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BLAST-RESISTANT REFUGE MODULES IN HAZARDOUS ENVIRONMENTS

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Abstract. *This paper focuses on shipping containers that are often misconstrued as inherently "blast-resistant". However, such containers are not blast-resistant refuge modules and may only have limited blast capacity. The latter are designed to resist blast and/or other weapons effects. Thus, ordinary shipping containers that had not been assessed or modified to resist blast should not be used as such. Facility owners and responsible persons are thus advised to consider the proper design and installation of containment modules, identify what existing shipping containers can or cannot do to sustain the effects of blast, indirect fire weapons and indeed to forced-entry requirements depending on use. This paper outlines the considerations when containers are intended to be modified to be blast-resistant refuge module, the potential damage of non-hardened shipping containers exposed to air-blast in hazardous environments, and how the design and installation of a blast-resistant refuge module should be approached. Where sensitive documents, operational equipment or ammunitions are stored in such containers, a brief description is provided outlining various International Standards on ballistics and forced-entry requirements of structures, as well as the individual building parts, such as integrated entry door(s) with accompanying door lockset and glazing unit(s).*

1 INTRODUCTION

Media reports over the last two years suggest suspected terrorists of conducting attacks of oil/gas facilities in the Middle East using unmanned aerial vehicles (UAVs). More recently, UAVs were reported to indiscriminately target civilian, industrial and military facilities in the on-going Russia-Ukraine conflict. Figure 1(a) shows silhouette examples of UAVs, while Figures 1(b) and 1(c) are examples of weapon-deploying drones used in recent conflicts. Clearly, UAVs come in different size, shape and capability. As an example, the fixed-wing drone in Figure 1(c) had been reported for deployment with more than 30kg payload, with a range of over 2,000km and flying at more than 150 km/hr. Attacks on facilities and installations had resulted in halting production, causing significant casualties and increasing the wariness of facility owners/governments. Thus, it is no secret that strategists around the world are considering

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