ISSN (Online) 2393-8021
ISSN (Print) 2394-1588

IARJSET

International Advanced Research Journal in Science, Engineering and Technology

AGNI-PANKH 16

Jawaharlal Darda Institute of Engineering and Technology, Yavatmal

Vol. 4, Special Issue 3, January 2017

Overview of Seismic Retrofitting Building

Pratiksha S. Dhomane[1], Shweta B. Katpelwar[1], Ankita M. Chavhan[1]

Student Civil Engineering Department, J.D.I.E.T., Maharashtra, India[1]

Abstract: Earthquakes around the world are single-handedly responsible for the destruction to life and property in large numbers. In order to mitigate such hazards, it is important to incorporate norms that will enhance the seismic performance of structures. This report provides criteria to evaluate the performance of existing buildings with steel and composite structures, either framed or braced. It also presents a comprehensive review of rehabilitation strategies to retrofit structural members and connections and frames The overall aim of the present study is to know and understand the behavior of certain structures under seismic activity and how different parameters affect retrofitted structures. It may be achieved by adopting one of the following strategies- - By reducing the seismic demands on members and the structures as a whole - By increasing the member capacities.

Keywords: seismic retrofitting, rehabilitation, repair, seismic.

I. INTRODUCTION

This report provides criteria to evaluate the performance of existing buildings with steel and composite structures, either framed or braced. It also presents a comprehensive review of rehabilitation strategies to retrofit structural members and connections (local intervention) and/or frames (global intervention). Indeed, it is expected that retrofitted buildings exhibit:
(i) no damage during low-intensity earthquakes,
(ii) some non-structural damage during moderate earthquakes.
(iii) Structural and non-structural damage during major events but the
Global collapse is prevented

II. LITERATURE REVIEW

Its provides the background of the research undertaken and defines the common terms used for seismic rehabilitation (because they are often open to misinterpretation). Limitations and assumptions have also been highlighted summarizes the structural deficiencies that generally characterize steel and composite buildings.
The seismic retrofitting of reinforced concrete buildings not designed to withstand seismic action is considered. After briefly introducing how seismic action is described for design purposes, methods for assessing the seismic vulnerability of existing buildings are presented. The traditional methods of seismic retrofitting are reviewed and their weak points are identified.

III. METHODS OF RETROFITTING

Surface treatment

Surface treatment is a common method, which has largely developed through experience. Surface treatment incorporates different techniques such as ferrocement, reinforced plaster, and shotcrete. By nature this treatment covers the masonry exterior and affects the architectural structure. Ferro cement consists of closely spaced multiple layers of hardware mesh of fine rods (Figure 1 (a)) with reinforcement ratio of 3-8% completely embedded in a high strength (15-30 MPa) cement mortar layer (10- 50 mm thickness). The mortar is troweled on through the mesh with covering thickness of 1-5 mm. The mechanical properties of ferro cement depend on mesh properties.

Shotcrete

Shotcrete overlays are sprayed onto the surface of a masonry wall over a mesh of reinforcing bars (Shotcrete is more convenient and less costly than castin- situ jackets. The thickness of the shotcrete can be adapted to the seismic demand. In general, the overlay thickness is at least 60 mm
Typically, the shotcrete overlay is assumed to resist all the lateral force applied to a retrofitted wall with the brick masonry being neglected all together (Abrams and Lynch 2001, Hutchison et al. 1984). This is reasonable assumption for strength design since the flexural and shear strength of the reinforced shotcrete overlay can be many times more than that of the URM wall. This assumption may result in some cracking of the masonry as the reinforcement in the shotcrete strains past yield. This may violate a performance objective for immediate occupancy or continued operation.

Grout and epoxy injection

Grout injection is a popular strengthening technique, as it does not alter the aesthetic and architectural features of the

IARJSET

ISSN (Online) 2393-8021
ISSN (Print) 2394-1588

International Advanced Research Journal in Science, Engineering and Technology

AGNI-PANKH 16

Jawaharlal Darda Institute of Engineering and Technology, Yavatmal

Vol. 4, Special Issue 3, January 2017

existing buildings. The main purpose of injections is to restore the original integrity of the retrofitted wall and to fill the voids and cracks, which are present in the masonry due to physical and chemical deterioration and/or mechanical actions..

  Placement of injection ports and sealing of the cracked areas in the basic wall as
well as around injection ports.

  Washing of cracks and holes with water. Inject of water (soak of the bricks), from
the bottom to the top of the wall, to check which tubes are active.

IV. TRADITIONAL METHODS OF SEISMIC RETROFITTING

Traditional methods of seismic retrofitting fall essentially into two categories, one based on the classical principles of structural design which requires an increase of strength and stiffness, and the other based on mass reduction. Thus the first one tends to satisfy the design inequality by an increase of the capacity while the second one achieves the same result by a reduction of the demand.

Only after stiffness and strength have been increased up to a level where the fundamental period corresponds to the constant branch of the design spectrum, is it possible to achieve a condition where the design inequality is satisfied. It is, therefore, evident that an attempt to increase the seismic resistance capacity in this way only results in an increase of the seismic demand. When, in the end, the procedure converges, it is at the expense of a considerable expenditure of resources. A similar situation occurs with reference to mass reduction. This may be achieved, for instance, by removal of one or more storeys as shown in Figure.

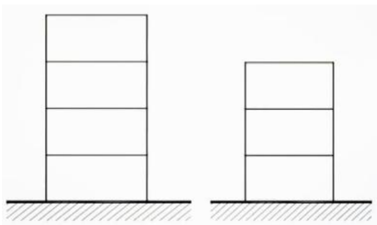

Fig. Seismic retrofitting by mass reduction (removal of a storey)

In conclusion, the traditional methods of seismic retrofitting, although effective, are rather expensive. It must however be pointed out that, as in the case of low buildings, the fundamental period may already fall within the constant branch of the design spectrum and a period shortening may not result increase of the seismic action

V. METHODS FOR SEISMIC RETROFITTING

Retrofitting of existing structures with insufficient seismic resistance accounts for a major portion of the total cost of hazard mitigation. Thus, it is of critical importance that the structures that need seismic retrofitting are identified correctly, and an optimal retrofitting is conducted in a cost effective fashion. Once the decision is made, seismic retrofitting can be performed through several methods with various objectives such as increasing the load, deformation, and/or energy dissipation capacity of the structure Conventional as well as emerging retrofit methods are briefly presented in the following subsections.-

Global Retrofit Methods

Two approaches are used for structure level retrofitting: a) conventional methods based on increasing the seismic resistance of existing structure , and b) non-conventional methods of reduction of seismic demands **.**

Conventional method

Conventional methods of retrofitting are used to enhance the seismic resistance of existing structures by eliminating or reducing the adverse effects of design or construction. The methods include adding of shear wall, infill walls and steel braces.

Adding new shear walls

One of the most common methods to increase the lateral strength of the reinforced concrete buildings is to make a provision for additional shear walls . The technique of infilling/adding new shear walls is often taken as the best and simple solution for improving seismic performance. Therefore it is frequently used for retrofitting of non ductile reinforced concrete frame buildings . the added elements can be either cast–in- place or pre-cast concrete elements . new elements preferably be placed at the exterior of the building, however it may cause alteration in the appearance and window layouts . placing of shear walls in the interior of the structure is not preferred in order to avoid interior mouldings .

Adding Steel Bracings

Another method of strengthing is the use of steel bracing, which also has similar advantages .The structural details of connection between bracing and column are shown below. The installation of steel bracing members can be an effective solution when large openings are required. This scheme of the use of steel bracing has a potential advantage over other schemes for the following reasons: -higher strength and stiffness can be proved, -opening for natural light can be made easily , -amount of work is less since foundation cost may be minimized, -the bracing system adds much less weight to the existing structure .

Non-Conventional Method

In recent years, several alternative approaches are being used in the retrofitting of structures. Among them, seismic base isolation and addition of supplemental device techniques are the most popular. The application of these techniques in retrofitting are also in infancy state ; hence , the technical literature related to their application , future

ISSN (Online) 2393-8021
ISSN (Print) 2394-1588

IARJSET

International Advanced Research Journal in Science, Engineering and Technology

AGNI-PANKH 16

Jawaharlal Darda Institute of Engineering and Technology, Yavatmal

Vol. 4, Special Issue 3, January 2017

performance, advantage and problems have not been thoroughly investigated . However, a brief discussion about these techniques has been made here.

Seismic Base Isolation

The seismic base isolation technology involves placing flexible isolation systems between the foundation and the superstructure. By means of their flexibility and energy absorption capability, the isolation systems reflect and absorb part of the earthquake input energy before this energy is fully transmitted to the superstructure, reducing the energy dissipation demand on the superstructure. Base isolation causes the natural period of the structure to increase and results in increased displacements across the isolation level and reduced accelerations and displacements in the superstructure during an earthquake. Base isolation can also be used in seismic retrofitting.

Local Retrofit Methods

The member-level retrofit or local retrofit approach is to upgrade the strength of the members, which are seismically deficient. This approach is more cost effective as compared to the structura level retofit. The most common method of enhancing the individual member strength is jacketing. It includes the addition of concrete, steel or fibre reinforced polymer jackets for use in confining reinforced concrete columns, beams , joints and foundation

Jacketing/Confinement

Jacketing is the most popularly used methods for strengthening of building columns. The most common types of jackets are steel jacket, reinforced jacket, fiber reinforced polymer composites jacket, jacket with high tension materials like carbon fiber, glass fiber, etc. the main purposes of jacketing are: - to increase concrete confinement by transverse fiber/reinforcement, especially for circular cross-sectional columns, -to increase shear strength by transverse fiber/ reinforcement, -to increase flexural strength by longitudinal fiber/reinforcement provided they are well anchored at critical sections.

VI. CONCLUSION

 Seismic Retrofitting is a suitable technology for protection of a variety of structures.
 Proper Design Codes are needed to be publishedas code of practice for professionals related to this field.
 The retrofitting buildings vulnerable to earthquakes and briefly discuss about the different methods of seismic retrofitting..

REFERENCES

1. Bhaumik M. (2013), Seismic analysis and frap jacketing of 4-storey rc building, J. of ……….. , No. 10-11, pp 15-17.
2. IS 1893: 2002, "Indian Standard Criteria for Earthquake Resistant Design of Structures, Part 1General provisions and buildings", Bureau of Indian Standards, New Delhi, 2002
3. BSSC (1997a). "FEMA 273: NEHRP Guidelines for the Seismic Rehabilitation of Buildings", Building Seismic Safety Council, Washington, D.C., U.S.A.
4. Abbas, H. and Kelly, J.M. (1993). A methodology for design of visco-elastic dampers in earthquake-resistant structures. Report No. UCB/EERC-93/09, University of California at Berkeley, California, USA.
5. Achenbach, M., Atanochovic, T. and Muler, I. (1986).
6. BSSC (1997a). "FEMA 273: NEHRP Guidelines for the Seismic Rehabilitation of Buildings",
7. BSSC (1997b). "FEMA 274: NEHRP Commentary on the Guidelines for the Seismic Rehabilitation of Buildings", Building Seismic Safety Council, Washington, D.C., U.S.A