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Foundation Reinforcement of Old ALA Building

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ABSTRACT

In Northern Tehran, a 100 - years old residential masonry building is being renovated into a public library.

The wooden floors of the upper story are being reinforced with an exposed steel space - frame and for settlement prevention of old bearing walls, the end bearing piles are used. During the construction of a reflective pool very close to the building, a number of masonry foundations begun sliding from under the brick columns of the main facade.

In order to stop the sliding and prevent damage to the building a design was proposed to reinforce the foundation.

The paper, examines the position of the building and the reflective pool, shows the way by which the foundation sliding was stopped and how it generally helped the whole building foundation.

KEYWORDS

Renovation, drilling, excavation, fastening, demolition

FLOOR REINFORCEMENT

The old Ala building with thick mud brick walls and a 30 ^{cm} wide mortar foundation is located in a beautiful garden.

Timber is used as first floor beams and wood trusses are used for roof members. There are a few brick columns with wooden cores on the north side of this building which have added to the looks of the building, Fig (1).

Fig. 1 North elevation

This old residential building is renovated into a new public library. During initial investigations, it was determined that the structure would not withstand the new loading and had to be strengthened. The strengthening procedure is to reduce the floor dead load and also create a new mechanism for the load transfer so ultimately the structure can take a live load of 7.5 kn/m^2 for the library storage area and 5 kn/m^2 for the study hall.

The new load bearing system consists of a steel grid system which is made from tube sections and are attached to the underneath of the timber members.

At corners of each room or corridor, four double INP sections are used as columns with an axial service load of about 50 kn.

For settlement prevention of old bearing walls, the columns load are supported by end bearing piles with 3^{m} embedment lengths, Fig (2).

Fig. 2 End bearing pile reimforcement

The work schedule used is listed below :

1- Remove the old 20 ^{cm} soil and mud brick flooring over the timbers.

2- To drill the holes for the piles at the corners of the rooms and corridors.

3- Strengthening the structure as mentioned before including casting new reinforced concrete and installing base plates.

4- Jacking up the floor system and installing the steel grid system under the timbers, Fig (3).

5- Installing the columns and attaching the grid system to them.

6- Installing light flooring construction on the wooden floor.

Fig. 3 Grid system under wooden floor

Sliding prevention

In this new design, a reflective pool is considered very close to the building. But after excavation and during its construction, a number of mortar foundations under the brick columns of the main facade began to slide.

For damage prevention to the building in this area, holes with 1^m diameter were dug about 1^m away from the said columns and steel INP columns encased in concrete were installed in them, Fig (4).

Fig. 4 Short INP columns

Fortunately this rigid short columns created sufficient vertical support against soil sliding and also created as appropriate area for further loading of the area.

Utilizing cross shape stiffeners from INP sections which were fixed in front of the said short columns a jacking force of 15kn were applied to each stiffener. After this stage the cross shape stiffeners and INP columns were connected with rizontal INP sections to each other and the jacks were removed, Fig(5).

A 1^m high, 30^{cm} thick brickwall was constructed and concrete was cast between the new brickwall and the previous vertically hard dug layer which created a massive retaining wall.

The construction steps for this phase of the work were as follows.

1- Drilling the holes in front of the brick columns.

2- Installing short INP sections (columns) and encasing them in concrete.

3- Utilizing jacking force for the cross shape INP stiffeners.

4- Making connections between stiffeners and short INP columns and removing the jack, Fig (6).

5- Constructing a massive 0.5^m brick and concrete wall behind the previous vertical hard layer.

Fig. 5 Jacking force for the stiffener

Finally, the control of the load bearing capacity of the brick columns on the north side of the building, a surcharge of 3 kn/m^2 was used as a load test for 48 hours and no deflections were created. The renovated building and reflective pool is shown in, Fig(7).

Fig. 6 Connection between stiffener and column

REFERENCES

Zand Parsa, K. [1992]. "Loading." Elm & Sanat 110, Tehran

Winterkorn, H.F. and Fang H.Y. [1975] "Foundation engineering handbook" Van Nostrand Reinhold Company, New York.

Fig. 7 Renovated building and reflective pool