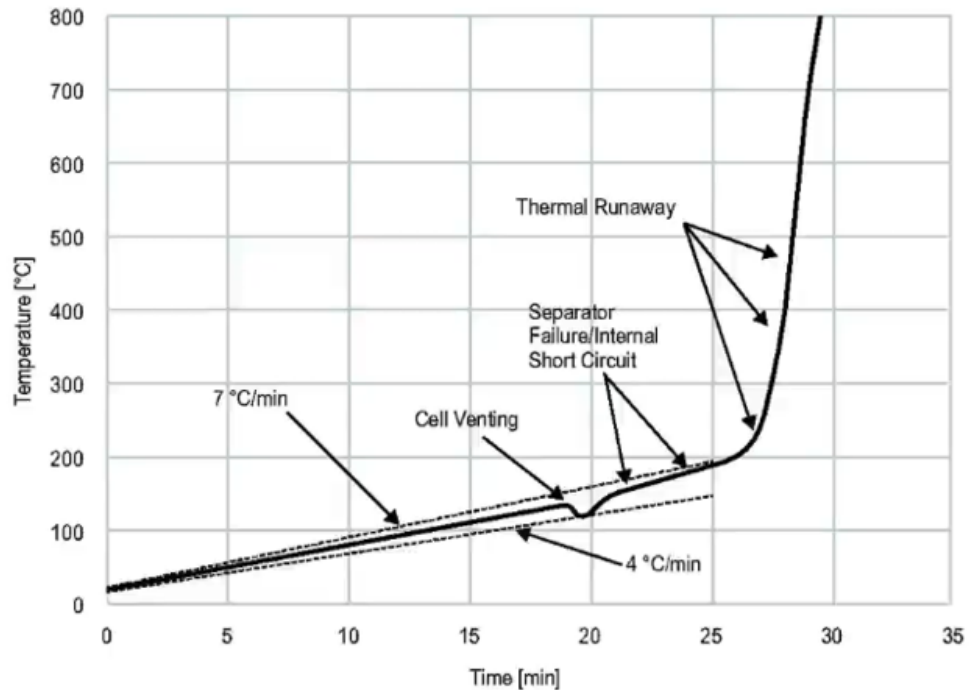


## 15 YEARS OF EXPERIENCE

### EXPLOSION PROTECTION FOR DUST



# THERMAL RUNAWAY



UI 9540A - Figure 7.1  
Illustrative Example of a Thermal Runaway  
Temperature Curve

## Signification:

- Thermal runaway is a violent incident for the battery with electrochemical and exothermic reaction and self-heating phenomenon.
- Occurs production of toxics and flammable gaz, and fire.

# ACCIDENT EFFECTS



## Mc Micken Accident

➤ ESS 2MWh / 27 Battery rack / 10584 cells

Time	Events
16:54:30	Incident detected
16:54:40	Temperature begin to increase in the rear of rack 15
16:55:50	Fire suppression system discharges Novec 1230
17:44	APS notifies 911
17:48	Fire department arrival time
20:02	Front door of container opened by emergency responders
20:04	Explosion occurs

### Notes :

- Duration of the event close to 3h
- Explosion due to an accumulation of toxic & flammable gases
- 0 deflagration vent panel placed on the BESS
- 8 firefighters injured whose 4 very seriously

## OVERPRESSURE EFFECTS

→ 20 mbar corresponding to the effects of glass breakage

50 mbar corresponding to irreversible effects and slight damage to structures

→ 140 mbar corresponding to the first lethal effects and serious damage to structures

200 mbar corresponding to significant lethal effects and serious damage to structures

→ 300 mbar corresponding to very serious damage to structures



NFPA®

855

Standard for  
the Installation of Stationary  
Energy Storage Systems

2023

- NFPA 855 has been revised due to the international accidents on Energy Storage System.
- The 2023 Edition NFPA 855 includes the Following updates requirements :
  - Explosion control
  - Gas détection
  - Management of Thermal Runaway

**9.6.5.6.3\*** ESS installed within a room, building, ESS cabinet, ESS walk-in unit, or otherwise nonoccupiable enclosure shall be provided with one of the following:

- (1) Explosion prevention systems designed, installed, operated, maintained, and tested in accordance with NFPA 69
- (2) Deflagration venting installed and maintained in accordance with NFPA 68

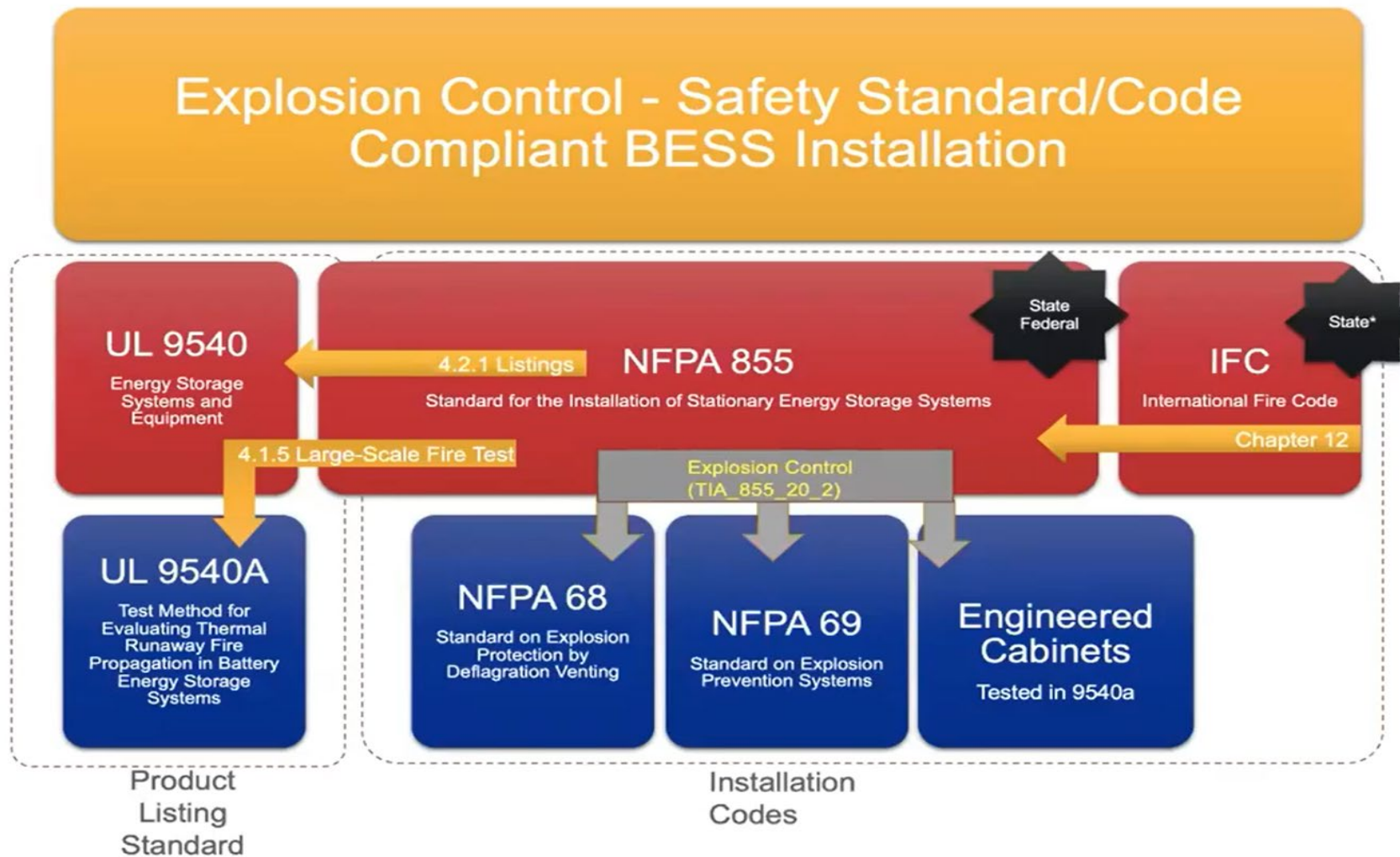
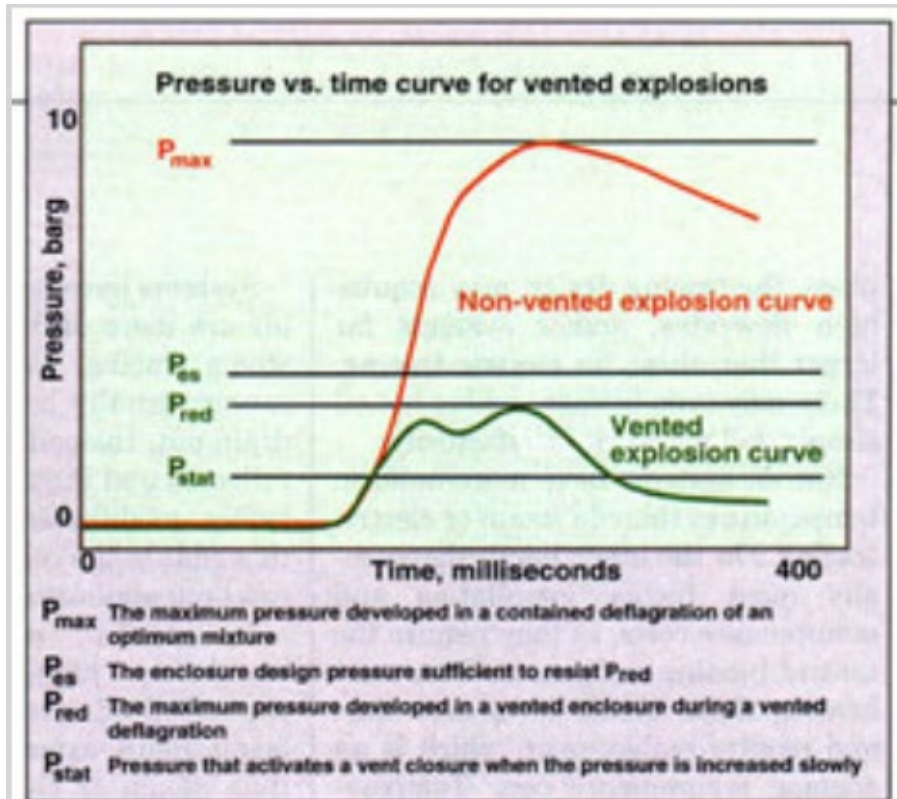


Image provided by Sandia National Laboratories Energy Storage Program

## PASSIVE PROTECTION



**FIGURE 1.** If designed and sized correctly, explosion vents reduce the maximum pressure ( $P_{max}$ ) of a deflagration to a safe level ( $P_{red}$ ) that the equipment is designed to resist ( $P_{es}$ )



## FIREFIGHTERS FEEDBACK

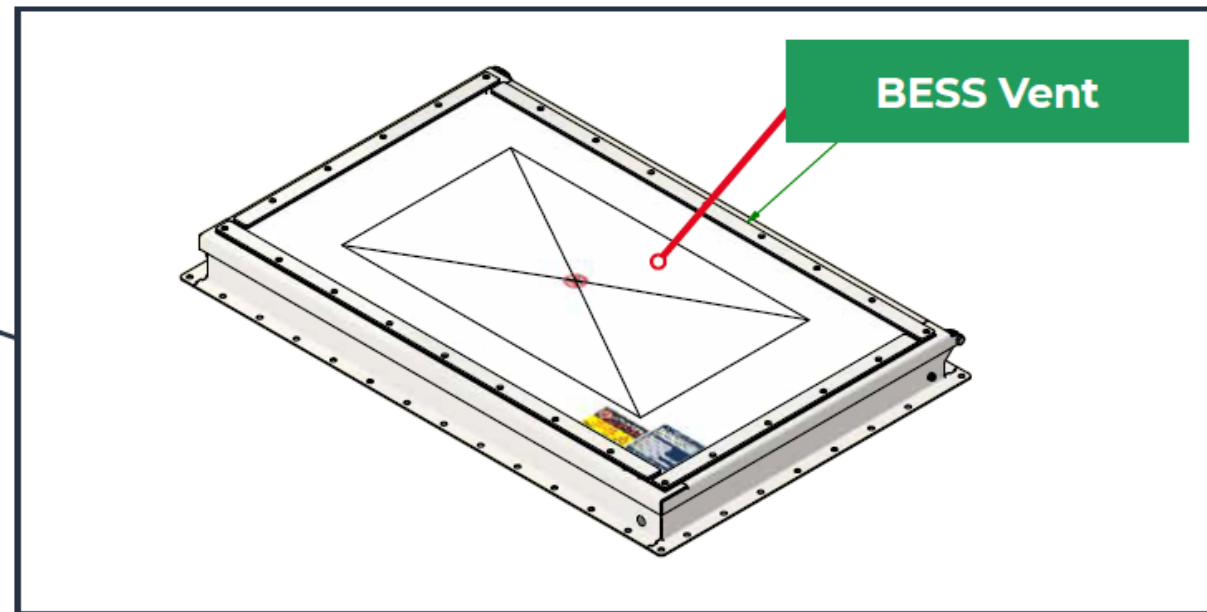
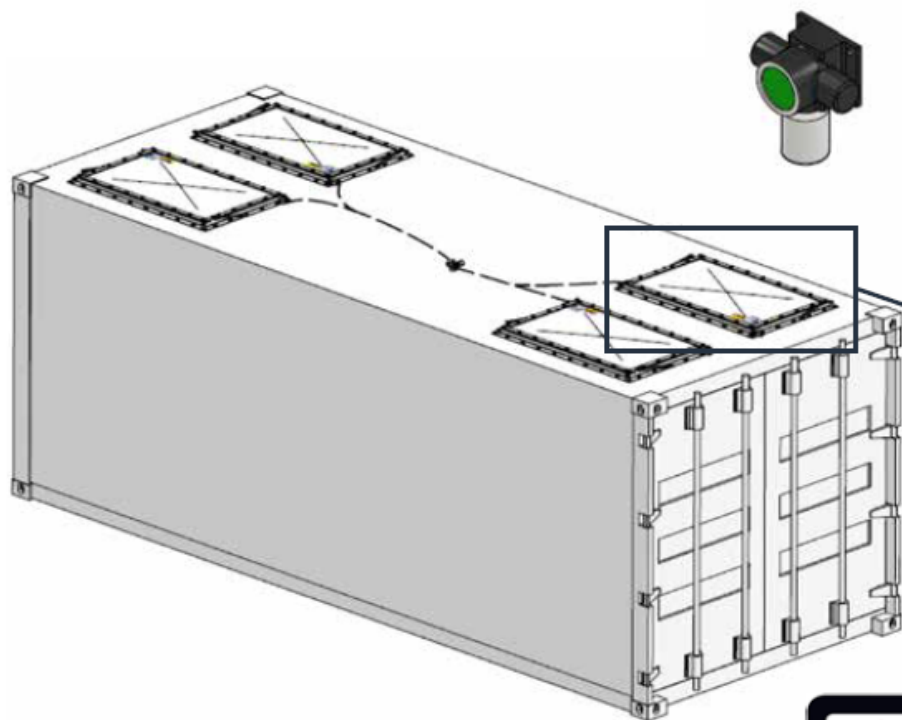


- ✓ Fire extinguishing systems by inerting (gas, powder and water) do not stop thermal runaway.
- ✓ Thermal runaway can only be stopped by battery flooding. (with water)
- ✓ The spraying of water on the particles emitted during the evaporation of the electrolyte increases the generation of H<sub>2</sub>.
- ✓ The gases must be removed to avoid concentration and the creation of an explosive environment.
- ✓ In the event of a thermal runaway, the firefighters cannot access the interior of the BESS to spray the battery.



## DUAL-VENT : PROTECT BESS FROM FIRE & EXPLOSION HAZARDS

**PATENT PENDING**



Rapid removal of gases during battery fires is critical to explosion prevention

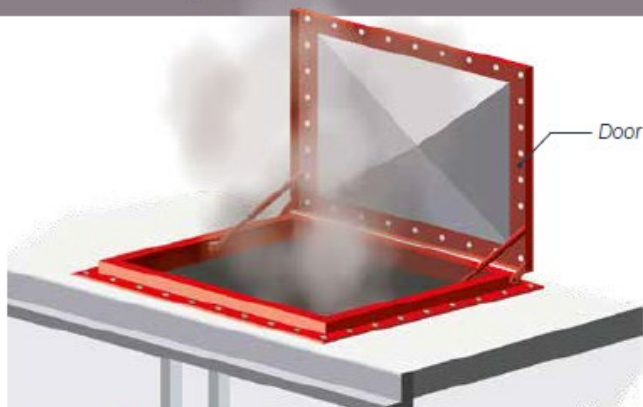
# DUAL VENT

PATENT PENDING

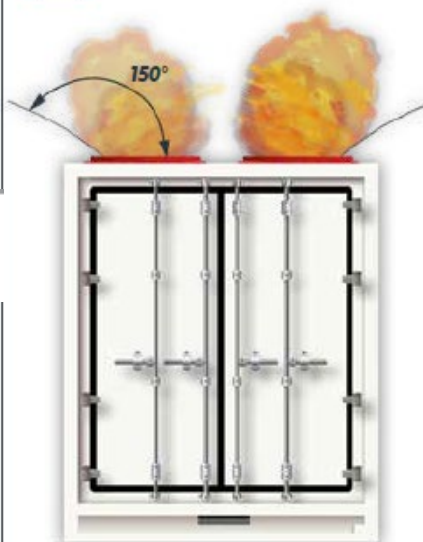
## A GAS VENTING



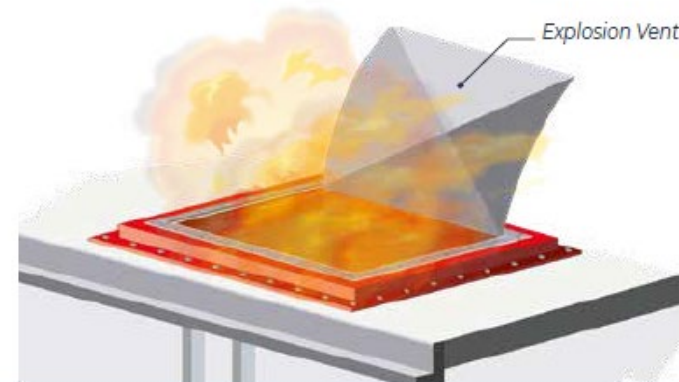
Door activated  
by gas detection



## B EXPLOSION VENTING



Integrated vent panel activated  
by explosion pressure



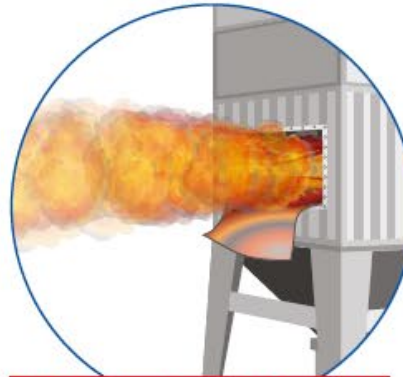
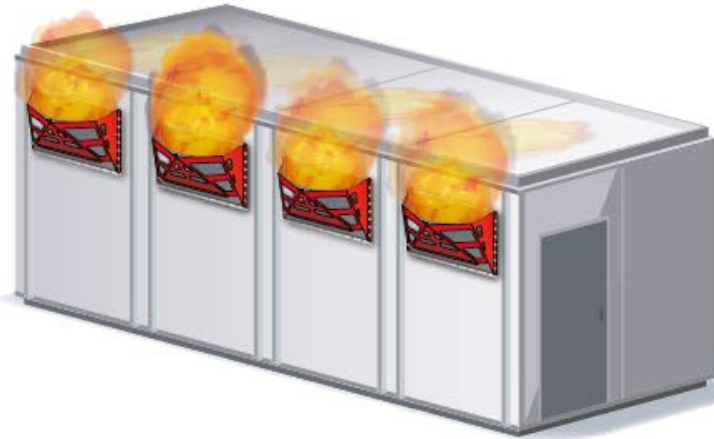


# VIGISPACE DEFLECTOR





# VIGISPACE DEFLECTOR FOR BESS



**Explosion without  
VIGISPACE**



**Explosion with  
VIGISPACE**



## RETROFIT EXAMPLE





components for your success

THANK YOU  
FOR **YOUR ATTENTION**

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