

Survey on the Infestation of School Buildings by Termites in Pontianak

by

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Abstract

Termites cause significant economic damage to wooden structures in Pontianak thus making termites of public interest. A survey on termite infestation in Pontianak City, West Kalimantan, Indonesia was conducted from December 2012 until February 2013. Of the 437 school buildings in ix districts in Pontianak City, 10% (44 school buildings) were chosen randomly as samples. School buildings surveyed including kindergarten, elementary, junior and senior high schools. All buildings sample were a combination of wood and reinforced concrete. 100% of the surveyed buildings were infested by termites. Furniture such as chairs and tables were the most susceptible. Roofing material such as rafters and beams were the second-most frequently attacked. Ten termite species were identified during the survey; *Nasutitermes havilandi*, *Cryptotermes sp*, *Cryptotermes sp 1*, *Cryptotermes domesticus*, *Cryptotermes cynocephalus*, *Coptotermes curvignathus*, *Coptotermes kalshoveni*, *Schedorhinotermes medioobscurus*, *Microcerotermes havilandi*, and *Globitermes globosus*.

Key word: termite survey, termite infestation, school buildings, Pontianak City

Introduction

Wood is an important building material that generally performs well in residential structures. Wooden materials, however, are susceptible to wood destroying insect attacks such as termite that cause significant economic losses. The damage caused by termite attack in big cites in Indonesia such as Jakarta, Bandung, Surabaya and Batam reach more than 70% (Nandika et al, 2003). Termites in Indonesia are categorized into four general groups: subterranean, dry-wood, damp-wood and tree termites.

Pontianak is an equatorial city with tropical climate and high humidity. This condition is suitable for proliferation of termites. Survey of termite infestation in school buildings in Pontianak is important because wooden materials are common in their construction. Several studies have shown

that termite attacks in elementary school buildings approaches 100% in Medan, Sumatera Island (Syaiful, 2009; Sinaga 2010). However, those studies were limited to elementary schools.

We conducted the termite survey of termite infestation in school buildings in Pontianak City, West Kalimantan. The study sites are in six districts at an altitude ranging from 0.10 to 1.50 m a.s.l. and soil types were recorded as organosol, gley, humus and alluvial. The average annual precipitation, temperature and humidity are 340.6 mm, 27.3 °C and 84 %, respectively. School buildings surveyed including kindergarten, elementary, junior and senior high schools. All buildings sampled were a combination of wood and reinforced concrete.

The purpose of the study was to survey the spread of infestation by termite in school building located in six districts in Pontianak City, West Kalimantan, Indonesia.

Materials and methods

The survey was done in December 2012 – February 2013, in six districts located in Pontianak City, West Kalimantan to determine termite activity in school buildings and identify the part damaged. A total of 437 schools are distributed in six districts (West Pontianak, East Pontianak, South Pontianak, North Pontianak, South East Pontianak, and Pontianak City) and data was obtained from 44 school buildings (10% from total school available).

Visual inspection of termite infestation was made in 44 school buildings for this survey. Infestation was determined by the presence of damaged wooden parts, perforations, or fecal pellets (Indrayani *et al.* 2005). The inspection was started at the top of building, in the roof area, and covered both exterior and interior areas. Visual observation also covered wooden structural parts (furniture), doorframes, windows and walls (Akhtar, 1983). Later, the area beneath the floor and that surrounding the building were examined to detect any defects relevant to the infestation of termites (Indrayani *et al.* 2005). Termites were collected during the survey were placed in vials containing 90% ethanol. Samples of termites were sent to Yamaguchi University for identification.

Results and discussion

When a building is inspected for termite infestation, there are several visible signs of termite infestation: remains of alate wings, mud or shelter tubes, pellets, perforations, and damaged wooden parts. The presence of mud tubes over the surface of walls in buildings is the primary sign of a termite infestation. Subterranean termites build earthen shelter tubes to protect them from dry weather, direct sunlight, low humidity and predation. The width of these termite shelter tubes can range from 6-mm (¼ inch) to 12mm (½ inch), and can extend many centimeters in length until wood is discovered. These tubes create special microenvironment for the termites and protect termites from the drying effect of air, and maintain the termites' contact with the soil.

The survey showed that all 44 school buildings inspected in Pontianak were infested by termites. All the buildings construction was a combination of wood and reinforced concrete. When the infestation was discovered, 10 buildings (22.73%) were less than 15 years old, 13 buildings (29.55%) were ranging from 16 – 30 years old, 17 buildings (38.64%) were over 31 years old, and 4 buildings (9.09%) were of unknown age (Table 1).

Table 1. Termite infested school buildings classified by years after construction

District	Years after construction (year)			
	≤ 15	16 - ≤ 30	≥ 31	Unknown
South East Pontianak	1	2	1	-
North Pontianak	2	2	3	1
East Pontinak	1	2	2	-
South Pontinak	2	3	2	1
Pontianak City	1	2	5	2
West Pontianak	3	2	4	-
Sub Total	10 (22.73%)	13 (29.55%)	17 (38.64%)	4 (9.09%)
Total	44			

The highest rate of infestation was found in buildings over 31 years of age. This result is consistent with previous surveys (Indrayani *et al.* 2004; 2005) that found the highest rate of infestation by *Incisitermes minor* in houses more than 5 years post-construction. Jones (2004) also found infestation in some buildings that were several decades old. This may reflect the fact that older buildings have lower moisture content than that of new buildings and mostly these construction materials use wood species such as mahoni (*Switenia mahagoni*), sengon (*Paraserianthes falcataria*) and other non-durable species.

The summarized data of termite-attacked parts of buildings are shown in Table 2. As shown in the table, furniture such as chairs and tables were the most frequently attacked in the school buildings infested by termites. This type of infestation is unlike those resulting from dry-wood termite attack, which mostly occurs in roofing materials (Indrayani *et al.* 2004; 2005). Termite attacking furniture in this survey was identified as *Cryptotermes sp* which are categorized as dry-wood termites. The fact that dry-wood termites prefer wood with a moisture content less than 12% as its food source (http://www.west-ext.com/drywood_termites.html) may help explain the relationship to this pattern of infestation. The majority of the infested building parts by dry-wood termite in Indonesia is

furniture. This is unlike in Japan which dry-wood termites mostly attack roofing materials. Column / pillar structure, rafter, girder and beam in roofing area were the second-most frequently attacked parts. Other parts such as underpinning, ceiling framework, cupboard and doorframe were hardly attacked.

Table 2. Percentage of wooden parts in buildings frequently attacked by termites

Attacked parts	Number of infested buildings											
	South East Pontianak		East Pontianak		North Pontianak		South Pontianak		West Pontianak		Pontianak City	
	Unit	%	Unit	%	Unit	%	Unit	%	Unit	%	Unit	%
Underpinning	1	25	1	20	2	25	2	25	2	22,2	4	40
Girder	2	50	2	40	3	37,5	4	50	5	55,5	4	40
Column/ pillar structure	3	75	3	60	4	50	5	62,5	6	66,6	6	60
Table	4	100	4	80	8	100	7	87,5	6	66,6	10	100
Chair	4	100	4	80	6	75	7	87,5	9	100	10	100
Door	2	50	2	40	1	12,5	3	37,5	3	33,3	3	30
Cupboard	2	50	2	40	2	25	4	50	1	11,1	40	40
Ceiling framework	3	75	3	60	4	50	7	87,5	4	44,4	70	70
Rafter	4	100	3	60	4	50	6	75	2	22,2	80	80
Beam (roofing area)	3	75	2	40	3	37,5	5	62,5	4	44,4	30	30

A total of ten species of termites were present in the school buildings surveyed. The ten species identified during this survey were *Nasutitermes havilandi*, *Cryptotermes sp*, *Cryptotermes sp 1*, *Cryptotermes domesticus*, *Cryptotermes cynocephalus*, *Coptotermes curvignathus*, *Coptotermes kalshoveni*, *Schedorhinotermes medioobscurus*, *Globitermes globosus* and *Microtermes havilandi*. *Nasutitermes havilandi* was the most abundant being found in almost all 44 school buildings surveyed.

Conclusions

Increased termite problems are also related to construction material and year after construction. The highest rate of infestation was found in buildings over 31 years after construction. Furniture such as chairs and tables were the most frequently attacked parts in the school buildings infested by termites. Structural columns/pillars, rafters, girders and beams in roofing area were the second-most frequently attacked parts. Other parts such as underpinning, ceiling framework, cupboards and doorframes were hardly attacked.

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