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# Blast Loading Effect On RCC Frame Structure

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**Abstract**:
An explosion is an extremely rapid release of energy in the form of light, heat, sound, and a shock wave. The shock wave consists of highly compressed air that wave-reflects off the ground surface to produce a hemispherical propagation of the wave that travels outward from the source at supersonic velocities.

A bomb explosion within or immediately nearby a building can cause catastrophic damage on the building's external and internal structural frames, collapsing of walls, blowing out of large expanses of windows, and shutting down of critical life-safety systems. Loss of life and injuries to occupants can result from many causes, including direct blast-effects, structural collapse, debris impact, fire, and smoke. The indirect effects can combine to inhibit or prevent timely evacuation, thereby contributing to additional casualties.

So for designing we required to analysis the loading of bomb blast on structure so in this paper we have analysis a 25, 50 and 75 kg of explosive effect on G+5 building in software Stadd-Pro .The actual effective distance from explosion (standoff distance) i.e. R is taken as 5 m, 10 m, and 15 m. Dynamic Analysis is done by time

**Keywords:** Explosion, standoff distance, Dynamic Analysis

## 1. Introduction

Extensive studies during the last five decades have shown that short-duration high- magnitude loading conditions significantly influence structural response. Explosive loads are typically applied to structures at rates approximately 1000 times faster than earthquake- induced loads. The corresponding structural response frequencies can be much higher than those induced by conventional loads. Furthermore, short-duration dynamic loads often exhibit strong spatial and time variations, resulting in sharp stress gradients in the structures. It is known that high strain rates also affect the strength and ductility of structural materials, the bond relationships for reinforcement, the failure modes, and the structural energy absorption capabilities.

Due to different accidental or intentional events, related to important structures all over the world, explosive loads have received considerable attention in recent years. The design and construction of public buildings to provide life safety in the face of explosions is receiving renewed attention from structural engineers. Such concern arose initially in response to air attacks during World War II, it continued through the Cold War and more recently this concern has grown with the increase of terrorism worldwide. For many urban settings, the proximity to unregulated traffic brings the terrorist threat to or within the perimeter of the building.

For these structures, blast protection has the modest goal of containing damage in the immediate vicinity of the explosion and the prevention of progressive collapse. In this sense, computer programs simulations could be very valuable in testing a wide range of building types and structural details over a broad range of hypothetical events. Over the last decades considerable attention has been raised on the behaviour of engineering structures under blast or impact loading. The use of explosives by terrorist groups around the world that targeting the feeder dimensions and increasing the feeding efficiency of the casting.

## 2. Methodology

The analysis of the blast loading on the structure started in 1960's. US Department of the Army, released a technical manual titled "structures to resist the effects of accidental explosions" in 1959. The revised edition of the manual TM 5-1300 (1990) most widely used by military and civilian organization for designing structures to prevent the propagation of explosion and to
provide protection for personnel and valuable equipments.

### 2.1 THE METHODS AVAILABLE FOR PREDICTION OF BLAST EFFECTS ON BUILDINGS STRUCTURES

- Empirical (or analytical) methods
- Semi-empirical methods
- Numerical methods.

**Empirical methods** are essentially correlations with experimental data. Most of these approaches are limited by the extent of the underlying experimental database. The accuracy of all empirical equations diminishes as the explosive event becomes increasingly near field.

**Semi-empirical methods** are based on simplified models of physical phenomena. The attempt is to model the underlying important physical processes in a simplified way. These methods are dependent on extensive data and case study. The predictive accuracy is generally better than that provided by the empirical methods.

**Numerical (or first-principle) methods** are based on mathematical equations that describe the basic laws of physics governing a problem. These principles include conservation of mass,
momentum, and energy. In addition, the physical behavior of materials is described by constitutive relationships. These models are commonly termed computational fluid dynamics
(CFD) models.

### 2.2 DESCRIPTION OF MODEL

Following data is used in the analysis of the RC frame building models

Type of frame: RC
Number of storey: 5
Floor height: 3.0m
Depth of Slab: 120 mm
Size of beam: (230 × 450) mm
Size of column: (400 × 600) mm

Spacing between frames: 5 m along X directions
4 m along Y directions
Live load on floor: 3 KN/m3
Floor finish: 2 KN/m2
Terrace water proofing: 1.5 KN/m2
Materials: M 25 concrete, Fe 415 steel , Brick infill
ThickNess of infill wall: 230 mm
Density of concrete: 25 KN/m3
Density of brick infill: 18 KN/m3
Poison Ratio of concrete : 0.2
Poison Ratio of brick masonry : 0.16
Compressive strength of concrete 5000 $\sqrt{25}$ = 25000 Mpa
Compressive strength of brick masonry : 5 Mpa

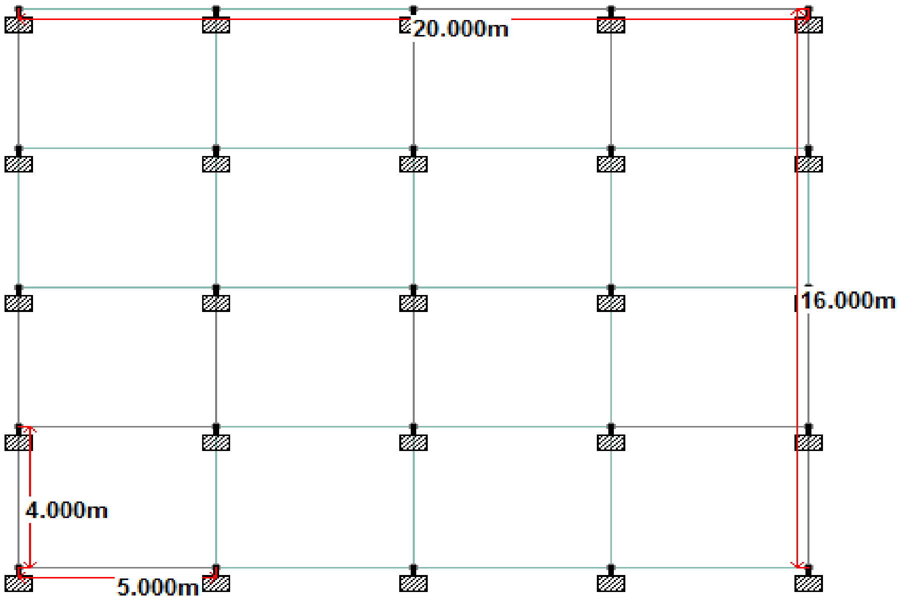


**Fig No. 2.1 Plan of Structure**

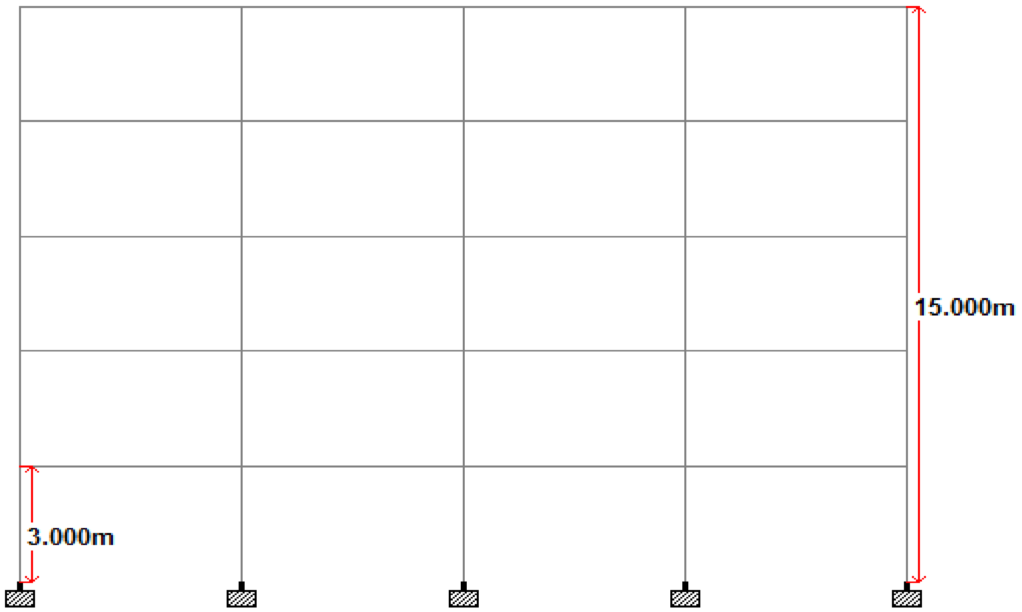


**Fig No. 2.2 Elevation of Structure**

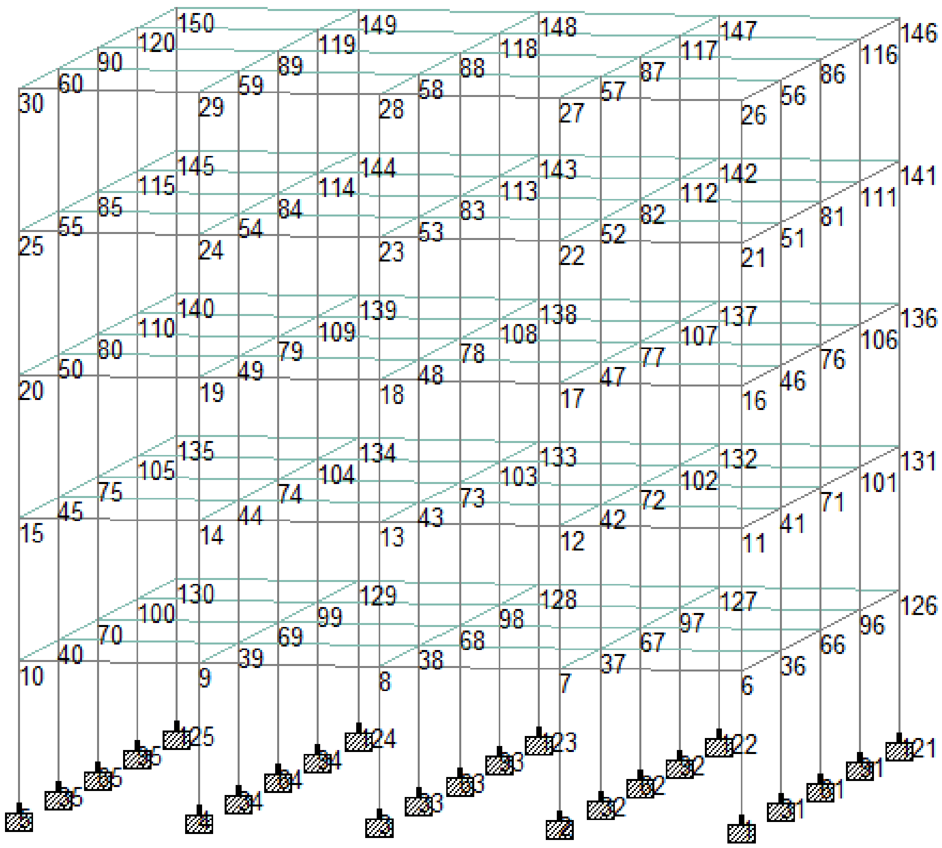


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**Fig No. 2.3 Node points**

## 3. CONCLUSION:

Optimization of gating system helps minimize the defect and improves the quality or yield of casting. Casting simulation is used for the reduces shop flore trial also for new product development. Numerical simulation helps to identify the defects and their locations. With this simulation technique, the Feeding ability of casting process can be analyzed and optimized. A good design gating system provides smooth and laminar flow, with minimum turbulence to avoid entrapment of air, metal oxidation, and mold erosion.

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