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Modern Technology for Strengthening Concrete Structures Makes Them Resistant to Earthquakes

Authors : Mohsen Abdelrazek Khorshid Ali Selim

Abstract : Disadvantages and errors of current concrete reinforcement methodsL: Current concrete reinforcement methods are adopted in most parts of the world in their various doctrines and names. They adopt the so-called concrete slab system, where these slabs are semi-independent and isolated from each other and from the surrounding environment of concrete columns or beams, so that the reinforcing steel does not cross from one slab to another or from one slab to adjacent columns. It or the beams surrounding it and vice versa are only a few centimeters and no more. The same applies exactly to the concrete columns that support the building, where the reinforcing steel does not extend from the slabs or beams to the inside of the columns or vice versa except for a few centimeters and no more, just as the reinforcing steel does not extend from inside the column at the top. The ceiling is only a few centimetres, and the same thing is literally repeated in the concrete beams that connect the columns and separate the slabs, where the reinforcing steel does not cross from one beam to another or from one beam to the slabs or columns adjacent to it and vice versa, except for a few centimeters, which makes the basic building elements of columns, slabs and beams They all work in isolation from each other and from the environment surrounding them from all sides. This traditional method of reinforcement may be valid and lasting in geographical areas that are not exposed to earthquakes and earthquakes, where all the loads and tensile forces in the building are constantly directed vertically downward due to gravity and are borne directly by the vertical reinforcement of the building. However, in the case of earthquakes and earthquakes, the loads and tensile forces in the building shift from the vertical direction to the horizontal direction at an angle of inclination that depends on the strength of the earthquake, and most of them are borne by the horizontal reinforcement extending between the basic elements of the building, such as columns, slabs and beams, and since the crossing of the reinforcement between each of the columns, slabs and beams between them And each other, and vice versa, does not exceed several centimeters. In any case, the tensile strength, cohesion and bonding between the various parts of the building are very weak, which causes the buildings to disintegrate and collapse in the horrific manner that we saw in the earthquake in Turkey and Syria in February 2023, which caused the collapse of tens of thousands of buildings in A few seconds later, it left more than 50,000 dead, hundreds of thousands injured, and millions displaced. Description of the new earthquake-resistant model: The idea of the new model in the reinforcement of concrete buildings and constructions is based on the theory that we have formulated as follows: [The tensile strength, cohesion and bonding between the basic parts of the concrete building (columns, beams and slabs) increases as the lengths of the reinforcing steel bars increase and they extend and branch and the different parts of the building share them with each other.] . In other words, the strength, solidity, and cohesion of concrete buildings increase and they become resistant to earthquakes as the lengths of the reinforcing steel bars increase, extend, branch, and share with the various parts of the building, such as columns, beams, and slabs. That is, the reinforcing skewers of the columns must extend in their lengths without cutting to cross from one floor to another until their end. Likewise, the reinforcing skewers of the beams must extend in their lengths without cutting to cross from one beam to another. The ends of these skewers must rest at the bottom of the columns adjacent to the beams. The same thing applies to the reinforcing skewers of the slabs where they must These skewers should be extended in their lengths without cutting to cross from one tile to another, and the ends of these skewers should rest either under the adjacent columns or inside the beams adjacent to the slabs as follows: First, reinforce the columns: The columns have the lion's share of the reinforcing steel in this model in terms of type and quantity, as the columns contain two types of reinforcing bars. The first type is large-diameter bars that emerge from the base of the building, which are the nerves of the column. These bars must extend over their normal length of 12 meters or more and extend to a height of three floors, if desired. In raising other floors, bars with the same diameter and the same length are added to the top after the second floor. The second type is bars with a smaller diameter, and they are the same ones that are used to reinforce beams and slabs, so that the bars that reinforce the beams and slabs facing each column are bent down inside this column and along the entire length of the column. This requires an order. Most engineers do not prefer it, which is to pour the entire columns and pour the roof at once, but we prefer this method because it enables us to extend the reinforcing bars of both the beams and slabs to the bottom of the columns so that the entire building becomes one concrete block that is cohesive and resistant to earthquakes. Secondly, arming the cameras: The beams' reinforcing skewers must also extend to a full length of 12 meters or more without cutting. The ends of the skewers are bent and dropped inside the column at the beginning of the beam to its bottom. Then the skewers are extended inside the beam so that their other end falls under the facing column at the end of the beam. The skewers may cross over the head of a column. Another passes through another adjacent beam and rests at the bottom of a third column, according to the lengths of each of the skewers and beams. Third, reinforcement of slabs: The slab reinforcing skewers must also extend their entire length, 12 meters or more, without cutting, distinguishing between two cases. The first case is the skewers opposite the columns, and their ends are dropped inside one of the columns. Then the skewers cross inside the adjacent slab and their other end falls below the opposite column. The skewers may cross over The head of the adjacent column passes through another adjacent slab and rests at the bottom of a third column, according to the dimensions of the slabs and the lengths of the skewers. The second case is the skewers opposite the beams, and their ends must be bent in the form of a square or rectangle according to the

dimensions of the beam’s width and height, and this square or rectangle is dropped inside the beam at the beginning of the slab, and it serves as The skewers are for the beams, then the skewers are extended along the length of the slab, and at the end of the slab, the skewers are bent down to the bottom of the adjacent beam in the shape of the letter U, after which the skewers are extended inside the adjacent slab, and this is repeated in the same way inside the other adjacent beams until the end of the skewer, then it is bent downward in the form of a square or rectangle inside the beam, as happened. In its beginning.

Keywords : earthquake resistant buildings, earthquake resistant concrete constructions, new technology for reinforcement of concrete buildings, new technology in concrete reinforcement
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