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Relationships between Outside and Interior Appearance Inspection and Actual Bio-Deterioration of Structural Members in Existing Wood Houses

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1 Introduction

One of the main factors disturbing the distribution of used wood houses is the difficulty in grasping whether structural components are decayed or damaged by termites. Therefore, a visual inspection of the current state of more than 100 wooden houses was carried out, and after all the finishing materials and interior / exterior materials were removed, a biological deterioration survey of all structural members was carried out. Then, we analyzed the relationship between appearance defects and biological deterioration of structural members.

2 Methods of Appearance Inspection and Bio-Deterioration Survey

The appearance inspection and the bio-deterioration survey were conducted with reference to "Durability design and maintenance / deterioration diagnosis of wood houses" (2002) issued by the Japan Housing and Wood Technology Center.

3 Database of Inspection and Survey Results

In order to evaluate the range and the degree of the bio-deterioration, each investigated house was divided into about 900 mm square segments which linked to the information of the house attribution and the results of the appearance inspection and the bio-deterioration survey.

4 Frequency of Appearance Degradation and Bio-Deterioration

Out of 65,000 segments, the appearance degradation was found in 5,667 segments, corresponding to 8.7 %, and the bio-deterioration of the structural members was found in 1,421 segments, corresponding to 2.2 %. Figure 1 shows the incidence of them for each building part. Both of the appearance degradation and the bio-deterioration of the structural member often occurred on the 1st story and outside rather than the 2nd story and inside, respectively. The bio-deterioration of the wooden structural members were found much on 1st story rather than 2nd

story, in the elder building age, in case of short eaves and in case of low foundation. The issues known experience empirically were verified numerically.

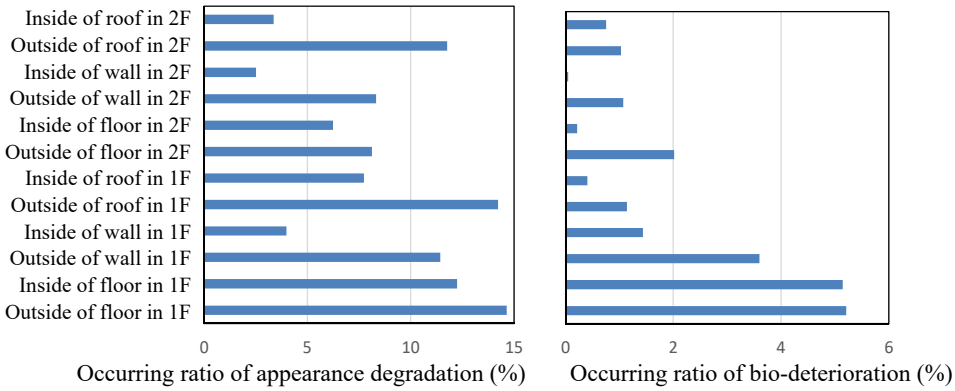

Figure 1. Frequency of appearance degradation (left) and bio-deterioration (right) in each building part.

5 Difference between Appearance Degradation and Bio-Deterioration

The number of the segments with/without appearance degradation and those with/without the bio-deterioration of the structural member were subjected to the cross tabulation, as shown Table 1. It was clarified that there was no bio-deterioration in more than 90 % of segments out of all with the appearance degradation, and that there was the bio-deterioration in only 1.6 % of segments of all without the appearance degradation.

Table 1. Cross tabulation of the appearance degradation and the bio-deterioration of the structural member.

			Appearance degradation			
			Found		Not found	
			No. of segments	Ratio	No. of segments	Ratio
Bio-deterioration of structural member	Found	2F	88	5.1 %	**129**	**0.5 %**
		1F	396	10.0 %	**808**	**2.3 %**
		Total	484	8.5 %	**937**	**1.6 %**
	Not found	2F	**1,649**	**94.9 %**	23,698	99.5 %
		1F	**3,534**	**89.9 %**	34,718	97.7 %
		Total	**5,183**	**91.5 %**	58,416	98.4 %

6 Conclusions

The results of the above-mentioned studies were concluded as follows:

- The bio-deterioration of the wooden structural members were found much on 1st story rather than 2nd story, in the elder building age, in case of short eaves and in case of low foundation. The issues known experience empirically were verified numerically.
- The tendency of the appearance degradation occurrence were the same as the tendency of the bio-deterioration partially, but didn't match it entirely.
- About 90 % of the portions whose interior or exterior appearance were degraded didn't have the bio-deterioration of the wooden structural member.
- The ratio of the portion with the bio-deterioration of the wooden structural member without appearance degradation were only 1.6 %.

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