Chapter 3
Methodology

3.1 General:

Several simplified methods of analysis have been developed and applied for research over the last six decades for un-reinforced masonry infilled RC frames. These include replacing the infill by a single diagonal strut or three struts and idealizing the structure as a pin jointed truss or braced frames. Palyakov [43,44], Holmes [21], Smith [53,54,55], Liauw Lee [35], FEMA [16] have employed Equivalent strut approach for studying behaviour of infilled RC frames. Classical methods of theory of elasticity and equivalent frame method have also been used by Liauw [34] and Hendry [20] to investigate the complex behaviour of the infilled RC frames. These methods fail to efficiently model the reciprocal stiffening action between the frame and infill and hence the interactive forces. With the advances in computing technology in the past few years, researchers have used Finite Element Method, Discrete Element Method and Finite Element Method with Discontinuous Elements to model and analyse infilled RC frames effectively. The finite element method has been extensively used for modelling infilled RC frame structures, since Mallick and Severn [37].

3.2 Method of Analysis

Two dimensional (2D) Finite element models have been developed for simulating infilled RC frames with 3-dimensional elements and ground acceleration is applied. Material properties of masonry are determined by conducting compression test on plain masonry and grouted & un-grouted rat-trap masonry prisms. The versatile FEM software package ANSYS is used for finite element model formulation and linear dynamic analysis.

Validation of FE model of infilled and bare RC frames is carried out using Shake table experiments at Earthquake Engineering and Vibration Research Centre (EVRC) of Central Power Research Institute (CPRI), Bangalore on experimental models cast in sizes suitable for the payload and other restrictions of the shake table facility available.

Single bay multi (four) storey bare RC frames and infilled RC frames of different aspect ratios and relative stiffness under three different ground accelerations (earthquakes) have been analysed for deformation, stress and acceleration response.
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The following frames are modelled for ground motion acceleration response studies.

1. RC Frames with Rat-trap masonry infills with/without reinforcement and with concrete grout.
2. RC frames with plain masonry infills.
3. RC bare frames (no infill).
4. Infilled RC frames with stilt floor (soft ground storey).