DISASTER RELIEF DESIGN PRE TO POST EARTHQUAKE

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Introduction:

Earthquakes are natural disasters that can cause significant damage to buildings, infrastructure, and communities. They can also result in loss of life and have long-lasting social and economic impacts. Disaster relief design for pre to post earthquake scenarios plays a crucial role in minimizing the loss of life and property damage caused by earthquakes. In this research paper, we will explore the different aspects of disaster relief design for pre to post earthquake scenarios, including measures taken before and after an earthquake, as well as the role of architects, engineers, policymakers, and the local community in disaster relief design.

Pre-Earthquake Phase:

The pre-earthquake phase involves measures taken before an earthquake occurs to minimize the impact of the earthquake on buildings, infrastructure, and communities. One essential aspect of the pre-earthquake phase is building codes and zoning regulations. These regulations ensure that buildings and infrastructure are designed to withstand seismic activity. Building codes can specify the minimum requirements for structural design, including the use of materials that can withstand seismic activity.

In addition to building codes and zoning regulations, community awareness and education programs play an essential role in the pre-earthquake phase. These programs teach people about the risks of earthquakes and how to prepare for them. They can also provide guidance on emergency preparedness, such as creating emergency kits and evacuation plans.

Another important aspect of the pre-earthquake phase is the development of early warning systems. These systems can detect earthquakes before they occur and provide advance warning to communities, enabling them to take necessary precautions and prepare for the earthquake.

Case study in earthquake prone area:- Tokyo Skytree Tower, Japan

It's the world's largest free standing tower & second tallest structure at 2080 feet height inspired by Japanese traditional temple Pagoda At base the tower is equilateral triangle & as it tapers the cross-section becomes circular. Seismic Design inventions: rigid substructure system, core shaft system & vibration control system Rigid substructure system: The site is located at the banks of sumida river with extremely soft soil around. A reinforced concrete wall pile is adopted as basement with thickness 1.2m & depth 35m. It stands on a bearing stratum giving the rigidity to the structure above. This strategy was developed for seismic design as it makes use of a relative displacement between the rigid substructure & soft ground to gain the damping ability also the damping of radiation. Core shaft & vibration system: The main central shaft of reinforced concrete is attached to the outer tower structure for the first 410 f above ground. A height of 1230 ft is surrounded by a framework of steel tubes fixed with oil dampers, which act as cushions during an earthquake. It does not support the tower, but functions as a counteract to any sway of the tower during quake & reduces around 40% of seismic waves.

During-Earthquake Phase:

The during-earthquake phase is the most critical phase of disaster relief design, as it involves responding to the immediate needs of the affected community. Emergency shelter, food, and water are essential during this phase, as people may be displaced from their homes or unable to access essential services. Disaster relief organizations such as the Red Cross can play a crucial role in providing emergency services during this phase.

Post-Earthquake Phase:

The post-earthquake phase involves responding to the immediate needs of the affected community, such as providing emergency shelter, food, and water. The design also includes the reconstruction of damaged buildings and infrastructure using earthquake-resistant materials and techniques to prevent or minimize the impact of future earthquakes.

Emergency shelters are often the first form of relief provided in the post-earthquake phase. These shelters can range from temporary tents to more permanent structures designed to withstand seismic activity. They provide immediate relief to people who have lost their homes and are displaced from their communities.

In addition to emergency shelters, the post-earthquake phase also involves the reconstruction of damaged buildings and infrastructure. The reconstruction process involves the use of earthquake-resistant materials and techniques to ensure that buildings and infrastructure can withstand future seismic activity. Reinforced concrete and steel are often used in the reconstruction process to provide additional support and resistance to seismic activity.

Role of Architects, Engineers, Policymakers, and the Local Community:

Architects, engineers, policymakers, and the local community all play critical roles in disaster relief design for pre to post earthquake scenarios. Architects are responsible for designing earthquake-resistant buildings and infrastructure that can withstand seismic activity. They must consider factors such as the type of soil and the seismic activity of the area when designing buildings and infrastructure.

Engineers provide technical expertise in ensuring that the design is structurally sound. They are responsible for ensuring that buildings and infrastructure are designed to withstand seismic activity and can provide support during the reconstruction process. Policymakers and local authorities provide the regulatory framework and resources needed to implement disaster relief design. They must ensure that building codes and zoning regulations are in place to ensure that buildings and infrastructure are designed to withstand seismic activity. They must also provide the necessary resources for emergency response and reconstruction efforts.

The local community provides vital input into the design process, ensuring that it meets their needs and respects their cultural values. They can also provide valuable feedback on the effectiveness of disaster relief design and emergency response efforts.

Case study of post-earthquake reconstruction:-Nepal

One example of post-earthquake reconstruction is the effort to rebuild Nepal after a devastating earthquake in 2015. The earthquake, which had a magnitude of 7.8, caused significant damage to buildings, infrastructure, and communities, leaving over 8,000 people dead and many more displaced. The Nepalese government, with support from international organizations such as the United Nations and the World Bank, launched a comprehensive reconstruction effort aimed at rebuilding the affected areas and improving resilience to future earthquakes. One critical component of the reconstruction effort was damage assessment. Teams of experts used a range of tools and techniques to identify damaged areas and prioritize reconstruction efforts. This involved using satellite imagery, aerial surveys, and field assessments to map the extent of the damage and identify areas in need of urgent attention.

Another critical component was the development of reconstruction plans. These plans involved repairing and rebuilding damaged buildings and infrastructure, upgrading existing structures to be more resilient to future earthquakes, and implementing disaster risk reduction measures to reduce the impact of future earthquakes. The plans also included support for affected communities, such as providing temporary shelters and restoring basic services such as water and sanitation. Funding was also a crucial

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component of the reconstruction effort. The Nepalese government and international organizations provided significant resources to support the reconstruction effort. Funding sources included grants and loans from international organizations such as the World Bank and the Asian Development Bank, as well as contributions from individual donors and private sector investments.

Community engagement was also a critical aspect of the reconstruction effort. The Nepalese government and international organizations worked closely with affected communities to ensure that their needs and concerns were taken into account in the reconstruction process. This involved engaging with community leaders and organizations, conducting community consultations, and involving affected individuals in the planning and implementation of reconstruction activities. Despite significant challenges, the reconstruction effort in Nepal has made significant progress. As of 2021, over 500,000 houses have been rebuilt, and many critical infrastructure projects have been completed. However, much work remains to be done, and ongoing efforts are focused on completing the remaining reconstruction activities and improving resilience to future earthquakes.

Architectural solution for the prevention of housing from moving towards pre to post earthquake's effects:-

Earthquakes can cause significant damage to buildings and infrastructure, and it is essential to take measures to prevent or minimize these impacts. One architectural solution for preventing infrastructure from moving towards pre to post-earthquake effects is to design buildings and infrastructure that are more resilient to seismic activity. This involves using specific design features and materials that can absorb or deflect seismic energy and reduce the damage caused by earthquakes.

One approach to designing earthquake-resistant buildings and infrastructure is to use seismic isolation systems. Seismic isolation involves installing bearings or other devices between the foundation and the structure that can absorb or deflect seismic energy. This can help prevent the building or infrastructure from being damaged during an earthquake by reducing the amount of seismic energy transferred to the structure. Another approach is to use reinforced concrete and steel to make buildings and infrastructure more resistant to seismic activity. Reinforced concrete involves embedding steel reinforcement in concrete to increase its strength and resistance to deformation. Steel frames and braces can also be used to provide additional support and resistance to seismic activity.

In addition to these measures, architects can also design buildings and infrastructure with specific features that can help prevent damage during earthquakes. For example, buildings can be designed with flexible, open-plan interiors that can accommodate seismic movement, while reducing the risk of collapse. Buildings can also be designed with symmetrical shapes and balanced masses to help distribute seismic energy more evenly.

Architects can also use advanced modeling and simulation tools to predict the behavior of buildings and infrastructure during earthquakes. This can help identify potential weaknesses in the design and enable architects to make changes to improve the structure's resilience.

Overall, preventing infrastructure from moving towards pre to post-earthquake effects requires a comprehensive approach that takes into account the specific needs and characteristics of the structure, as well as the seismic activity of the area. By designing buildings and infrastructure with earthquake-resistant features, architects can help prevent or minimize the impact of earthquakes on critical infrastructure.

Conclusion:

Disaster relief design for pre to post earthquake scenarios is essential for protecting communities from the devastating effects of earthquakes. By adopting a holistic approach that takes into account the unique needs of the local community and the seismic activity of the area, architects, engineers, policymakers, and the local community can work together to create.