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In-plane and out-of-plane failure structures improving through the structural retrofitting methods

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Selection of an appropriate method of retrofitting basically depends upon the structural scheme and the building materials employed in the construction of parent building along with a feasible and economical technology. Moreover an understanding of failure mode, structural behaviour with the weak and strong aspects of design as derived from the earthquake damage surveys also influence the selection of retrofitting schemes. Numerous techniques, used to retrofit seismically efficient or damaged masonry buildings, may be broadly classified into the three categories on the basis of their effect on structural performance, namely, (i) improving the existing masonry strength and deformability, not related to any specific objective which is similar to the repairing process on masonry structures; (ii) improving the in-plane strength of the wall or any weak zone of the section akin to local/member retrofitting and (iii) improving the structural integrity of the whole structure in terms of in-plane and out-plane strength or only against out-of-plane forces very much like the global/structural retrofitting.

Buildings, bridges, dams, under-ground storage structures, overhead storage structures, high-rise structures, launch pads, airport terminals, stadia, shopping malls, cineplex's, swimming pools, etc., are some of the wide spectrum of civil engineering structures that are built for different purposes and to carry out different activities. These structures are built with materials like masonry, concrete, steel and aluminium as per the design requirements and economical considerations. These structures are subjected to geophysical and man-made loads during their service life. When the magnitude of these loads exceed the capacity or strength of the structures, they are likely to be damaged. Considering the economy of constructing another new structure in place of the damaged structures and also the loss of revenue due to interruption in the functioning of the structure and economic and environmental factors, a decision to repair the structure becomes essential. Sometimes the strength of a structure is reduced because of the use of substandard materials in its construction or due to the application of additional load because of changes in its functioning or due to seismic forces for which the structure had not been designed originally. These situations warrant strengthening or up-gradation of the structure to carry the enhanced loading. A variety of structural up-gradation and retrofitting techniques has been evolved over the years in respect of different structures and has also been used. Some methods of seismic up-gradation such as addition of new structural frames or shear walls have been proven to be impractical because they have been either too costly or restricted in use to certain types of structures.

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Charcoals and seed powders as biosorbents for removal of heavy metals from wastewaters

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Biosorption is the removal of substances (compounds, metal ions, organic etc.) by inactive, non-living, as well as excreted and derived products materials (materials of biological origin) due to high attractive forces present between the two. Several of biosorbents of plant, animal and microbe origin have been tested for their use in removal of heavy metals from waste water. *Melocanna baccifera* (Bamboo) charcoal is produced from charcoal kiln under the influence of high temperature and minimal supply of air. These charcoals are grinded to a fine powder and activated with various concentrations of KOH solutions. The use of activated charcoal is considered to be the best available technology for removing low-solubility contaminants in water treatment. Operational cost is low. Therefore, *M. baccifera* raw charcoal (MBRC) and activated charcoal (MBAC) were evaluated as adsorbents for the removal of heavy metals such as Pb, Cd, Ni, Zn and Cu from aqueous solutions. 50% and 60% of KOH activation showed higher adsorption of heavy metals. Surface characterization of MBRC and MBAC were carried out using scanning electron microscope (SEM), fourier transform infrared spectroscopy (FTIR) and X-ray diffraction (XRD). Most of the adsorption isotherm followed Langmuir isotherm rather than Freundlich isotherm. The maximum adsorption capacity of MBRC and MBAC for removal of various heavy metals is calculated using Langmuir isotherm. The order of heavy metals removal (in quantity) are Cu > Pb > Ni > Zn > Cd. Most of the sorption pattern of MBRC and MBAC followed chemisorption for removal of heavy metals. FTIR analysis of charcoals showed that many functional groups are involved in heavy metals adsorption.

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