eatures, advantages and disadvantages of each method. Chapter 7 outlines recommended procedures and provides aids for the design of the various components of reinforced concrete, reinforced masonry and structural steel buildings. Chapter 8 provides some typical structural details for doors and frames, wall penetrations, and connections for steel and reinforced concrete components. Blast protection considerations for non-structural items such as interior details, windows, openings, and HVAC ducts are covered in Chapter 9. Chapter 10 gives guidance on strategies for evaluating the blast resistance of existing buildings and provides practical measures for upgrading masonry and metal buildings, the most common types of building construction for plants in the petrochemical industry. Design examples are provided in Chapters 11 to 13 to illustrate the use of these procedures and tools in the design of typical buildings for blast resistance.

1.3 RELATED INDUSTRY GUIDELINES, SPECIFICATIONS AND CODES

Currently, there are no specific industry standards or guidelines for blast resistant design of process plant buildings. However, the design practices used by some operating companies and contractors are based on a number of existing documents dealing with this subject including:

a. *Siting and Construction of New Control Houses for Chemical Manufacturing Plants,* (SG-22), Chemical Manufacturing Association.

b. *An Approach to the Categorization of Process Plant Hazard and Control Building Designs,* (CIA 1992), Chemical Industries Association.

c. *Design of Structures to Resist Nuclear Weapons Effects,* (ASCE Manual 42), American Society of Civil Engineers

d. *Structures to Resist the Effects of Accidental Explosions,* (TM 5-1300), Department of the Army, Navy, and Air Force.

The SG-22 and CIA documents are similar and cover the siting, design and construction of control buildings in petrochemical plants for a specified set of TNT equivalent blast loads and the simplified dynamic (elasto-plastic, single degree of freedom) design approach. The other documents, cited above, are more comprehensive but are generally geared to design for high-yield explosives for military and munitions applications. However, the fundamentals and design principles covered in these documents are applicable to designs for other types of explosions.

In addition to the publications cited above, the American Institute of Chemical Engineers, Center for Chemical Process Safety (CCPS) committee and the American Petroleum Institute (API) recently have addressed various aspects of blast protection technology relevant to this report. In particular, CCPS has developed *Guidelines for Evaluating the Characteristics of Vapor Cloud Explosions, Flash Fires, and*