

# FINAL EXAM

## BLAST RESISTANT DESIGN

1. A “blast” event refers to:
  - a. An entertainment event that gets beyond the capability of the building where it is being held
  - b. Any type of force that causes a building to move
  - c. A shockwave of compressed air that spreads outwards from an explosion
  - d. A military action using live ammunition
2. For Blast buildings that are used in forward military positions, which one of the following is an important characteristic?
  - a. Air conditioning
  - b. Easily transported and erected
  - c. Must be yellow and red in color
  - d. Use solar energy for power
3. Which of the following types of Architecture have potential for requiring blast resistant design:
  - a. Industrial buildings
  - b. Strategically symbolic buildings
  - c. Transportation hubs
  - d. All of the above
4. Many military building installations have a degree of blast design consideration. How many broad categories do these buildings typically fall into?
  - a. 2
  - b. 3
  - c. 4
  - d. 5
5. The most frequently occurring blast events happen in which type of building?
  - a. Military
  - b. Industrial Plants
  - c. Federal facility
  - d. Residential Buildings
6. An effective BR design team is composed of which of the following professionals?
  - a. Architect
  - a. Structural Engineer
  - a. Building Owner
  - a. All of the above
7. The secondary layer of the BR design team consists of which of the following professionals:
  - a. Owner & their QRA/security consultant
  - b. Structural engineer and Contractor
  - c. MEP consultants and material vendors and manufacturers
  - d. Regulators and Association Managers
8. “Side-On” over pressure is also called:
  - a. Reflected pressure
  - b. A force that strikes only the side of a building or structure
  - c. Free field overpressure
  - d. Low volatility over pressure
9. The blast “duration” is measured in:
  - a. Impulse units
  - b. milliseconds
  - c. seconds
  - d. hours

10. Deflagration explosions are created by low explosive forces and move at speeds \_\_\_\_\_ the speed of sound (sub-sonic).
- Equal
  - Above
  - Below
  - None of the above
11. \_\_\_\_\_ results in supersonic (faster than the speed of sound) explosions created by high explosives.
- A Vapor Cloud
  - Detonation
  - Shock Wave
  - Deflagration
12. Which type of explosion occurs when a cloud of flammable vapor, gas or mist ignites.
- Shock wave
  - Deflagration
  - Vapor Cloud
  - Thermal Radiation
13. Which of the following terms comes from the military and is used in reference to attacks from the air, specifically for damage that can be caused by bombs that are designed to explode above a target?
- HOB (Height of Burst)
  - Stand-Off Distance
  - Building Damage Levels
  - Progressive Collapse
14. Increasing the “Stand-Off Distance” does which of the following?
- Increases the impact of the blast
  - Eliminates the blast wave
  - Creates an observation point for monitoring blasts
  - Reduces the damage risk from a blast
15. This type of overpressure is on the side “facing” the blast when a blast wave propagates in a rigid surface. This type of overpressure is always higher than the pressures on the other faces.
- Reflected Overpressure
  - Incident Overpressure
  - Back face Overpressure
  - All of the above
16. This type of overpressure is sometimes called the “free field” overpressure and is the undisturbed blast wave pressure that impacts the overall building.
- Reflected Overpressure
  - Incident Overpressure
  - Back Face Overpressure
  - Impulse Pressure
17. Per ASCE, how many Building damage levels are there?
- 3
  - 4
  - 5
  - 6
18. When a building is designed to a Low BDL, which of the following is not true:
- Building is usable after an event
  - Only minor repairs are needed
  - Cost of repairs approaches replacement cost of the building
  - Building design is robust and repair costs are moderate.
19. Who sets the BR design criteria?
- The Architect
  - IBC codes
  - The structural engineer
  - The Owner and their QRA consultant

**20. On a typical Overpressure / Impulse curve, low pressure and low impulse values mean?**

- a. Nothing
- b. Less damage
- c. More damage
- d. A region of negative impulse

**21. Which of the following are relevant BR design issues that need to be addressed during the building programming?**

- a. Does the Building need to be designed for BR?
- b. Who will determine BR design criteria?
- c. Should the design team hold or proceed on an assumed basis as directed by Owner?
- d. All of the above

**22. When designing for BR, Architects have primary responsibility for all of following except:**

- a. Exterior wall components and details.
- b. Foundation design
- c. Exterior doors and hardware.
- d. Window systems and glazing.

**23. Which of the following are favorable characteristics of prefabricated BR buildings?**

- a. Speed of transport and erection
- b. Standardization
- c. Deployment in remote areas
- d. All of the above

**24. If structural strengthening of a building is not feasible or insufficient to address blast impact, what is a technique that can mitigate the shockwave?**

- a. Employ slopes, or berms around the building
- b. The use of “blast walls”
- c. The use of heavy blast rated fabric and similar tensile structures
- d. All of the above

**25. Buildings designed for \_\_\_\_\_ psi require specialized components.**

- a. <1
- b. 3-7
- c. 8-10
- d. None of the above