

The Local Wisdom of House Lifting Technician in Buri Ram Province

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Abstract

This research aimed to study (1) the state of the house that need to renovate and (2) the local wisdom of house lifting technicians in Buri Ram province. The qualitative study was used by investigating the six groups of local technicians. The six houses renovations were studied. It was found that the local wisdom of house lifting technicians was raised by their own experiences without the engineering or architectural background knowledge. The house lifting generated by the local technicians could be applied to houses made from wood, wood and masonry, and also reinforced concrete members. The reasons for house renovation were; 1) to solve settlement problem 2) to extend the ground floor to floor height 3) to strengthen the column and footing structures and 4) to relocate the house. The techniques used for renovation were house lifting, changing the column and footing structures, straightening the wall alignment, and relocating the whole housing structure.

Keywords : Architecture, Local Wisdom, Local Technician, House Lifting, House Relocation

1. Introduction

A house is one of the architecture accommodations. It is considered as one of the four requisites of life. Individual settlers use local wisdoms to design and build their houses. The knowledge was transferred through generations. Not only the design and build process, but also the retrofit and renovation that was learned through generations. The knowledge and skills were raised an accumulated through experiences. Even though the knowledge and technology about house design and building are taught in vocational and university level, the local wisdom and technicians are still playing the major parts in the local area. House lifting is one of the renovation processes that local technicians have involved and experienced. The local wisdom of house lifting

generated from the attempt to lift Thai ancient house mostly built by timber and wood. Through their experiences and skills, the house lifting technicians can apply their techniques to lift the house that built from wood and masonry and also the reinforced concrete structure. The transfer knowledge through generations and experiences of the team create development of the systematic work process and techniques which can be applied for various cases of house renovations. It was surprised that those local technicians especially in the Northeastern part of Thailand have raised and accumulated their skills through experiences without architecture or engineering background knowledge. These improbable findings of local technicians to develop their working procedure were full of self-esteem. (Tharapong Rattranatrakul and Uthai Cholthansarit,2003). In the control area, the Thailand Building Act stated that the houses that needed to be renovated or relocated had to be processed according to engineering principle or controlled and inspected by certified engineers. However, in rural areas which were not controlled by the Building Act, the local wisdom house lifting technicians are still needed for the community member to solve the house problem.

2. Research Objectives

- 2.1 To study the state of the house renovation need
- 2.2 To study the local wisdom of house lifting technician

3. Research Methodology

The field investigation was used to study the techniques of 6 groups of house lifting technicians. Every group has more than 10 year experiences. Their services were renovating, house lifting, and relocating the house structure in Buri Ram and nearby provinces. The structured interview and photo collection was also used to collect data from 6 cases of renovated houses. Lastly, the data was verified and analyzed by descriptive analysis method.

4. Research Result

House lifting local wisdom was raised and accumulated by the technician's experiences. The experiences create their skills which were performed without engineering or architectural knowledge. However, the engineering principle of force equilibrium was considered the most important factor to accomplish the house lifting process. The house lifting generated by the local

technicians could be applied to houses made from wood, wood and masonry, and also reinforced concrete structures. The house lifting techniques were used for house renovation which was caused by; 1) settlement problem of a house foundation or the unequal settlement between the old and new building that created wall cracks 2) house ground level compared to the surround area were considered lower due to the higher road embankment. It caused the flood and rotten wooden column and narrowed the underground space 3) the poor quality of column and footing structures which need to be strengthened, and 4) the need of relocating the house without demolition and rebuild both parallel and rotating direction. In detail, the study of each group techniques was as following;

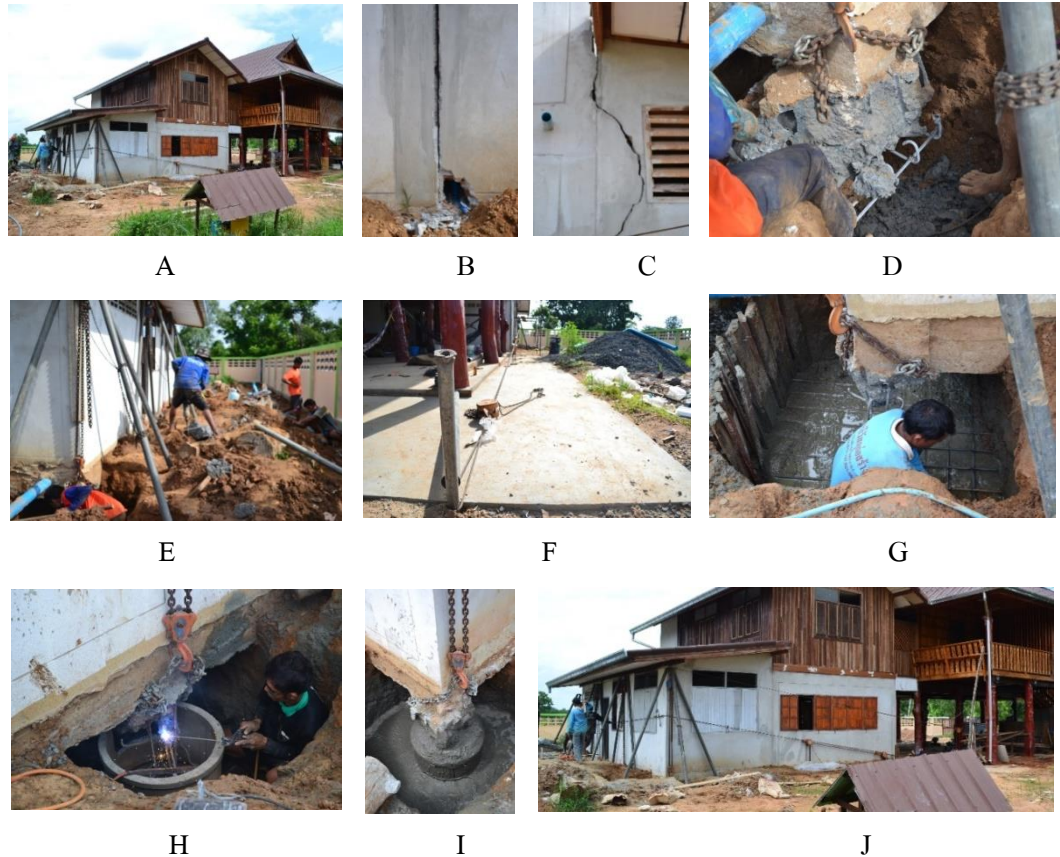
Local house lifting technician group I

House no.1 was the two-storey house. The ground floor was blank space. There consists of 24 wooden columns. The roofing material was fiber cement tile. There was an increment part of the house which was reinforced concrete structure. The increment part consists of 4 concrete columns. The problem was an unequal settlement between the two-storey house and increment part so there was a severe wall cracks along the attaching area. The technique used was lifting the settlement part, level up the part to the original position, then reconstruct the concrete pier and footing. The 6 technicians were work together for 2 days until the job was done.

Construction process

- 1) dig the ground around the column position until meet the pier and footing
- 2) install the three-legged hoist (capacity of 5 tons) at the 4 column position
- 3) strap the four wall with chain and wire rope
- 4) lift the settled part as a whole to the original level
- 5) exstract the existing concrete footing and cut the bar from the attached pier
- 6) place the new footing reinforcement bar (RB9# 1.20x1.20 m)
- 7) Add the L-shape deformed bar (dia 9 mm) to connect the old pier with the new footing
- 8) use concrete tube (dia. 60 cm) as a footing mold
- 9) concrete mix proportion of 1:2:4 (cement:sand:rock) was poured into the mold
- 10) remove the hoist and chain 12 hours long after the concrete pouring process
- 11) backfill the dug hole

In conclusion, the technician group I attempted to disconnect the settled footing from the pier and above structure, then extended the length of the pier until the original position was set. The new pier was casted by concrete of 60 cm diameter size which was much bigger than the old pier size. It is recommended that the increment part of the house shall be disconnected from the old house to prevent the cracks caused by an unequal settlement.



Picture I : The house lifting process of Local technician group no. I

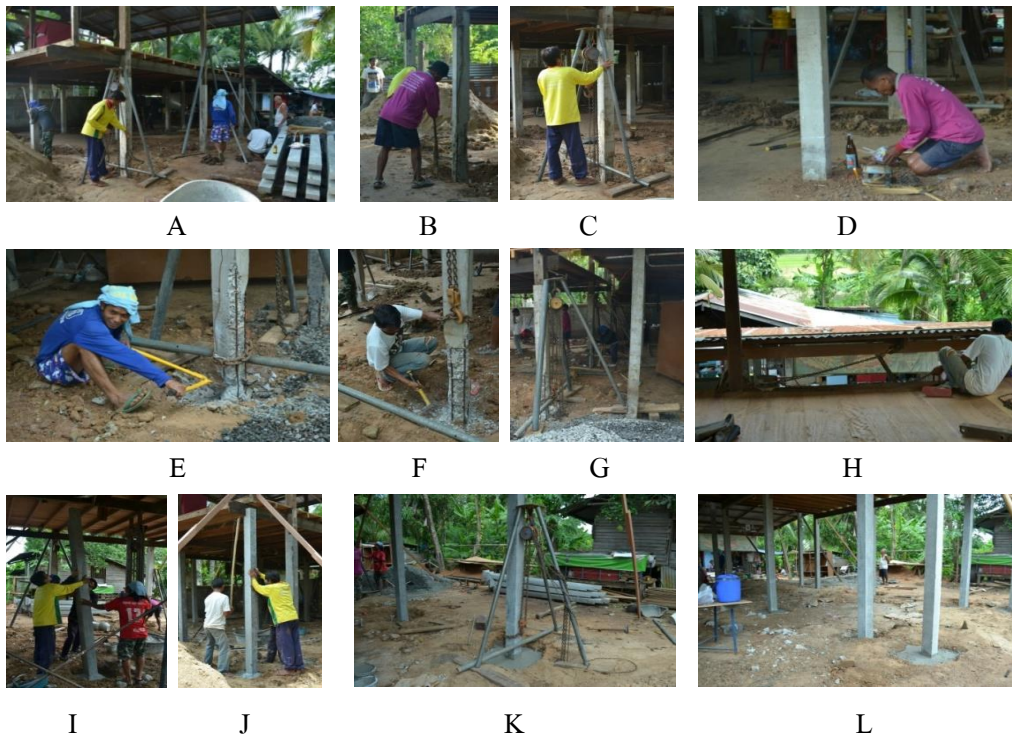
Local house lifting technician group II

House no.2 was the two-storey house. The ground floor was blank space. There consists of 9 concrete columns. The roofing material was corrugated galvanized sheet. There was an increment part of the house for as a kitchen which was reinforced concrete structure. The increment part consists of 6 concrete columns. The problem was due to the higher road embankment which caused the waterlogging at the ground floor. The wooden column was soaked and rotten. The technique used was lifting the house to the designate level, remove the old wooden column, then reinstall the precast concrete poles at the column position. The 9 technicians were work together for 1 day until the job was done.

Construction process

- 1) dig the ground around the column position until meet the pier and footing
(meanwhile, the spirit rituals ceremony was operated in order to psychology reinforce the team and to ask for permission to the sacred spirit who protect the house so that can bring fortune and safety to the team members)
- 2) extract the existing concrete footing and cut the bar from the attached pier
- 3) install the three-legged hoist at the 6 column position, then lift up for 50 cm.
- 4) support the 2nd floor beams by the hoist platform, then release the three-legged hoist
- 5) replace the damage columns with precast concrete poles. (15x15cm, L=3m)
- 6) pour concrete mix proportion of 1:2:4 (cement:sand:rock) as footing.
- 7) install wire rope bracing to stabilize the structural members.
- 8) remove the hoist and chain after concrete was poured for 5 hours at least.
- 9) backfill the dug hole

In conclusion, the technician group II attempted to disconnect the damaged columns with the new concrete poles. Moreover, the bracing technique was used to stabilize the whole structural members. The vertical alignment shall be checked during the renovating process.



Picture II : The house lifting process of local technician group no. II

Local house lifting technician group III

House no.3 was a group of 5 one-storey prefabricated houses. Each of the houses consists of 8 wooden columns. The roofing material was carved fiber cement tile. The houses were moved to be installed at the same area in order to service as bungalows. Due to the owner's requirement that the house floor level should be higher than normal using lifting technique instead of hiring the crane machine (which cost much higher). The 12 technicians worked together for 2 days until the job was done.

Construction process

- 1) install the three-legged hoist, then lift the house to the designate level.
- 2) strap the four wall of each house with chain and wire rope in order to slide move the whole body of the house to the position set.
- 3) dig the ground to make footing hole.
- 4) use concrete tube (dia. 60 cm) as a mold for concrete footing
- 4) pour concrete mix proportion of 1:2:4 (cement:sand:rock) as footing
- 8) remove the hoist and chain after concrete was poured for 12 hours at least
- 9) backfill the dug hole

In conclusion, the technician group III lift the house to the designate level, then make the footing above the ground. There was no rebar reinforcement of the footing which may cause the crack of concrete footing if the concrete properties and curing process were not appropriate.



A



B



C



D



E



F

Picture III : The house lifting process of local technician group no. III

Local house lifting technician group IV

House no.4 were 2 two-storey house. The first floor consisted of 15 concrete columns and masonry wall. The second floor was wooden structure and wall. The roofing material was carved corrugated galvanized sheet. There were damaged columns in both houses. The column position of both houses were aligned, and the owner decided to combine the two houses as one. The 6 technicians worked together for 2 days until the job was done.

Construction process

- 1) knock down and remove the first floor wall using pound hammer
- 2) dig the ground around the column position until meet the pier and footing
- 3) install the three-legged hoist (capacity of 5 tons) at each column, then lift up the house
- 4) support the 2nd floor beams by the hoist platform, then release the three-legged hoist
- 5) replace the damage columns with precast concrete poles. (15x15cm. L=3m)
- 6) pour concrete mix proportion of 1:2:4 (cement:sand:rock) as pier and footing
- 7) install wire rope bracing in all direction to stabilize the house structure.
- 8) remove the hoist and chain after concrete was poured for 12 hours at least.
- 9) backfill the dug hole

In conclusion, the technician group IV lift up the house in order to replace the damaged column by the new concrete pole. Awareness of stability of the whole structure is highly required because collapse would be easily occurred if the structure lost the stability.



A



B



C



D



E



F

Picture IV : The house lifting process of local technician group no. IV

Local house lifting technician group V

House no.5 was a two-storey house. The first floor consisted of 9 concrete columns and masonry wall. The second floor was wooden structure and wall. The roofing material was carved corrugated galvanized sheet. The problem was due to the higher surrounded ground embankment which caused the waterlogging on the ground after raining. The owner decided to move the house from the lower ground level into the higher level but in the same area. The technique used was lifting the house, slide move and rotate the house to the new position. The 9 technicians worked together for 1 day until the job was done.

Construction process

- 1) knock down and remove the first floor wall using pound hammer
- 2) dig the ground around the column position until meet the pier and footing
- 3) a log of wood was used to locked the column at both end.
- 4) the wire rope bracing were installed at every column to prevent tilting and swaying
- 5) install the three-legged hoist (capacity of 5 tons) at each column, then lift up the house until the footing was above ground level
- 6) support the column base with a leaf spring, round steel, and wood plank to create a wheeling mechanism
- 7) pull the column structures by the chain and hoist in order to slide move and rotate the house to the position set.
- 8) support the 2nd floor beams by the hoist platform, then release the three-legged hoist
- 9) pour concrete mix proportion of 1:2:4 (cement:sand:rock) as pier and footing
- 10) install wire rope bracing in all direction to stabilize the house structure.
- 11) remove the hoist and chain after concrete was poured for 5 hours at least.
- 12) backfill the dug hole

In conclusion, the technician group V lift up the house in order to slide move and rotate the house as a whole. This practice required a higher techniques because the movement was in both vertical and horizontal direction. The bracing is required to prevent tilting and swaying of the house which may cause the instability that might lead to structural collapse.



A



B



C



D



E



F



G



H



I



J



K



L

Picture V : The house lifting process of local technician group no. V

Local house lifting technician group VI

House no.6 was a two-storey house. The first floor consisted of 9 concrete columns and masonry wall. The second floor was wooden structure and wall. The roofing material was carved corrugated galvanized sheet.

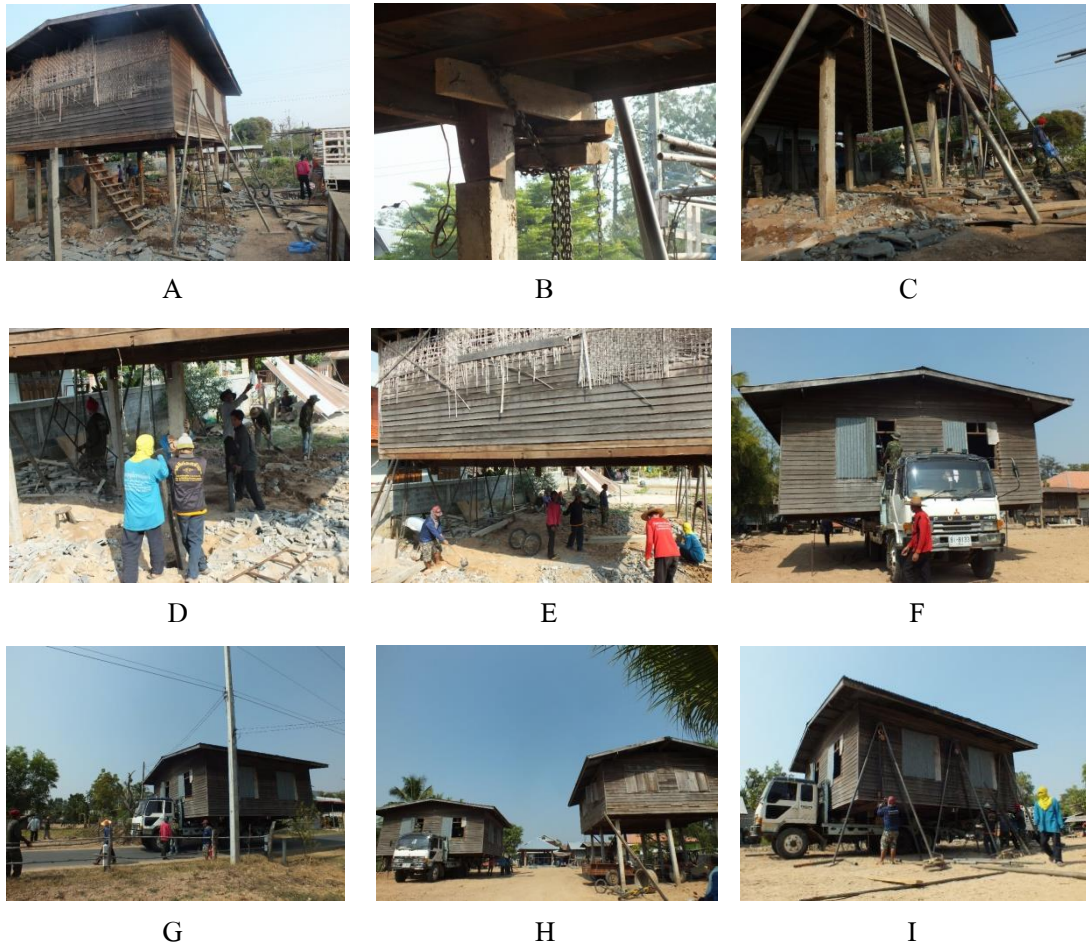
The problem was due to the higher surrounded ground embankment which caused the waterlogging on the ground after raining. The column was damaged. The owner decided to move

the house to the new area. The technique used was lifting the house, using a truck to remove the house as a whole to the new position. The 9 technicians worked together for 1 day until the job was done.

Construction process

- 1) knock down and remove the first floor wall using pound hammer
- 2) dig the ground around the column position until meet the pier and footing
- 3) use steel log to tie the column base both horizontal and diagonal directions
- 4) install the three-legged hoist (capacity of 5 tons) at each column, then lift up the house until the footing was above ground level
- 5) use wood log to support the 2nd floor beam and column, tie with chain
- 6) remove all the 1st floor columns from the 2nd floor beams
- 7) ten-wheeled truck with the plain tray was used to carry the house by driven the truck tray under the house body
- 8) the hoist and chain were removed after the house body placed on the truck tray
- 9) the house body was moved to the new area by the truck
- 10) install the three-legged hoist (capacity of 5 tons) at each column, then lift up the house until the house body was above the truck tray
- 11) the truck was driven out
- 12) install the new concrete poles (15x15cm, L=3m)
- 13) pour concrete mix proportion of 1:2:4 (cement:sand:rock) as pier and footing
- 14) install wire rope bracing in all direction to stabilize the house structure.
- 15) remove the hoist and chain after concrete was poured for 5 hours at least.
- 16) backfill the dug holes

In conclusion, the technician group VI lift up the house in order to remove the 1st floor coulms so that the truck tray could be inserted under the house body. Every connection between columns and beams were braced and locked to be as rigid structure. This teachnique was similar to the technician group V because it required a higher techniques for the house movement both vertical and horizontal direction. The bracing is required to prevent tilting and swaying of the house which caused the instability that might lead to structural collapse.



Picture VI : The house lifting process of local technician group no. VI

The research result showed that the house lifting was one of an important process for house renovation mainly for solving settlement problems, extending floor to floor depth, strengthening pier and footing, and relocating the house.. The local wisdom of house lifting technicians was raised and accumulated through their experiences without architecture or engineering background knowledge. Every groups of technician used three-legged hoist with chain and wire rope as the main equipment for supporting, lifting, and relocating the house. The number of technicians in each works related to the number of the house column because once the house was lifted, every column had to be moved. Stability and force equilibrium of the house structure were the most important factors for safety and successful house lifting process. In terms of management, the headman of the team was considered to play major parts for workmanship, materials, equipment, and budget planning and managing. The 6 to 9 technicians worked together

for only 1-2 day for each project. The budget and time spent in each project was considered much lower than renovating the house by demolition and rebuild.

5. Discussion

Local wisdom of house lifting technicians was raised and accumulated by the technicians' own experiences without the architecture and engineering background knowledge. The statement was according to the study of Ponsit Saeheng (2011) stated that the house lifting technicians used their experiences to describe, calculate and estimate the lifting and movement of the house without theoretical principle. The renovation problems found in this study were similar to the study in others area in Thailand especially for extending ground floor depth, raise house floor beyond the flood level, and solving house settlement problem. (Luckana Anonghai, 2010 and Bodin Hompikul, 2013) The difference problem found in Buri Ram province was the renovation due the waterlogging at ground level due to the higher land level around the house caused by land and road embankment. The process of temporary lifting the house, remove and replace the columns, recast the pier and footing, reset the wall alignment, and relocating the house were the process that most local house lifting technicians in Northeastern part of Thailand were used. (Terdthai Rattanatham, 2017 and Tharapong Rattranatrakul and Uthai cholthansarit ,2003) The local wisdom of lifting house process for renovation was considered to spend less time and budget compared to demolition and rebuild the house. Study of Bodin Hompikul (2013) supported that house lifting local wisdom was a self-reliance knowledge to renovate the house in local area that could be promoted as the community occupation.

6. Recommendation

1. House lifting local wisdom can be promoted as one of the community occupations especially for young generations or unemployed by creating the learning media for self learning or through training project.

2. Knowledge and experience exchanging between the local wisdom group and academic or professional personals shall be raised in order to promote the house lifting techniques and process. The short course program might be designed to raise awareness of human comfort and

safety to the technician under the architecture and engineering principle. The study of labor saving device and new technology for house lifting will also support the community occupation.

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