ISET Journal of Earthquake Technology, Paper No. 537, Vol. 54, No. 2-4, June-Dec. 2017, pp. 57-67

EFFECT OF SHEAR WALL IN THE DYNAMIC RESPONSE OF STRUCTURE UNDER BLAST LOADING- AN ANALYTICAL APPROACH

Tejaswi B.G.* and R. Shanthi Vengadeshwari**

*PG Student, Department of Civil Engineering
Dayananda Sagar College of Engineering, Bengaluru, India
**Asso. Professor, Department of Civil Engineering
Dayananda Sagar College of Engineering, Bengaluru, India

ABSTRACT

The consequences of lateral load are devastating in nature compared to gravity loads. In the present scenario the effect of blast load on structures is gaining importance and needs attention. During explosion impulsive load is developed which is highly nonlinear and lasts for milliseconds resulting in catastrophic events. Shear wall has high in plane stiffness and strength which can be used to simultaneously withstand large horizontal loads and support gravity loads. Provision of shear wall allows dissipation of energy in controlled manner in the near field explosion. This research paper concentrates on the effectiveness of shear wall in the dynamic response of the structure while resisting the high intensity blast load acting in the proximity of the structure. Lateral displacement and story drift are the primary parameters considered. The blast load is applied as a function of time in the form of triangular load on finite element model using commercially available software SAP2000.

KEYWORDS: Blast Load, Time-history Analysis, Shear Wall, Peak Reflected Pressure

INTRODUCTION

The most commonly used weapons by terrorists are TNT, C4 explosives and Improvised explosive device (IEDs). In addition, the engineered structures are under the threat of missile attacks by terrorists. The alarming attacks happening across the world on to the commercial buildings or buildings of national importance in the form of human bombs or explosives. When they are placed inside a truck parked at a near distance to the building creates more causalities and severe damage to the building resulting in the progressive collapse of the structure. The most common types of lateral loads on the structures are due to wind and earthquakes. The blast load acting on the structure is idealized as a lateral load and of extremely small duration in the order of milliseconds. Structures can be exposed to various types of explosions. They can be either external explosions such as suicidal car bombs or internal explosions such as LPG blast, or blasts inside petrochemical industries. This study considers an external explosive event, caused by TNT of differing charges placed in a truck. Since an explosion is a surface burst, the propagation of the blast wave is hemispherical in nature. When the angle of incidence exceeds 45 degrees, the impact is comparatively less. Hence the impact of blast on the top story is much lesser when compared to the bottom story; this is one of the primary reasons for the progressive collapse of the structure due to the failure of bottom story columns.

REVIEW OF LITREATURE

(Ngo et al. 2007) explained the impact of blast loading on the structures, propagation, modelling and the types of blast waves. When the structure was subjected to the blast load the dynamic behavior of the structure changed and it could also lead to the progressive collapse of the structure. The author summarized that, for high risk facilities such as military structures, buildings of national importance the impact of blast load should be considered in the preliminary stages of design. (Gebbeken, Norbert et al. 2010). In this paper author explained the importance of architectural features to effectively resist the blast wave. Through numerical simulations he proved the role of geometry and shape of the building to resist the blast load. He had summarized that structural hardening was not always the necessary remedy to resist the blast load, it could be achieved by proper planning and orientation of the building. He also suggested few of the architectural features that can effectively reduce the blast wave and attenuate it before it reaches the structure surface.(Draganić and Sigmund 2012) the research work involved to assess the