Procedure to Develop a Guideline for Quality Visual Inspection of Housing Construction Projects

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Abstract

This study presents a procedure of a guideline development for quality visual inspection of housing construction projects in order that quality visual inspection by personal judgment to be in the same guideline especially some part of construction which are difficult to inspect by using personal judgment for consideration to accepted or unaccepted. This study starts with skin of concrete structure, bricklaying, plaster, finishing with tile and painting that most inspectors usually difficult to inspect by visualize. In this study used to analyze the mean of statistic of acceptable by using visual inspection and the results of this can make to be procedure of a guideline development to applied for quality visual inspection in others.

1. General Introduction

In housing project construction at the present, the most of housing projects which are been selling at present are pre-built housing since the proprietor cannot perceive the problem of the construction. Therefore the developers guess the importance of quality construction inspection in the beginning and at the end because the inspection which is correctly and properly will be a quality and reduce the defect of the construction.

Quality construction inspection is importance because most of developers will have the standard in the inspection process including the persons in quality inspection unit for the best quality. However, then the inspection construction will have the standard of the inspection but the parts of the quality construction inspection which is visualized depending on the personal judgment of the inspectors. So, determining the standard of a guideline for the visual quality construction inspection will be important in order that the output is similar to the standards.

2. Principle

2.1 Construction Quality

Quality is one of the standardization objectives, the quality of the product or a building or other construction is the totality of its attributes that enable it to perform a stated task or to fulfill a given need satisfactorily for an acceptable period of time.

The term “Quality” has different meaning for many people. However, two use merit quotation of the quality of things are that the first is appropriate to both buildings and construction product: a particular class, kind or grade of anything, as determined by its quality. The second is particularly apposite for quality assurance.

2.2 Construction Inspection

Base on human natural and the individual psychology, if the customers have a doubt of the quality construction, we require the construction inspection that usually is quick to affirm the construction. Whole economy, the housing project construction is built on

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the roles of the buyer and seller. The rule of the caveat emptor is not only philosophical, but new construction inspections are usually performed immediately after their new home have been built and considered "ready" for occupancy by the builder and appropriate legal authorities.

The construction inspectors must be familiarly and understand the plan, specification and details and can be able to compare the work with the requirement of the document. Moreover, the inspectors must be able to identify and reject any unsatisfactory work or keeping and would be able to record of what was rejected and for what reasons. In additions to construction inspection, the inspectors must be able to look upon and can view critically the particular part of the construction project and must also to have ability to evaluate and analyze of what is inspecting. The construction inspection consists of many methodologies to inspect in each part of work which the inspectors will consider on suitability. The methodologies of inspection can define as follows:

2.2.1 Drawing Inspection

One method of construction inspection is to inspect by checking the details in accordance with drawing. The drawing inspection will inspect through considerate such as detail, position, dimension, size, spacing and etc. which to be correctly and accurately as the drawing.

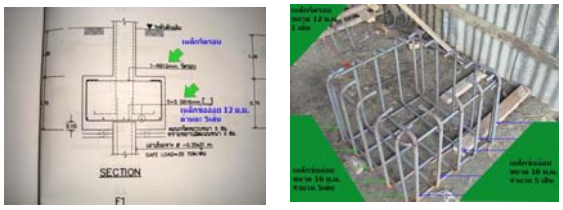

Figure 1 Drawing Inspection of detail reinforcement

2.2.2 Specification Inspection

Specification inspection is the inspection which considerate base on material specification that the owner/developers specified in the drawing. This inspection method is that the inspector would be ensuring that work is done according to design specifications.

Figure 2 Material Specification Inspections

2.2.3 Standard Inspection

Normally, construction procedure shall provided in manual, code or standard which are permitted or approved by the organization, institute or association such as ASTM, ACI, JIS, TIS, EIT, etc.

Figure 3 Inspection from standard Inspection

2.2.4 Visual Inspection

Visual Inspection is the quality inspection which will be evaluated from eyesight of the inspectors base on personal judgment. This cannot indicate or measure because of the decision on balancing of each inspector is inequality. The visual inspection of the building was not to be done with intention of writing technical report. The inspectors neither had the time nor equipment to thoroughly check. The inspector will perform only a visual inspection of the house to determine the quality

construction integrity as they are found on the day of the home inspection.

Figure 4 Visual Inspection for skin of concrete structure

2.3 Housing Construction Inspection

The initiation knowledge of housing construction inspection is new-home inspection which is only the end-point of the inspection, and then the buyers cannot check the completely especially the strength of structural. The best solution is to inspect during construction through consummation. However most housing projects in real estate term are the pre-built housing then buyers cannot know whether or not these houses will have defects in the future.

3. Study Methodology

3.1 Type of Study

A study of "Quality Visual Construction Inspection" is concerned evaluation by personal judgment which is the "Quantitative Research" as descriptive study to use for development by using survey study of the questionnaires.

Quantitative Research is to collect the data as numerical that can analyze and conclude by using statistic system.

3.2 Sample Group and Tool of Study

The sample groups of the inspector are using in 2 steps of this study:

1. To define the criteria of visual inspection: 25 inspectors who work as inspector for 5 – 8 years.
2. To use for questionnaires as show in Table:

Table 2 Detail of sample group

Company	Number of Inspectors		
	1 – 3 years of Experience	3 – 5 years of Experience	5 – 8 years of Experience
A	8	15	7
B	10	8	7
C	7	5	3

3. To use for verify result amount 5 persons who have experience in quality visual inspection more than 10 years.

Tool and method of this study are 3 parts questionnaire as follows;

1. General Information.
2. Opinion of questioners concerned pictures of quality visual construction following 5 work items:
   - Concrete structure 20 pictures
   - Bricklaying 11 pictures
   - Plaster 9 pictures
   - Finishing with Tile 22 pictures
   - Painting 15 pictures
3. Suggestion of the experience in quality visual inspection about pictures and improvement.

3.3 Data Collection

The data collection will use the questionnaires which will be distributed to persons in quality inspection unit of housing construction projects to study the method and guideline inspecting the construction.

The criteria of visual inspection in each item and defect concluded by the most opinion of 80% of 25 inspectors when they evaluated by using visual inspection which concerned about the check points which the most inspectors' amount 20 persons (80% of 25 inspectors) will found in the inspection.

3.4 Data Analyzing

Score rating and Statistic system is used for this study because assessment is widely used in questionnaires. Descriptive statistic is the characteristic study of percentage, mean of data by description.

Work Items	Inspection	Percentage of data																							
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
1.Skin of concrete structure	Y	72.9	77.1	58.6	41.4	75.7	74.3	58.6	44.3	74.3	67.1	90	90	52.9	94.3	94.3	52.9	95.7	91.4	94.3	97.1	-	-
	N	27.1	22.9	41.4	58.6	24.3	25.7	41.4	55.7	25.7	32.9	10	10	47.1	5.7	5.7	47.1	4.3	8.6	5.7	2.9	-	-
2.Bricklaying	Y	88.6	74.3	84.3	92.9	95.7	75.7	92.9	77.1	82.9	37.1	38.6	-	-	-	-	-	-	-	-	-	-	-
	N	11.4	25.7	15.7	7.1	4.3	24.3	7.1	22.9	17.1	63.9	61.4	-	-	-	-	-	-	-	-	-	-	-
3. Plaster	Y	80	77.1	82.9	48.6	82.9	61.4	32.9	37.1	58.6	-	-	-	-	-	-	-	-	-	-	-	-	-
	N	20	22.9	17.1	51.4	17.1	48.6	67.1	62.9	41.4	-	-	-	-	-	-	-	-	-	-	-	-	-
4. Finishing with tiles	Y	61.4	78.6	92.9	97.1	60	32.9	85.7	60	54.3	67.1	34.3	74.3	82.9	85.7	51.4	15.7	35.7	58.6	91.4	94.3	94.3	47.1
	N	38.6	21.4	7.1	2.9	40	67.1	14.3	40	45.7	32.9	65.7	25.7	17.1	14.3	48.6	84.3	64.3	41.4	8.6	5.7	5.7	52.9
5. Painting	Y	80	87.1	65.7	88.6	91.4	52.9	55.7	62.9	81.4	87.1	92.9	90	51.4	90	92.9	-	-	-	-	-	-	-
	N	20	13.9	34.3	11.4	8.6	47.1	44.3	37.1	18.6	12.9	7.1	10	48.6	10	7.1	-	-	-	-	-	-	-

"Y" means the inspectors accepted the quality of construction by using visual inspection.

"N" means the inspectors unaccepted the quality of construction by using visual inspection.

4. Verifying Results

The result of this study can be verified by interviewing the experts or senior inspectors amount 5 persons who have experience in quality visual inspection more than 10 years for check the conclusion of most inspectors about the definition of the pictures relevant quality visual inspection.

Concrete Structure

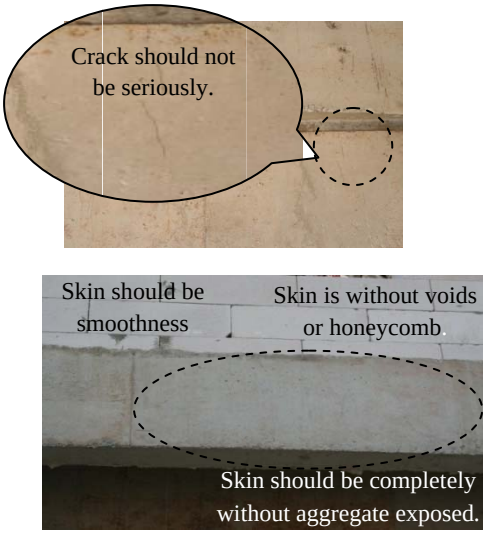

Figure 5 concrete structures for Visual inspection

Bricklaying

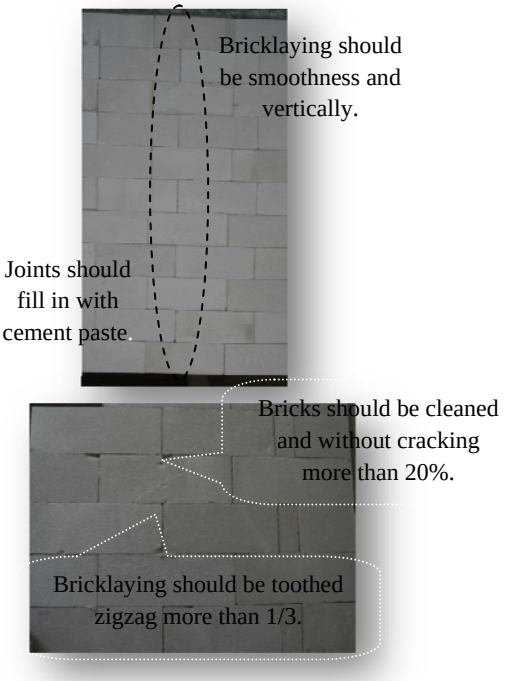

Figure 6 Bricklaying for Quality Visual Inspection

Plaster

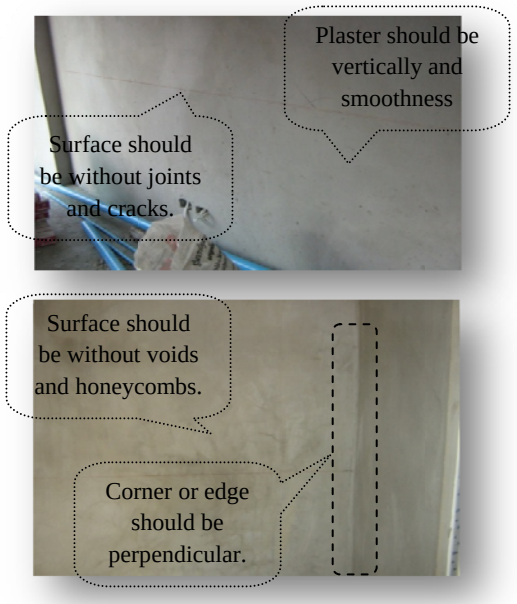

Figure 7 Plasters for Quality Visual Inspection

Finishing with tile

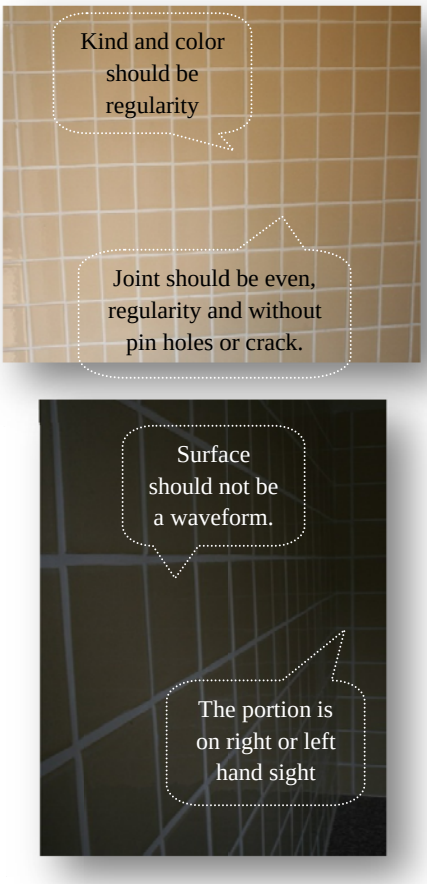

Figure 8 Sample pictures of finishing with tiles for Quality Visual Inspection

Painting

Figure 9 Sample pictures of paint for Quality Visual Inspection

5. Conclusion

From results of this study which used by Score rating and Statistic system can concluded that:

1. Pictures of Skin of concrete structure have mean 74.9% and percentage of data more than mean are figure 2, 5, 11, 12, 14, 15, 17, 18, 19 and 20.

2. Pictures of Bricklaying have mean 76.3% and percentage of data more than mean are figure 1, 3, 4, 5, 7, 8 and 9.

3. Pictures of Plaster have mean 73.8% and percentage of data more than mean are figure 1, 2, 3 and 5.

4. Pictures of Finishing with Tiles have mean 63.7% and percentage of data more than mean are figures 2, 3, 4, 7, 10, 12, 13, 14, 19, 20 and 21.

5. Pictures of Painting have mean 72.1% and percentage of data more than mean are figures 1, 2, 4, 5, 9, 10, 11, 12, 14 and 15.

The most definitions of this study will be prototype to be a procedure to develop a guideline of quality visual inspection for housing construction projects of new inspectors who would like to use for referent.

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