

A Study on the Prefab Greenhouse on the Rooftop for the Neighborhood Regeneration in Seoul, South Korea

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Abstract

In this study, we evaluated the purpose and method of new facilities for the urban farming in neighborhood regeneration during establishment of the plan for regeneration of the castle village in Haengchon District, which was recently carried out by Seoul. By utilizing the unused rooftop spaces of multi-family houses, the economic burden of residents to purchase land decreased, and although at a small scale, a method to generate profits together with neighbors is examined. So selecting the rooftop of the “Haengchon Lot”, which is the revitalization center of Haengchon-dong, the business trial and research were officially launched. Unlike vinyl greenhouse that are planned at the ground level, the prefabricated greenhouse on the rooftop has been designed. The expansion models must be lightened and miniaturized. By taking into consideration the different installation conditions of different rooftops and also taking into consideration the convenience of installation, the safety of the structure and economic costs etc.

Keywords: Prefabricated Housing, Prefab-Greenhouse on the rooftop, Urban Regeneration Neighborhood Regeneration, off-site element

1. Introduction

Recent interest in urban revitalization has increased, and with the recent revision of related laws this research has the objective of providing a realistic alternative for the revitalization of the city. Therefore, by utilizing the unused rooftop spaces of multi-family and multi household complexes, the economic burden of residents to purchase land is decreased, and although at a small scale, a method to generate shared profits with neighbors is examined. This can be viewed as an effort connected to job creation and self sustained revitalization that takes into consideration economic and social perspectives rather than mere physical revitalization such as re-development [1].



Figure 1. Condition of the Castle Village, Hanchondong, Seoul

(Source : Photo by author, 2015)

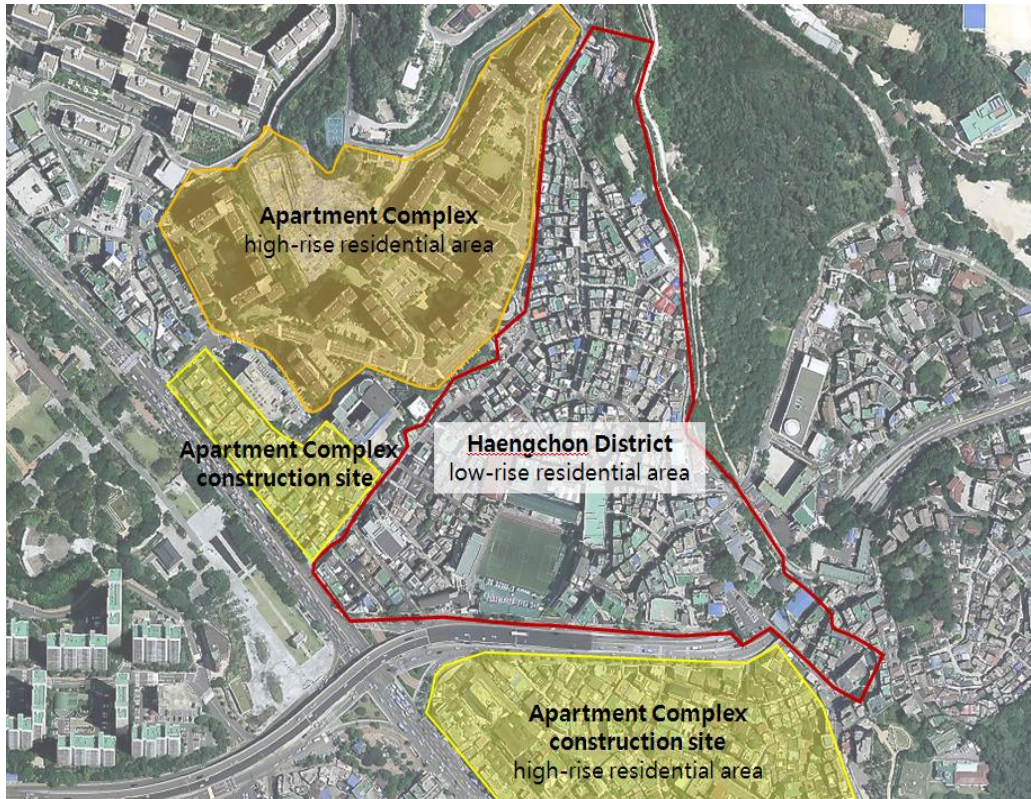


Figure 2. Condition of the Haengchon-District and Surroundings[2]
(Source : Research team of Soongsil University, 2016)

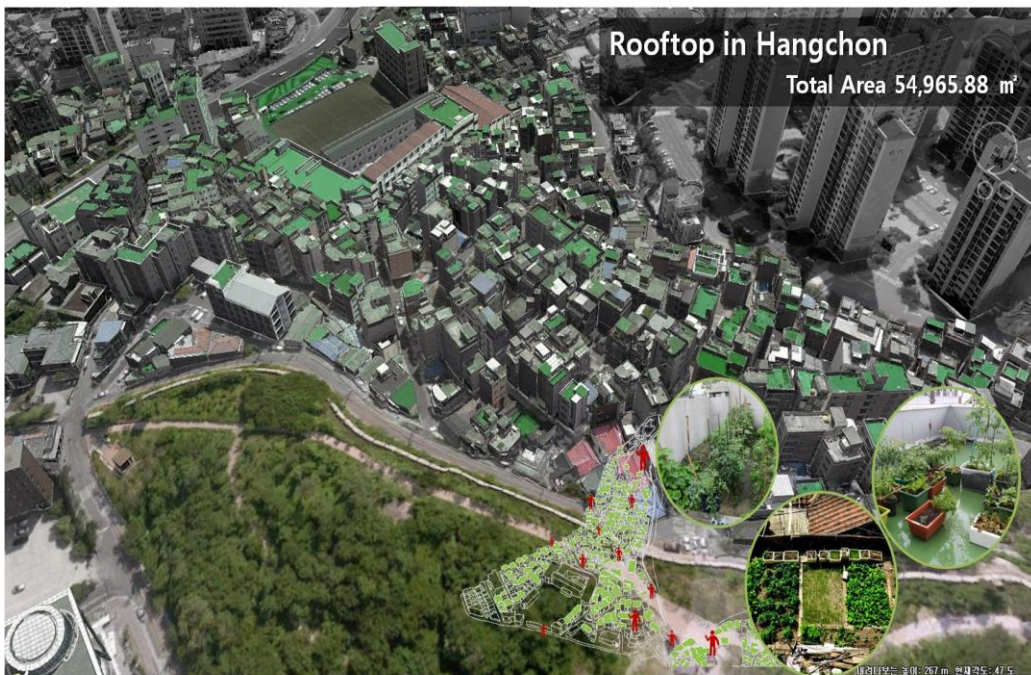


Figure 3. Condition of the Haengchon-District's Rooftop
(Source : Research team of UIA Architects, 2015)

2. Condition of the #1 Anchor Facility (Haengchon Lot)

With the support of the NRF starting in February of 2015, review and consideration of specific target locations were conducted. Later with the support of the Department of the Housing Environment Improvement of Urban Regeneration Headquarters, Seoul Metropolitan Government in May of 2015 and by selecting the rooftop of the “Haengchon Lot”, which is the revitalization center of Haengchon-dong, the business trial and research were officially launched.



Figure 4. Skim of Haengchon Lot in the Haengchon-Dong
(Source : Photo by author and Design simulation by UIA Architects, Sep. 2015)



Figure 5. Opening Ceremony for the “Haengchon Community Space (Haengchon Lot)” in the Haengchon-Dong
(Source : Photo by author, Sep. 2015)

Later under the lead of the “research team”, which established and managed theories, and the “UIA architectural design office”, which managed the project’s entire design and execution plan, the project was conducted under the cooperation of the most competent domestic professional partners such as “Shin-sung Construction”, which was in charge of the modular frame and framework, and “Dong-yang Structural Systems”, which was in charge of inspecting the structure, and “HC Bellows”, which was in charge of applying the bellows that took the shading into consideration, and “ECA&C”, which was in charge of the construction, and “Kerb”, which was in charge of the brand and packing design, and “PMA urban research center”, which was in charge of matters related to the master plan including methods to manage the indoor spaces *etc.*, and “Eloquence”, which was in charge of photography and documenting the progress *etc.* There is also continued support from the city of Seoul living standard improvement department, the execution team of Castle Town, the urban farming team of the Jongno-gu Office, the resident center of Gyonam-dong and the executive committee of Castle Town *etc.* at the civic and organizational level. [3]



Figure 6. Experts’ Consultation on the Haengchon Lot

(Source : Photo by author, Dec. 2015)

3. Program of the Prefabricated Greenhouse

As a method to reuse the forgotten and dismissed rooftops spaces to revitalize the residential spaces, a rooftop greenhouse was planned as the “internal program (utilization proposal)”.

By raising “Seedlings” at the #1 anchor facility (Haengchon Lot) of the Castle Town Haengchon-dong in Seoul and handing these seeding out to residents, by connecting this with the “Urban Revitalization University (which is the name of the education program for residents)” program currently being run, practical programs that provide substantiality to “Urban farming” is planned.



Figure 7. Situation of the Roof tops and Urban Farming

(Source : Report from UIA Architects, 2015)

The method that is currently being summarized provides an education space for urban farmers where they can freely use the space in the winter season (December to February) while in the summer this space is planned to be used as a practice grounds for raising seedlings to be handed out to residents, and there are other internal management programs continuously being discussed that take into consideration methods to connect the utility of this facility with other facilities.



Figure 8. Urban Revitalization University in Hangchon District (which is the Name of the Education Program for Residents)
(Source : Seoul City)

4. Consideration for the Prefabricated Greenhouse on the Roof Top

It was extremely important to lighten the weight for the sake of structural safety, and because the project is located in a dense residential area, it was necessary to take into consideration methods to shorten the duration of construction. Also because the multi family and multi household houses faced each other with a 3~4 m road in between, and because there was a high density of 3 to 4 story buildings, the complaints associated with the noise, vibration and dust *etc.* due to the construction had to be taken into consideration [4].



Figure 9. Consideration Methods to Shorten the Duration of Construction
(Source : Photo by author, Dec. 2015)

Unlike vinyl greenhouse that are planned at the ground level, because this project needs to be installed to the rooftop, it must be designed while keeping the design of the entire city in mind. Also because the characteristics of each region must also be kept in mind, a white base color was chosen for the color of the bellows. [5]

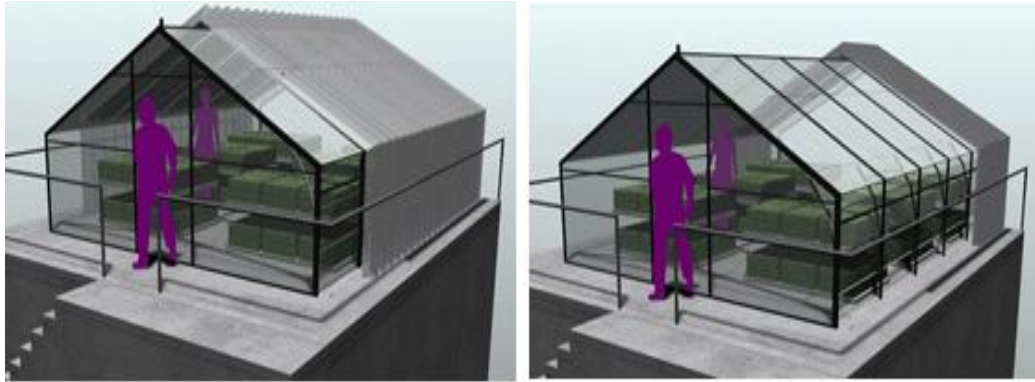


Figure 10. Field Drawing Bellows and Window System

(Source: UIA Architecture, Oct. 2015)

Also after installing the bellows, a method of diversifying the colors of the LED lights was chosen. Taking into consideration conservation of energy, SOLAR WARM AIR CIRCULATORS were planned to be installed.

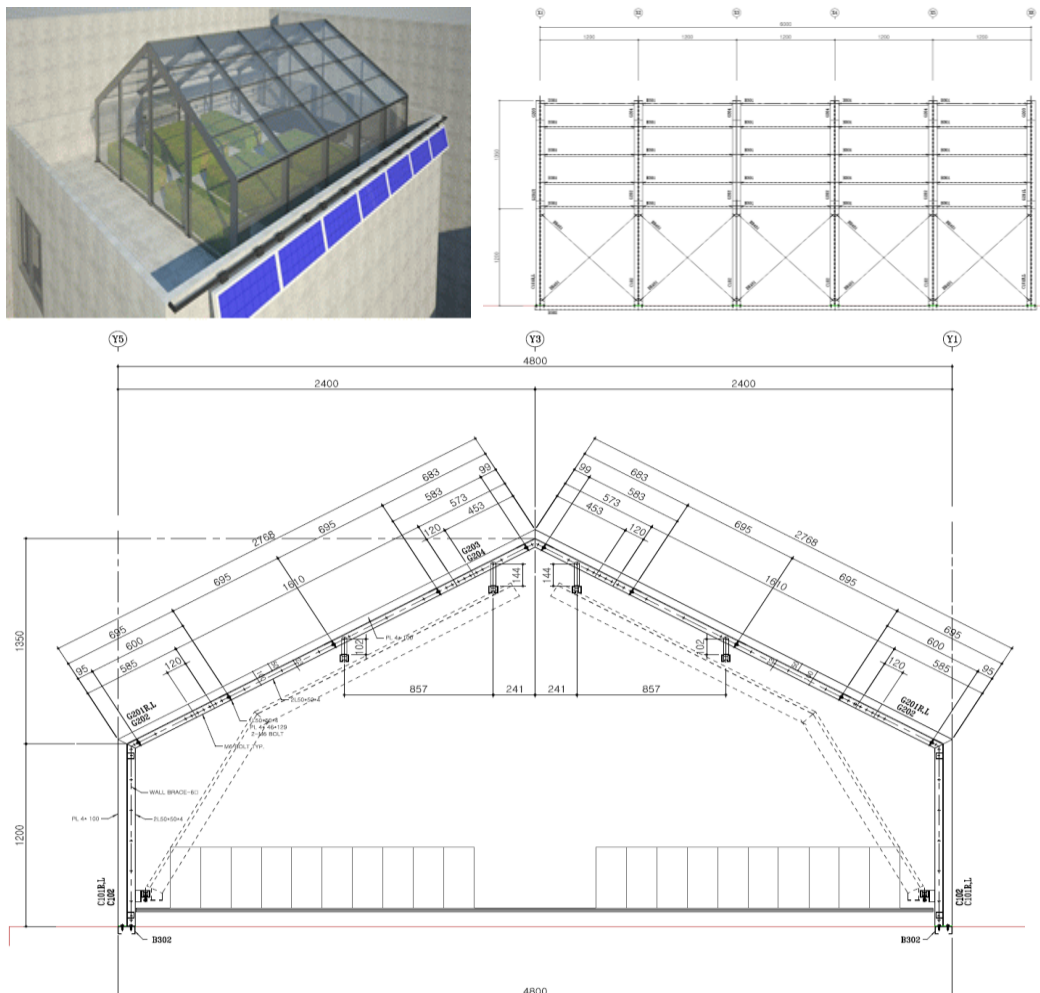


Figure 11. Modular Greenhouse for Prefabricated Frame and Solar Warm Air Circulator

(Source : UIA Architects, Nov. 2015)



Figure 12. Experts' Meeting for the Prefabricated Greenhouse
(Source : Photo by Author, Dec. 2015)

5. Process of the Test-Bed for the Prefab Greenhouse

The newly planned modular greenhouses will be installed to the “Haengchon Lots”, which are 3 story buildings remodeled as the village revitalization centers of the Haengchon Village. By re-modelling the multi-family houses, the lower floors are planned to offer support as urban farming support programs in order to encourage green revitalization of the village.

After inspecting and strengthening the structural safety of the roof, a green house that is connected to the internal stairway of the 3rd floor will be installed. The Mo-jong seedlings will be grown in this space and farming education *etc.* programs are also planned to be conducted here.

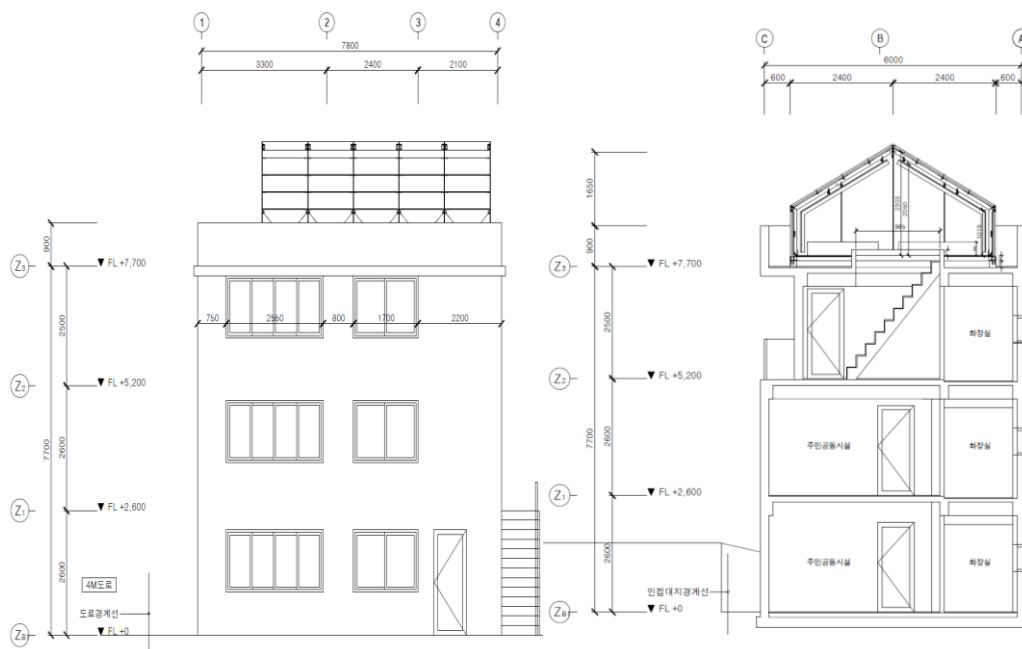


Figure 13. The Prefabricated Greenhouse on the #1 Anchor Facility (Haengchon Lot)

(Source : UIA Architects, Nov. 2015)

[STEP 1]

Presentation for residents and borough office



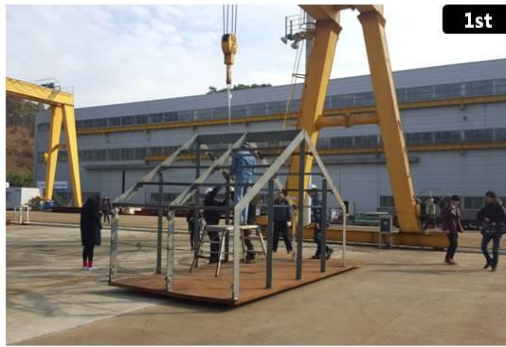
[STEP 2]

Experts' Meetings for Design and Structure



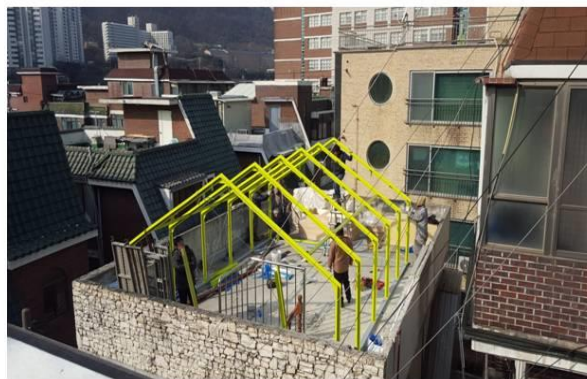
[STEP 3]

Modular Frame by "SG Shinsung"



[STEP 4]

Frame Design and Setting by "SG Shinsung" and "EG A&C"



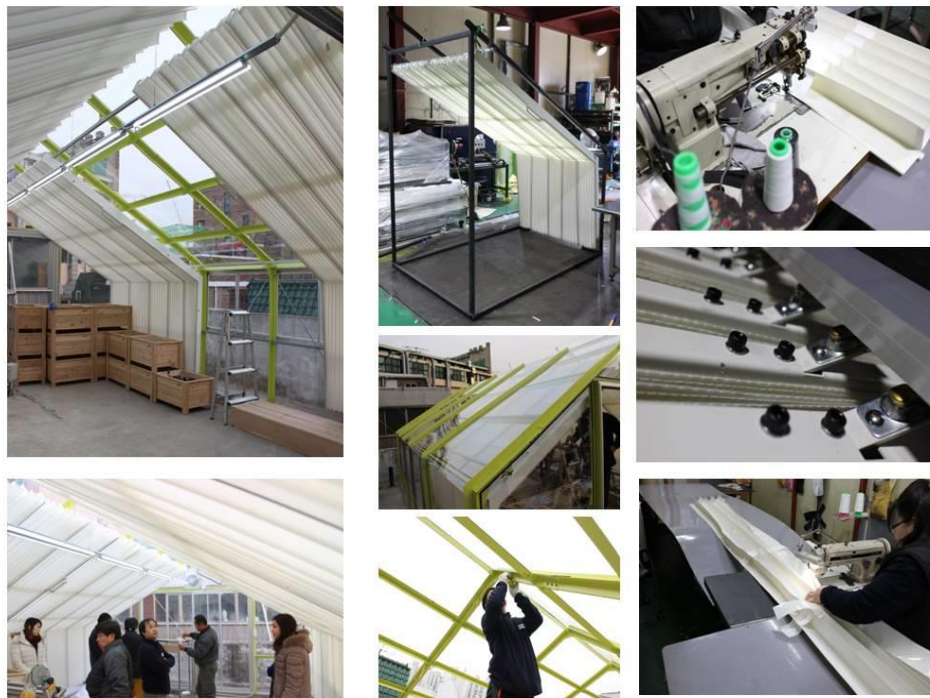
[STEP 5]

Window and Doors by "EG A&C"



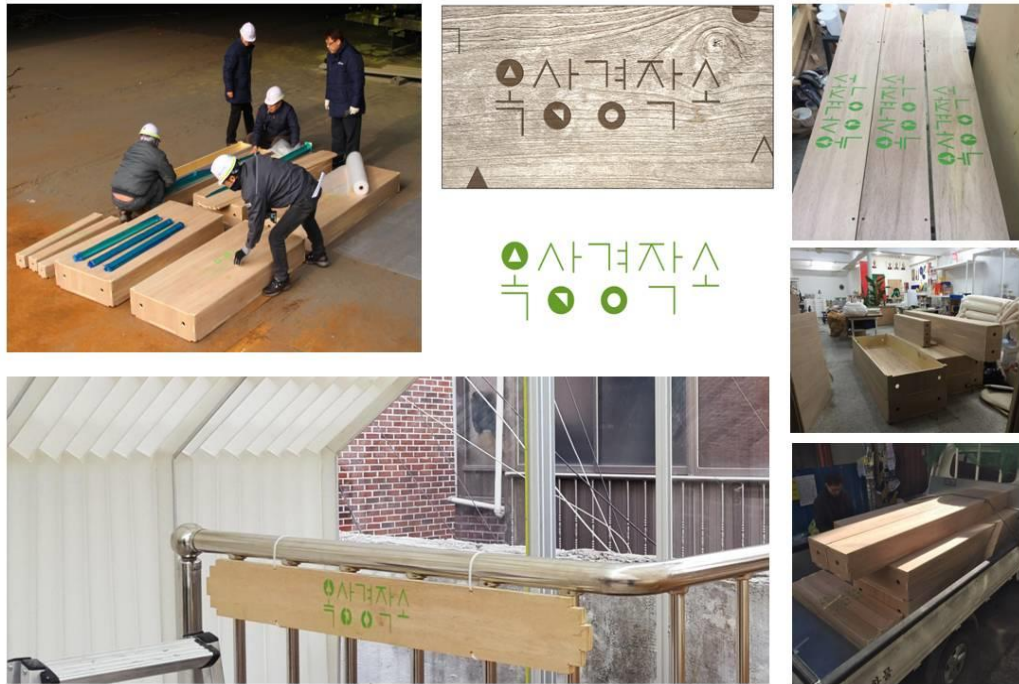
[STEP 6]

Shading of Bellows by "Haechang"



[STEP 7]

Packing and symbol by 'Kerb'



[STEP 8]

Inside of Greenhouse

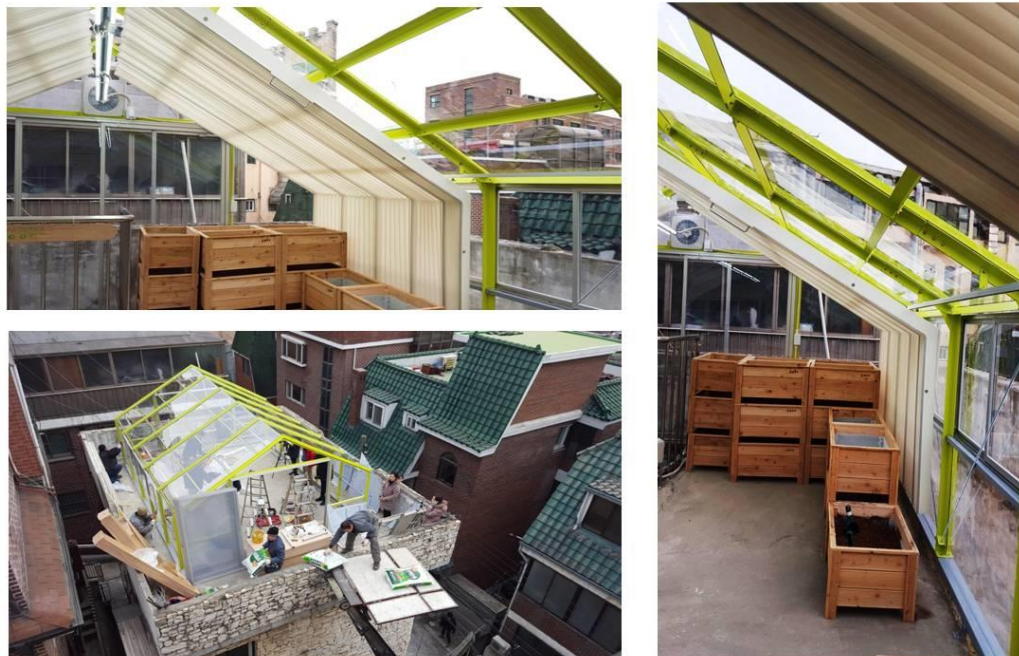


Figure 14. The Prefabricated Greenhouse Process

(Source : by Author's Presentation in International conference at Manila, Feb. 2016)

6. Conclusion

There have been previous limitations that the Prefabricated Greenhouses had to be constructed using Hybrid construction methods and it was only possible to build the greenhouses as an extension in accordance with the law. But for the sake of the expansion of this project, it must be possible to build the green houses as temporary construction buildings instead of extensions through the revision of roof top construction related laws, and development of the greenhouses must be continued so that the packing is made easier. Unlike the test bed that has been installed to anchor facilities, the expansion models must be lightened and miniaturized. By taking into consideration the different installation conditions of different rooftops, convenience of installation, safety of the structure and related economic costs *etc.*, there is a need for continuous research and development that will help spread the installation of this project.



- ✓ Using hybrid construction methods
- ✓ Extensions by revising rooftop construction regulations
- ✓ Development of packing easier
- ✓ Be lightened and miniaturized
- ✓ Continuous research
- ✓ Consideration the installation conditions of different rooftops
- ✓ Convenience of installation
- ✓ Safety of the structure
- ✓ Related economic costs

Figure 15. Consideration for the Prefabricated Greenhouse's on the Rooftop in Low-rise Residential Area in Seoul

(Source: by author, Feb. 2016)

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