

IMPROVEMENT OF TACT SCHEDULE MANAGEMENT PROCESS FOR THE FINISH WORK OF APARTMENT HOUSES

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Abstract

This study determined tact process paths by separating the finish works according to the properties of work areas and work relations in order to apply the tact schedule management to the finish works. In addition, by suggesting preparing and sharing the workflow charts, the experiments can be shared between the executors and any possible frictions between the specialist works can be identified in advance. In addition, any errors on the plan can be reviewed and modified through the measurement stage of tact plan attainment rate. The process of tact schedule management is improved with such tools and methods and the efficiency of the process through the application of cases was verified.

Keywords: Tact, Schedule Management, Workflow Chart, Tact Plan Attainment Rate

1. Introduction

Finish Works are carried out by a variety of companies, and the works are affected by many factors such as materials, labor, weather, the air condition, resulting in a complex process of production. This kind of environment of the Production led to wasting times like interference between the works, reworks, deferred works, and excess time for works. The study of KIM, Young-Jae (2003) shows that 45 % of the periods for the finish works is spent in doing nothing. Hosing and Urban Statistics Manual published by Housing and Research Institute (2005) shows that apartments account for the largest amount of 87.3% of the 42.7% of the residential area in terms of building permit area. In addition, as there are many similar units on the same level in apartments, it is considered that Tact schedule management of planning and managing repetitive works is efficient in apartments.

Therefore, this research limits its targets to the finish works of apartments, which accounts for a large amount of residential area and are relevantly standardized.

In order to apply Tact schedule management, there should exist a path for Tact works with direct work order, and there need efforts to identify and eliminate any possible frictions between works before beginning them. However as for the finish works of the study area, there are complicated correlations between works and the works occasionally are operated simultaneously. Therefore the study suggests dividing works according to characteristics of work area and correlation between the works, and then determining several tact work paths. In addition, it aims to reduce the work frictions and increase the reliability of the works by making workflow chart and measuring Tact Plan attainment rate.

2. Preliminary Study

2.1 Concept and Purpose of TACT Schedule Management

Tact Schedule Management is the process which continuously plans and manages the work flows by determining the work areas with the same kind of jobs and uniting the resources and the work hours.

The properties of tact schedule management can be explained by the work continuance by specific works and work continuance of work space. Work continuance by specific works can improve productivity through learning effects by job, while the continuance of work space can make the work order and work relations unilateral with less chance of problems and rapid response and anti-reoccurrence effects in case of problem occurred, leading to lesser spare time and waiting time.

The previous study suggests that there are limitations where specific application methods considering different relations between specialist works are not able to be suggested, due to the suggestion of application methods limited to single finish works of specialist ones and the construction of frameworks as well as the theoretical study for the application of tact schedule management.

To solve such problems, the introduction of tact schedule management is needed since it plans and manages the correlations and order of works to be unilateral and repetitive.

2.2 Literature Review

YUN, Yu-Sang (2005) suggests the Tact time selection method by 3 point tracing method to secure job continuance and the establishment method for the tact schedule management which enables to adjust the job base to tact time base. KIM, Yung-Jae (2003) suggests the process model as a method to reduce the period of finish works with the repetitive process, but consideration with the characteristics of finish works and interference elements on the job continuance were lacked there. YUN, Yu-Sang (2003) suggested a system of the separation of job areas by specialist work with the consideration of job properties. However, it is difficult to establish a whole plan for the specialist works since the correlation between specialist works is not considered. SEO, Sang-Wok (2003) suggested communication tools and information sharing between partners and an executor by examining the problems of existing tact schedule management and establishing tact schedule management system. KIM, Sun-Guk (2003) examined the problems through the investigation on the field management system and developed a partner-oriented system, which was normally executor oriented in the past. Although Bashford (2003) demonstrated the superiority of the uniformity of resources injection through the analysis of simulation by equalizing the injected resources and time to secure job continuance, further research is needed regarding the application on the construction sites in a theoretical way.

2.3 Identification of Problems on the Fields

Problems concerning the process management were identified by examining literature as well as interview with managers on sites in South Korea.

First, according to the results of the investigation on the period of finish works, it was found that 45 % of the work hours are wasted during the work period.

Second, finish works have relatively short work period in the work area compared with the construction of frames as well as properties of potential learning effects through repetitive operation since the operation of the work teams can be carried out flexibly. However, since there are many restrictions due to the complicated linkage with different specialist works, it is difficult to expect to increase the productivity through repetitive operation.

Third, finish works are numerous carried out at the same time with the other specialist works within the certain work areas unlike the construction of frames. The continuance job operation of finish works is linked to the pre-construction and post-construction, which consider the execution. However in executing the current finish works, the analysis on the linkage with other specialist works and the execution are not systemically prepared and frequent work frictions with other specialist works occur.

Fourth, many partners participate in the finish works. The communication between executor and partner is done by the submission of execution plans and job order, and check of execution. However it is in the situation where the communication between the unit partners which actually carry out the construction is not smooth.

Finally, due to the properties of finish works, any change in the schedule of specific process will affect on the process plans of the different types of works which are linked in order of precedence. However the field process management system or time is not in favor of the management which keeps linking any changing elements due to the occurrence of risk factors with the early process plans.

2.4 Improvement Methods

The work continuance by specialist works of tact schedule management can improve the productivity through learning effects of each work and the work continuance of work space can gain the effects of rapid response and anti-reoccurrence effects with less problems, resulting in the less spare and waiting time. However the previous tact schedule management needs the tack operation paths which are constructed in the direct work order, and it also needs measures to any possible restrictions such as frictions between pre- and post-constructions due to difficulty in maintaining the continuous process plans.

This research allows to apply tact schedule management to finish works by separating complex work process of finish works and establishing several tact work paths, and to identify and eliminate the restrictive elements such as wasting factors during the works by analyzing the workflow between various types of works and productivity of detailed specialist works and suggesting communication tools between executors and partners. In addition it allowed reviewing and modifying any errors in the plans at the early stage by measuring the tact plan attainment rates.

3. Process for the field application of tact schedule management

The process for the application of tact schedule management can be separated into the basic process plan stage, detailed process plan stage, and process operation stage.

The figure 4.1 shows the process for the tact schedule management for the finish works.

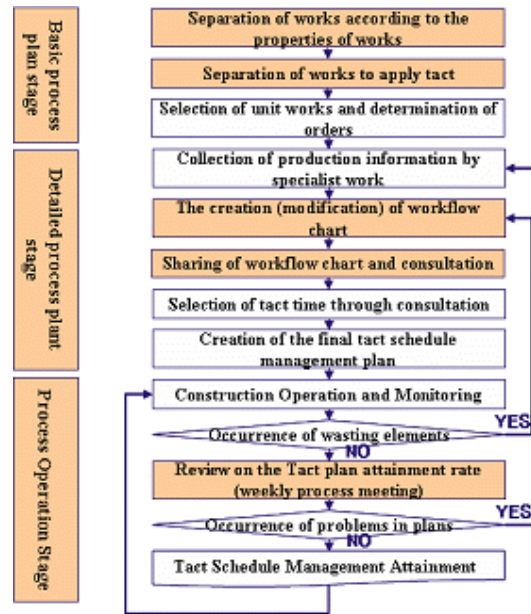


Fig 1. Tact Process

3.1 Basic Process Plan Stage

(1) Separation of works according to the properties of works

As for the finish works within a home, there are complex correlations between many specialist works such as concrete finish, masonry works, decorative design, window framing woods, ceiling, pipes, waterproofing, tiles, paperhanging, furnishings and there are work frictions due to frequent construction of many variety of works at the same time in the same place. Therefore work friction due to the work space can be reduced by separating and planning the work space based on the usage of the space.

(2) Separation of works to apply tact

Since the works which were already separated into work areas, also do not have direct orders for the tact process paths, they also need to be divided according to the workflow. By separating the works into closely related ones according to the correlation, the several formation of work groups are possible.

(3) Selection of unit works and determination of orders

In case several work groups, which were formed by job separation, need parallel works within the same work areas, the selection of major works should be selected and the order should be determined. With this the tact process paths for the finish works of a home complete and several tact process paths can exist according to the job separation and job details within a house.

3.2 Detailed Process Plan Stage

(1) Collection of production information by specialist work

Executors receive work cards for the tact process and execution plans of partners with work outline by specialist works, execution control system, specific process chart, used materials, execution results & quality, execution method by process and improvement

plans, control plans for the quality, safety and environment, and other specifications, after selecting partners.

(2) The creation (modification) of workflow chart

Since tact schedule management set the spare time as '0' in principle, the deferred works can influence on the related works. Therefore any possible wasting elements on the workflow need to be blocked through specific work analysis. The workflow chart, which is made by analyzing the workflow, eliminates the occurrence of wasting and plays a role to prevent any reoccurrence through complementary works in case of new wasting elements according to construction monitoring. The workflow chart should describe the work parts, necessary materials, frequently occurring variables, and interference with other specialist works.

(3) Sharing of workflow chart and consultation

The workflow chart, which was prepared by specialist works, aims to record the internal wasting elements of relevant specialist works with the *priori* judgment and help the smooth operation within the specialist works. In this stage the workflow charts are shared with the other specialist works and any requests can be reviewed and modified through the consultation of specialist works.

(4) Selection of tact time through consultation

Estimated work time by specialist works is determined based on the performance of similar project and experience of operator, and the tact time is determined with the consideration of target work period and workload of a project.

- Tact time: tact time refers to the work period of a work team within a tact process area or the time span from the beginning of the work to the moment of transferring to another work process area. The target work period can be calculated by dividing with the number of tact process areas.

(5) Creation of the final tact schedule management plan

The final tact schedule management plan will be completed by making tact process plans by work group and allocating the works to complete the works within the target period after selecting the tact time.

3.3 Process Operation Stage

(1) Construction Operation and Monitoring

This is the execution stage according to the final tact schedule management plan. It watches the construction process and prevents any reoccurrence of wasting factors by modifying the workflow chart by relevant workers in the case of the occurrence of wasting factors.

(2) Review on the Tact plan attainment rate (weekly process meeting)

It is an effort to modify and complement through the comparison between the plans and the actual work levels. It is carried out periodically through process meeting where all the relevant people participate in it. Tact plan attainment rate shows how much the tack process is carried out according to the tact time within a week. It is calculated as the ratio of weekly planned tact process numbers to the tact process numbers as follows:

$$\text{Tact plan ainment rate}(\%) = \frac{\text{finished works}}{\text{planned works}} \times 100 \dots\dots\dots \text{Eqn. (1)}$$

(3) Achievement of tact schedule management.

With the above process, the information on the construction process is shared, the conditions of pre-works are identified in advance, and smooth workflow is maintained through the cooperation between relevant specialist works.

4 Application Cases

4.1 Selection of Tact Process Paths

Since it is impossible to express the finish works of complex correlations as tact process paths which consist of direct orders, each tact process plan should be established by forming work groups with the correlations and selecting tact process path per each work group. The selection of work separation is needed in order for the simultaneous works according to each tact process plan. Therefore kitchen, restroom, and balcony were separated into rooms and living room according to the usage of water supply and drainage as well as the details of works.

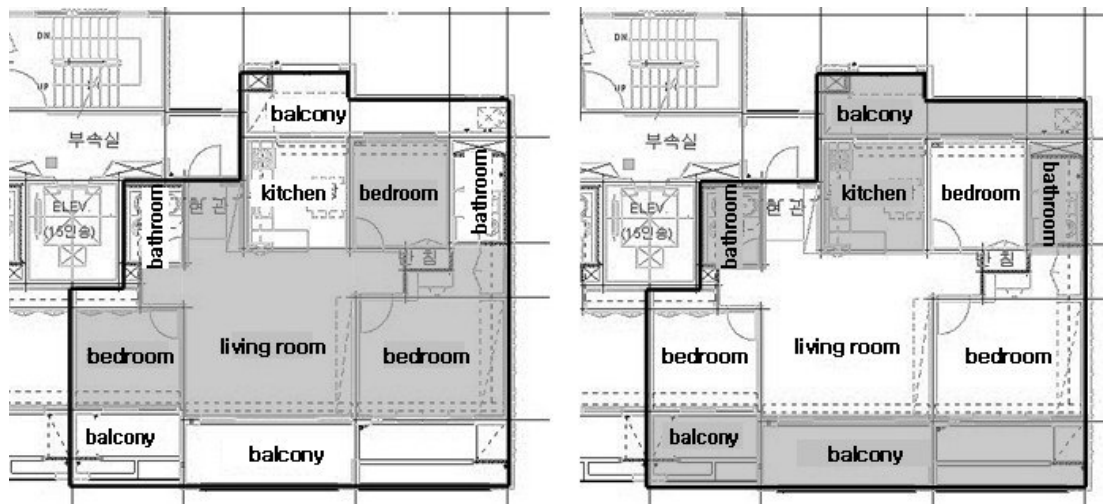


Fig 2 Work Space Divide

Since the works of each work area do not have direct work order for the tact process paths, they need to be divided again according to the workflow. The work process of finish works of hot-floored room is difficult to be carried out together with other works since it is difficult to secure the process paths and work space. Due to the characteristics, other specialist works are carried out together after the completion of the finish works for the hot-floored rooms. Therefore the finish works of hot-floored rooms are separated into pre- and post-works. In addition, in order to select the tact process paths, the work order of the finish works within a house needs to be determined.

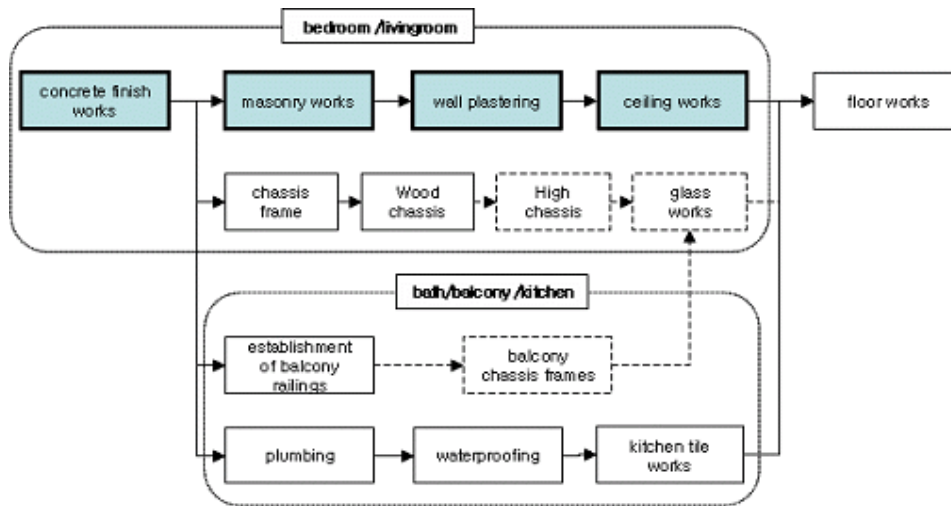


Fig 3 Selection of Tact Process Paths

The works before the construction of hot-floored rooms includes two tact process paths with different work areas with almost no linkage between them, and the application method of process is identical. Therefore it is not unreasonable to review the effects and the applicability even though applying to a single tact process path.

4.2 The Creation of Workflow Charts

By making workflow charts as a tool for the analysis of workflows and specific works between various specialist works and communication between executors, the restrictive factors during the process can be identified and eliminated in advance. Combining the workflow charts with the relevant specialist works and sharing them helps the smooth work process.

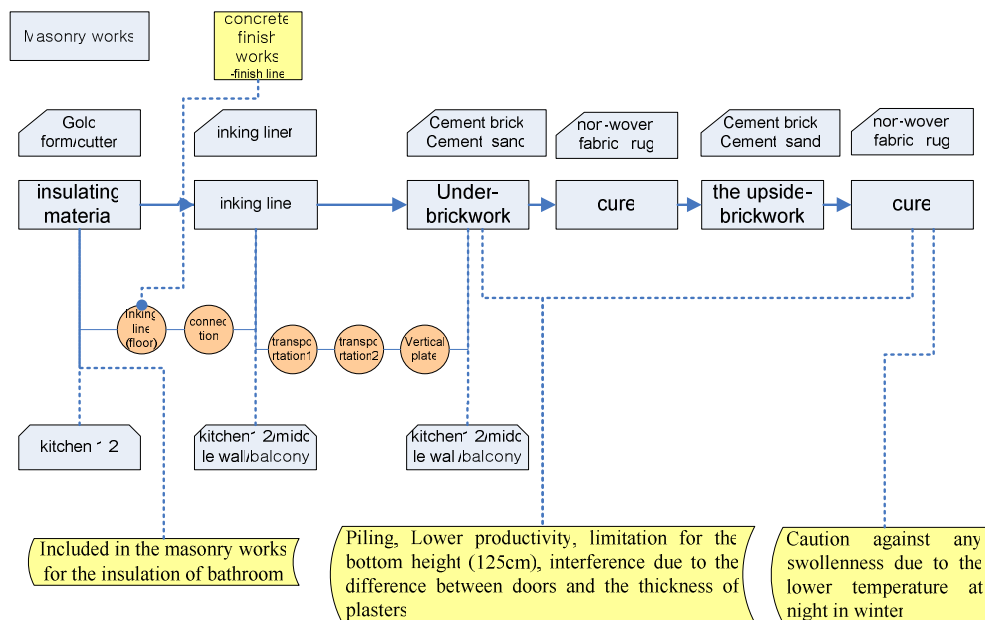


Fig 4 Workflow Charts (ex: masonry work)

4.3 Selection of Tact Time

The total number of households is 719 and the average work period in the existing estimated process chart is 180 days. Therefore, this case study determines the target work period of the case as 180 days. The (Table 1) below shows the composition of work teams, productivity of each team, and work time of each household, based on the investigated data.

Table 1 productivity information

Tact work		Workteam organization	Output/team day	Time/ household
Concrete finish work		Artificer 4	2 household	0.5 (day)
Masonry works	lower part	Artificer 2 , aid 1	2 household	0.5 (day)
	upper part	Artificer 2 , aid 1	2 household	0.5 (day)
Wall plastering		Artificer 2 , aid 1	1 household	1 (day)
Ceiling works		Artificer 1 , aid 1	1~1.5 household	0.75 (day)

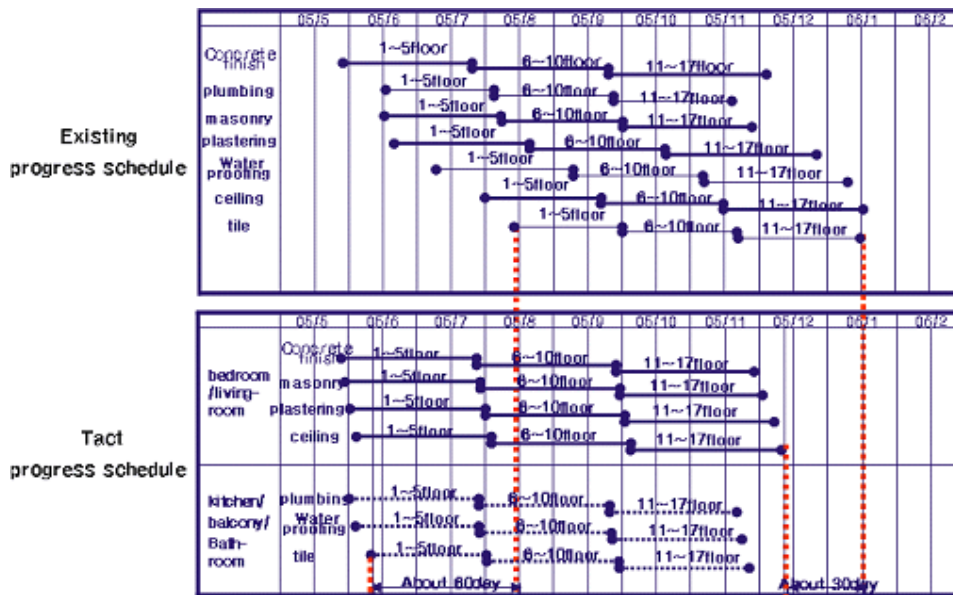
By dividing the selected work period of 180 days by the total number of households, 719, the daily target productivity will be 4 households, that is, the tact time was determined as 0.25 days. The number of injected work groups can be calculated by dividing the work time per household by the tact time.

Table 2 Selection of Tact Time

Tact work		Aim Output/day	Tact time	Work team
Concrete finish work		4 household	0.25 day	2
Masonry works	lower part	4 household		2
	upper part	4 household		2
Wall plastering		4 household		4
Ceiling works		4 household		3

4.4 The Analysis of the Case Study

It was found that about a month of reduction in the work period is possible if applying the tact schedule management. Since this case only targets the pervious works before the plastering works of the hot-floored room rather than the whole finish works and the possible execution moment for the hot-floored rooms are 60 days earlier than the existing management, much greater effects are expected with the application of tact schedule management to the whole finish works.



5. Conclusion

This study determined tact process paths by separating the finish works according to the properties of work areas and work relations in order to apply the tact schedule management to the finish works. In addition, by suggesting preparing and sharing the workflow charts, the experiments can be shared between the executors and any possible frictions between the specialist works can be identified in advance. In addition, any errors on the plan can be reviewed and modified through the measurement stage of tact plan attainment rate. The process of tact schedule management is improved with such tools and methods and the efficiency of the process through the application of cases was verified.

This research draws the effects of the application of the tact schedule management with the case application in the planning stage through interview with working-level officials, but its efficiency of the process management stage still needs to be verified with actual application to the field. In addition, multilateral research should follow regarding the improvement of the schedule management with the ongoing study on the tact schedule management as well as other techniques.

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