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Perceptions & Use of Termite Resistant Treated Wood Products in the United States. Part II: The Perspective of Home Builders and Architects in Formosan Subterranean Termite Infected States

Percepcija i uporaba drvnih proizvoda zaštićenih od termita. Dio II: Stajališta graditelja kuća i arhitekata u državama zaraženim podzemnim termitima iz porodice *Coptotermes*

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ABSTRACT • This paper is Part II of a study that examines perceptions, attitudes and behaviors regarding termites and treated wood. In Part I, we surveyed homeowners and in this paper we surveyed home builders and architects. The geographic region for both Parts I and II is U.S. states where Formosan subterranean termites (FST) exist. This is a particularly voracious species of termite. Overall, in this paper, respondents are in agreement that treated wood is safe in new home construction framing and is safe if handled and disposed of properly. Forty-one percent of respondents agreed that treated wood is safe for residents in indoor structural applications. Overall, when taking into account the neutral responses, respondents have a favorable view of treated wood safety for all applications posed to them. Fifty-five percent of respondents were not familiar at all with FST. Although they had a general lack of knowledge, 29 percent of respondents said FST were a problem in the regions their companies serve.

Keywords: termites, United States, treated wood, home builders, architects

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SAŽETAK • Ovaj rad drugi je dio studije koja proučava stajališta, mišljenja i ponašanja vezana za termite i zaštićeno drvo. U prvom radu anketirani su vlasnici kuća, dok su u ovom radu anketirani graditelji i arhitekti. U radu su, kao i u prvom dijelu istraživanja, proučavane američke regije u kojima je utvrđeno postojanje podzemnih termita iz porodice *Coptotermes* (FST). Spomenuti su termiti posebno agresivna vrsta termita. U cjelini, ispitanici smatraju da je zaštićeno drvo, uz pravilnu uporabu i rukovanje, sigurno za izgradnju kuća i novih konstrukcijskih elemenata. Pritom 51 % ispitanika smatra kako je zaštićeno drvo pri uporabi u unutarnjim uvjetima sigurno za ljude. Općenito, kada se uzmu u obzir i neutralni odgovori, ispitanici imaju pozitivno mišljenje o uporabi zaštićenog drva u svim ispitivanim uvjetima i situacijama. No 51 % ispitanika uopće nije informirano o podzemnom termitu (FST). Iako većina ispitanika malo zna o podzemnim termitima, 29 % njih izjasnilo se kako su u regijama u kojima djeluju njihove tvrtke imali problema sa spomenutim termitima.

Ključne riječi: termiti, Sjedinjene Američke Države, drvni proizvodi, graditelji kuća, arhitekti

1 INTRODUCTION

1. UVOD

The wood treating industry in the U.S. was an estimated to be \$4.5 billion dollars in 2008 (Vlosky, 2009). Pressure treated wood has become an important commodity in U.S. markets with 50 million U.S. homeowners having pressure treated wood structures (Eisler, 2003).

Commercial wood preservatives have been broadly classified as either water based or oil-type depending on chemical composition of the preservative and the carrier used during the treatment process (USDA, 2005). All treatments in the liquid phase generally depend on movement of the liquid preservative into the wood (Freeman *et al.*, 2003). Oil-type preservatives are further divided into oilborne preservatives and creosote and creosote solutions (Prestemon, 1994).

The volume of wood treated with copper based preservatives grew rapidly during the 1970s and 80s and remains high today (Freeman and McIntyre, 2008). Since the 1970's, the majority of the wood used in residential settings was CCA-treated wood (CPSC, 2005). Preservative-treated wood is economical, durable, and often aesthetically pleasing.

There has been a growing public concern regarding the safety of treated wood. In particular, the concern regarding disposal has heightened as a result of greater public awareness of potential dangers from arsenic that has been generated as a result of a recent U.S. Environmental Protection Agency (EPA) ruling that stated that the wood preservative industry has voluntarily decided to halt production of CCA-treated wood for consumer uses. In previous research conducted by the authors, consumers were found to have reservations about using treated wood in their homes. The perceptions of treated wood by the public may be the cause of a credibility problem for the wood industry. For example, in a 2001 study, only 27 percent of U.S. homeowners indicated that they trust wood claims made by wood product suppliers (Vlosky and Shupe, 2002).

In recent years there has been renewed interest in wood durability in terms of residential housing. In the U.S., home builders and architects are primarily responsible for the majority of treated wood that is purchased for new home construction. The market place has become increasingly competitive as non-wood al-

ternatives (i.e., steel and concrete) continue to gain market share by marketing a "non-toxic and uniform" product. However, these products continue to increase in price as the global demand for steel and concrete continues to rise. With regards to preservative-treated wood, there have been tremendous changes in the consumer market. Builders and architects are being forced to select from waterborne preservatives that they likely have less familiarity than CCA. Some of the preservatives such as alkaline copper quat (ACQ) and copper azole (CA), although viewed as "new," have been in use for a decade or more, primarily overseas. Many treaters are now using these preservatives rather than CCA. The three largest wood-preservative manufacturers in the U.S., Arch Wood Protection, Chemical Specialties, and Osmose, have been transitioning from CCA products to alternative, arsenic-free products. This new generation of preservatives—which includes Alkaline Copper Quaternary (ACQ) and Copper Azole (CBA)—makes use of organic copper-based formulas (BobVilla.com). Other alternative water-borne preservatives anticipated to increase in use include borates and sodium borates (SBX), copper HDO, and propiconazole-tebuconazole-imidacloprid (PTI). ACQ is the most widely used alternative currently being used in the United States exceeding usage of CCA in 2004 (Vlosky, 2006) but below CCA usage in 2007 (Vlosky, 2009).

Any treated wood preservative must be safe when used as directed. In addition, ecologically benign alternatives to traditional preservatives should be utilized if possible. Examples are organic-, nano-, and borate-based preservatives.

A previous study of home builder perceptions of preservative-treated wood found that that only one percent of respondents had an extremely negative perception of treated wood while 38 percent had a somewhat positive perception and 32 percent had an extremely positive perception (Vlosky and Shupe, 2004). Sixty-one percent of respondents felt that treated wood is safe for human in outdoor applications and it is safe if handled and disposed of properly. Fifty-one percent said it is safe for builders to use. Further, 42 percent believed it is safe for children's outdoor play equipment and 38 percent believed treated wood is safe for pets or farm animal exposure. Finally, 55 percent of respondents desired additional information on treated wood.

The study, conducted in 2007, addresses issues that U.S. home builders and architects consider in evaluating whether to build or specify homes that are built with termite resistant building materials. The objective of the study was to identify the factors that affect potential usage of termite resistant structural panels and other treated wood products in the region of the United States that is impacted by the Formosan subterranean termite. We examined the perspectives of home builders and architects to better understand: 1) Basic understanding of the treated wood market space; 2) Incentives for usage; 3) Barriers and concerns that may preclude usage; 4) Willingness-to-pay for termite resistant wood products and; 5) Identify market potential for termite resistant structural panels and other treated wood products.

2 MATERIALS AND METHODS

2. MATERIJALI I METODE

2.1 Research procedures

2.1. Postupci istraživanja

Mailed questionnaires were used to conduct the study. This method is a cost-effective means of data collection and affords a high degree of anonymity. Mail surveys are also less limited by rigid time constraints that can impede the effectiveness of other survey methods. Sampling, survey procedures, follow-up efforts and data analysis were conducted in accordance with well-documented and verified mail survey techniques. The following sections elaborate on these procedures.

Based on an iterative process with study clients, a list of topics and questions were generated. The survey was reviewed and revised by the researchers and study clients. In addition, a pre-test sample was conducted with 30 companies randomly selected from the sample pools to check for readability and clarity. An iterative process resulted in the final questionnaire. Survey recipients were provided with the following definition of Treated Wood: "Wood in which preservatives have been added to improve resistance to termites and decay."

2.2 Sampling

2.2. Uzimanje uzoraka

Sample frames for the study consisted of a random sample of the top 250 home builders and top 250 architectural firms in the study region (by 2006 sales). The study region included states where Formosan subterranean termites currently exist (Ring, 2005) as well as selected states on the periphery. Mailing lists were purchased from Best Mailing Lists, Inc., a national list provider. All survey recipients were identified by name (and title for companies).

2.3 Data analysis

2.3. Analiza podataka

Questionnaire quantitative data was coded and entered into the Statistical Package for the Social Sciences (SPSS)[®] for analysis and interpretation. Data entry was closely supervised to ensure accuracy. Descriptive and frequency statistics were generated for the quantitative data; qualitative information from open-

ended questions was analyzed to discern common themes or concepts. After accounting for undeliverable surveys and recipient requests to be removed from the mailing list, the adjusted response rate was 34 percent.

3 RESULTS

3. REZULTATI

Of the 130 respondents in this study, 111 (85 percent) are from the home building industry and 19 (15 percent) represent architectural firms. Of the 74 questions in the survey where response comparisons can be made between home builders and architects, there were statistical differences in 10 questions. Along with the result that architects make up only 15 percent of total responses, the two groups were combined for reporting purposes.

3.1 Demographics

3.1. Demografske strukture

Over two-thirds of respondents are in 6 of the 15 states included in the study (Table 1). Alabama and Florida each account for 15 percent of responses. With regard to company size, all respondents combined had an average of about \$33 million in sales in 2006. Figure 1 shows the distribution of respondent sales. Although the largest 500 firms were surveyed, nearly half of respondents had sales between \$1 million and \$19 million in 2006. On the other end of the spectrum, the study did capture large firms with 22 percent of respondents having 2006 sales of \$80 million to \$100 million or more. The pattern is similar with regard to number of full-time employees with nearly 50 percent of respondents having between 11 and 50 employees (Figure 2). Twenty-three percent of respondents have over 100 employees.

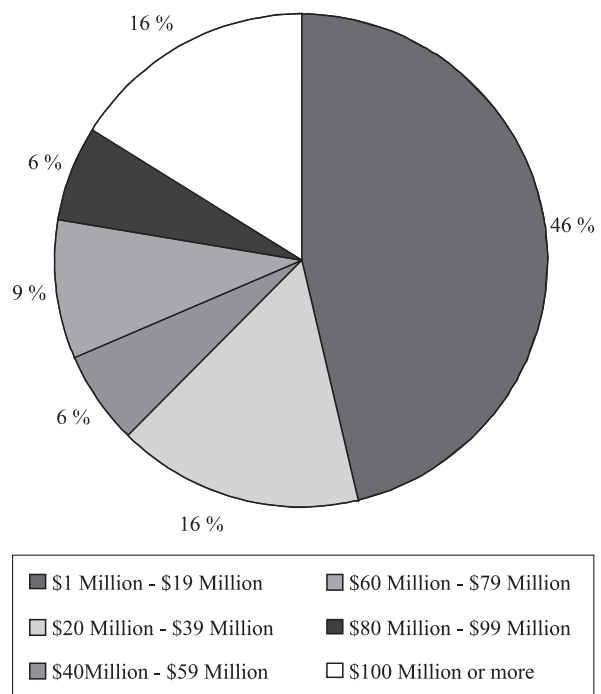


Figure 1. Respondent sales in 2006 (n = 130)
Slika 1. Prodaja među ispitanicima u 2006. godini (n = 130)

Table 1 Respondents by state

Tablica 1. Ispitanici prema državama

State / Država	Frequency / učestalost	Percent / postotak	Cumulative percent / Prosječni postotak
Alabama	20	15.4	15.4
Florida	19	14.6	30.0
Texas	17	13.1	43.1
California	16	12.3	55.4
Louisiana	10	7.7	63.1
Kentucky	8	6.2	69.2
Georgia	7	5.4	74.6
South Carolina	6	4.6	79.2
Mississippi	5	3.8	83.1
Virginia	5	3.8	86.9
Arkansas	4	3.1	90.0
Arizona	3	2.3	92.3
Hawaii	3	2.3	94.6
Maryland	3	2.3	96.9
Delaware	2	1.5	98.5
North Carolina	2	1.5	100.0%
Total / ukupno	130	100.0%	

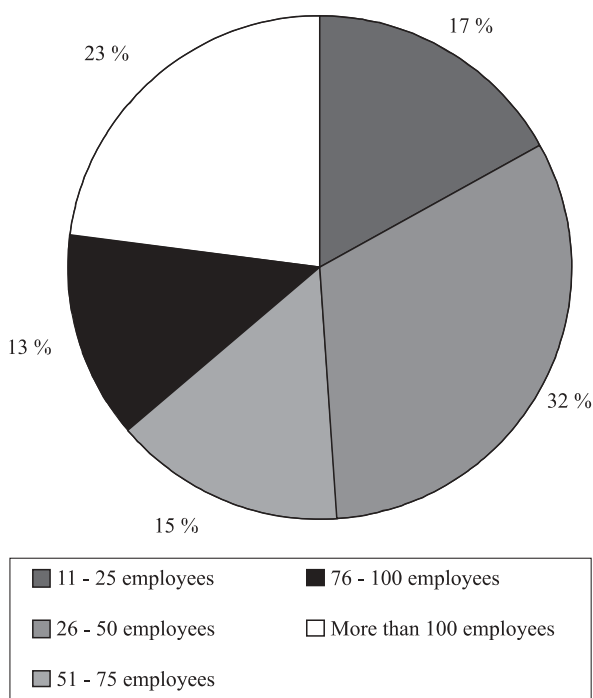


Figure 2 Number of employees in respondent companies (n = 130)

Slika 2. Broj osoba zaposlenih u istraživanim tvrtkama (n = 130)

3.2 Building materials and construction

3.2. Građevni materijali i konstrukcija

Respondents were asked to indicate the importance of the different construction criteria they use when building/specifying a new house. A scale of 1=very unimportant to 3=neutral to 5=very important was

used. Figure 3 shows the rank of these criteria by mean importance. Of note to the treating industry is that the two highest ranked criteria are treated-wood-related, to be free from mold and resistant to decay. Additional points to note are that resistance to wood destroying insects was ranked 6th.

Durability is an important concern for any building material a home builder might use or an architect might specify. Accordingly, we asked about the perception that respondents have about the number of years different competing materials would last in unexposed structural home applications (Figure 4). The choices were on a scale of: 1=0-10 years; 2=11-25 years and; 3=more than 25 years. Concrete (3.0) and steel (2.9) were ranked as having the greatest longevity. Treated lumber was ranked third (2.6).

3.3 Treated wood products

3.3. Zaštićeni drveni proizvodi

As the questionnaire transitioned into treated wood-related questions, we first wanted to see if respondents were familiar with the concept of treated wood and various chemicals and compounds used in wood preservation. In order to make comparisons to previous studies mentioned earlier, the choice set for preservatives used did not include trade names nor were all preservative names spelled fully. In addition, in this section, we were interested in general familiarity with preservatives and not specifically those with high efficacy in termite prevention. Sixty-one percent of respondents somewhat or strongly agreed that they were familiar with the overall concept of treated wood. Respondents were most familiar with creosote (72 percent of respondents) and chro-

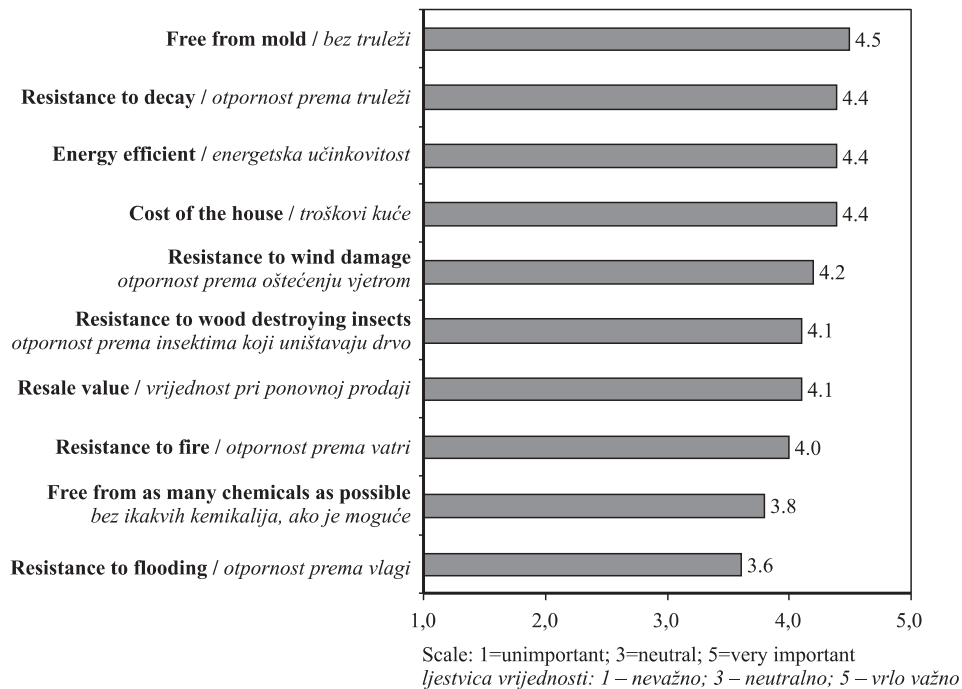


Figure 3 Importance of construction criteria (n = 128)

Slika 3. Važnost konstrukcijskih kriterija (n = 128)

mated copper arsenate (CCA) (71 percent) (Figure 5). Respondents were asked if they used or specified treated wood products for applications in homes they have built or specified (Figure 6). Decks and outside stairs were most cited with 84 percent of respondents. Outdoor structures and landscaping timbers followed with 68 percent and 65 percent of respondents, respectively. Other Products included those in contact with concrete, base plates, below grade forming and sheathing, boat docks, seawalls, sill plates and treated mud sills.

In 2002, a U.S. Environmental Protection Agency (EPA) ruling that stated that the wood preservative industry has voluntarily decided to halt production of

CCA-treated wood for consumer uses (EPA, 2002). In previous research conducted by the authors, consumers were found to have reservations about using treated wood in their homes (Vlosky and Shupe, 2002). The perceptions of treated wood by the public may be the cause of a credibility problem for the wood industry. For example, in the same study, 27 percent of U.S. homeowner respondents indicated that they trust wood claims made by wood product suppliers (Vlosky and Shupe, 2002). The ruling does not affect CCA treated structures for non-consumer uses such as poles, posts, crossties, etc. Also, the ruling does not require that existing CCA structures be removed or indicate that there

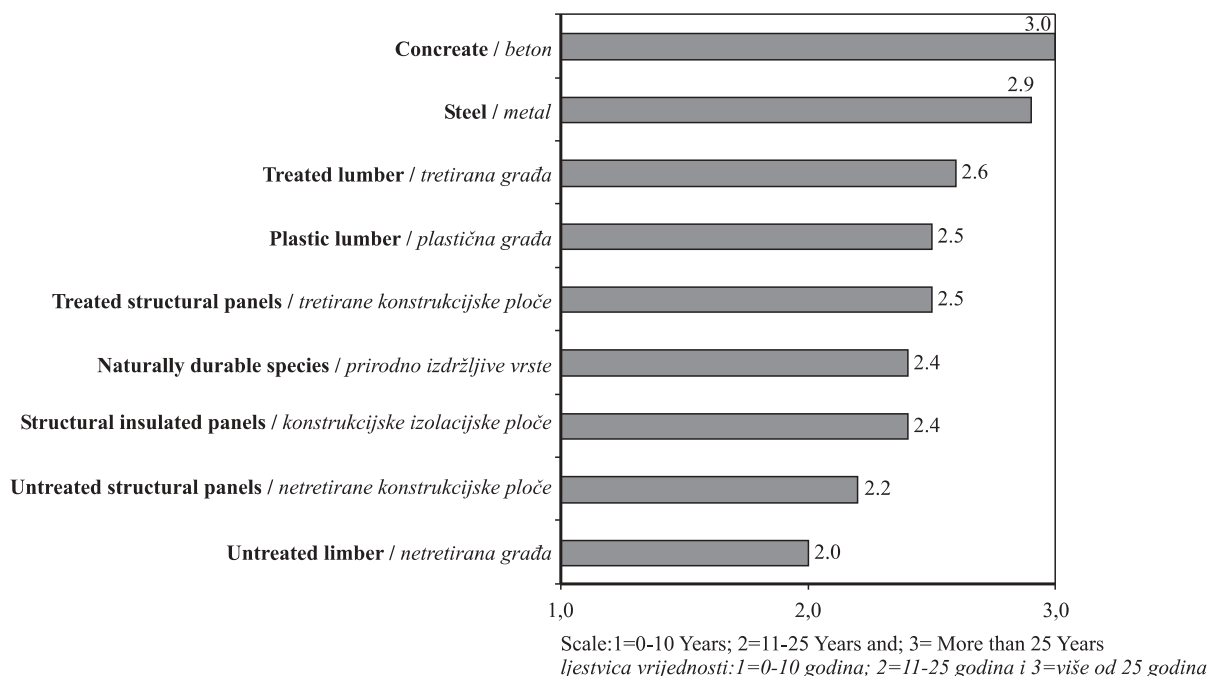


Figure 4 Perceived durability of building materials (n = 130)

Slika 4. Uočena trajnost građevnih materijala (n = 130)

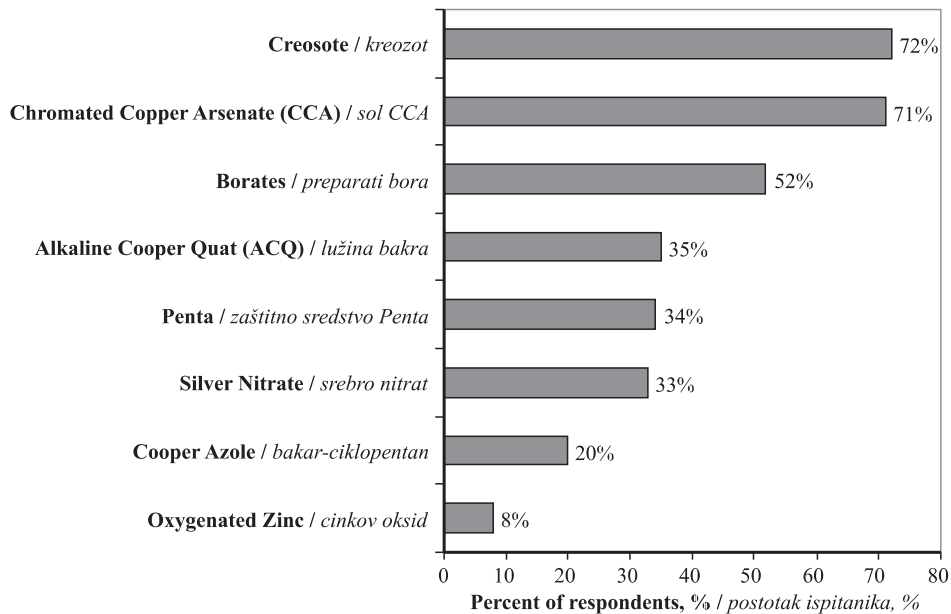


Figure 5 Familiarity with wood treating chemicals ($n = 130$) (multiple responses possible)
Slika 5. Poznavanje sredstava za zaštitu drva ($n = 130$) (mogućnost višestrukog odgovora)

are any adverse human health effects from exposure to existing CCA treated structures. Respondents in this study were asked how familiar they were with details of this transition. Nearly 25 percent were not aware at all while only 17 percent said they were very aware. We asked respondents what effect they expected in the marketplace from the switch to “new generation” preservatives. Forty-two percent said they did not know what effect this would have. On a 5-point scale from “Very Negative to “Very Positive”, no respondents thought the effect would be “Very Negative” while nine percent thought the effect on markets would be “Very Positive”. Twenty-six percent of respondents were at the midpoint (neutral).

As indicated previously, treated wood safety is an issue for consumers. Using a 5-point scale, we asked respondents to indicate their level of agreement or disagreement with statements regarding treated wood application safety. The results in Table 2 are ranked with the strongest level of agreement (somewhat agree + strongly agree) at the top. Overall, respondents are in agreement that treated wood is safe in new home construction framing and is safe if handled and disposed of properly. Forty-one percent of respondents agreed that treated wood is safe for residents in indoor structural applications. Overall, when taking into account the neutral responses, respondents have a favorable view of treated wood safety for all applications posed to them.

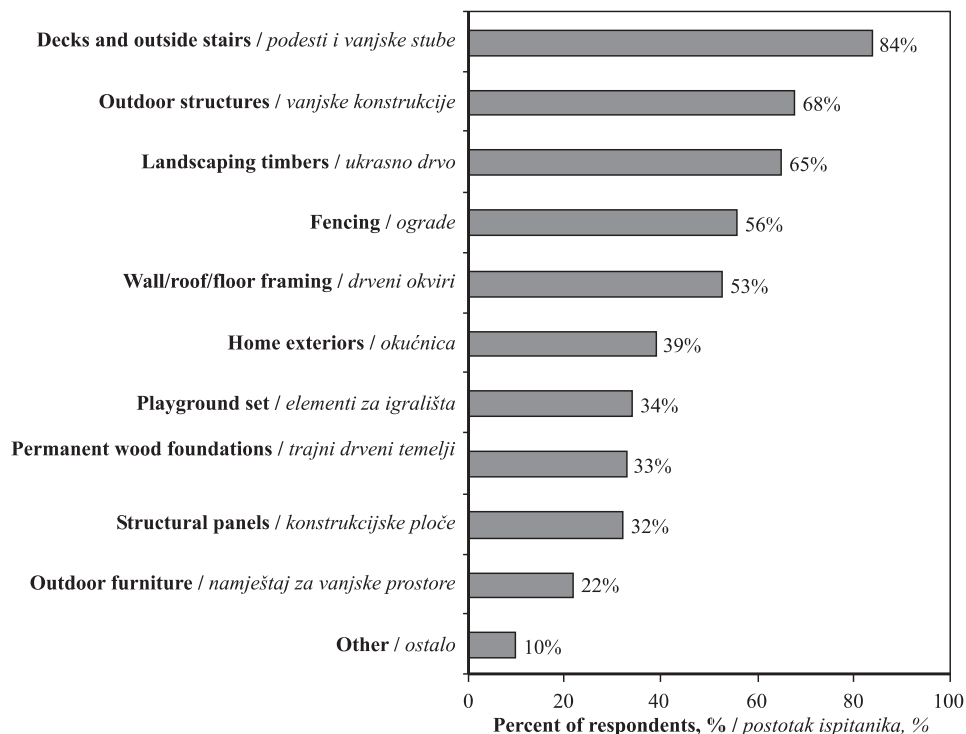


Figure 6 Treated wood applications used by respondents ($n = 128$) (multiple responses possible)
Slika 6. Udio zaštićenog drva što ga upotrebljavaju ispitanici ($n = 128$) (mogućnost višestrukog odgovora)

Table 2 Treated wood safety for selected application ($n = 130$)

Tablica 2. Sigurnost zaštićenog drva za određenu primjenu ($n = 130$)

	Strongly disagree <i>Ne slažem se u potpunosti</i>	Somewhat disagree <i>Djelomično se ne slažem</i>	Neutral <i>Neutralno</i>	Somewhat agree <i>Djelomično se slažem</i>	Strongly agree <i>Potpuno se slažem</i>
Is an acceptable material to use for new home construction framing <i>Materijal prihvatljiv za izradu konstrukcijskih okvira</i>	4%	4%	33%	30%	29%
Entirely safe with proper use, handling and disposal <i>Potpuno siguran uz pravilnu uporabu, rukovanje i odlaganje</i>	0%	13%	20%	46%	21%
Safe for outdoor human contact applications <i>Siguran za ljudski kontakt u vanjskim uvjetima</i>	1%	15%	26%	38%	20%
Safe to builders <i>Siguran za građevinske djelatnike</i>	1%	20%	21%	42%	16%
Safe to children for outdoor play equipment <i>Siguran za djecu i opremu za igranje u vanjskim uvjetima</i>	16%	28%	15%	29%	12%
Does not emit odors <i>Ne ispušta mirise</i>	2%	37%	35%	14%	12%
Safe to be near pets or farm animals <i>Siguran za kućne ljubimce i životinje</i>	7%	32%	24%	27%	10%
Safe to residents for indoor structural applications <i>Siguran za osobe pri uporabi u unutarnjim uvjetima</i>	9%	20%	30%	32%	9%

Respondents were asked if they thought that some types of treated wood are safer than others. Thirty-five percent of respondents said yes, 14 percent said no and 55 percent were not sure. This clearly indicates the need to educate home builders and architects regarding different preservative treatments and associated applications. The types of treated wood respondents think are MOST safe are ACQ and Borates while the types of treated wood they think are LEAST safe are CCA, Creosote and Penta.

How respondents form opinions about treated wood has implications for advertising and product promotion as well as venues to create awareness for home builders and architects. Word of mouth from other builders and architects was ranked first by 54 percent of respondents (Figure 7). Second ranked by 38 percent of respondents was Trade Magazines which indicates that this venue should be used by treated wood and preservative treatment manufacturers. Fifty-three percent of respondents said that they would like more information on proper use, handling and disposal of treated wood. This presents another opportunity for treated wood manufacturers and preservative providers to educate builders and architects on the benefits of using treated wood.

3.4 Termites

3.4. Termiti

Termite problems and issues are prevalent in many parts of the U.S. In the study region, the Formosan subterranean termite is particularly insidious. Surprisingly, 55 percent of respondents were not familiar at all with Formosan subterranean termites. Although they had a general lack of knowledge, 29 percent of re-

spondents said Formosan subterranean termites were a problem in the regions their companies serve. When examined by state, 100 percent of respondents in Hawaii said Formosan subterranean termite Formosan subterranean termites were a problem (Figure 8). Hawaii was followed by South Carolina (83 percent of respondents said it was a problem) and Florida (79 percent). Georgia was represented by the smallest percent of respondents (9 percent).

Previously, we talked about building materials in the context of durability. In this section we asked respondents specifically about the efficacy of different building and construction materials protection against termites in general. As shown in Figure 9, using a 3-point scale of protection against termites, steel and concrete were ranked highest (both 2.9 / 3.0). Treated wood and plastic were tied for second (2.6 / 3.0). Thirty-five percent of respondent said that they have had at least one experience with termites damaging a home they built remodeled or specified. Of these respondents, 68 percent said that they did not know what types of termit

Seventy-eight of respondents has taken some type of action to prevent attack by the termites in homes they build/specify. Figure 10 shows the actions that respondents have taken. The use of treated wood was the most cited (58 percent of respondents) followed by the use of soil termiticides (49 percent of respondents) and use of concrete (34 percent).

One of the objectives of the study was to get some idea of the demand for termite protection which, in turn, leads to a proxy for opportunities for treated wood products to meet this demand. Accordingly, we first asked respondents what is the *current level of demand*

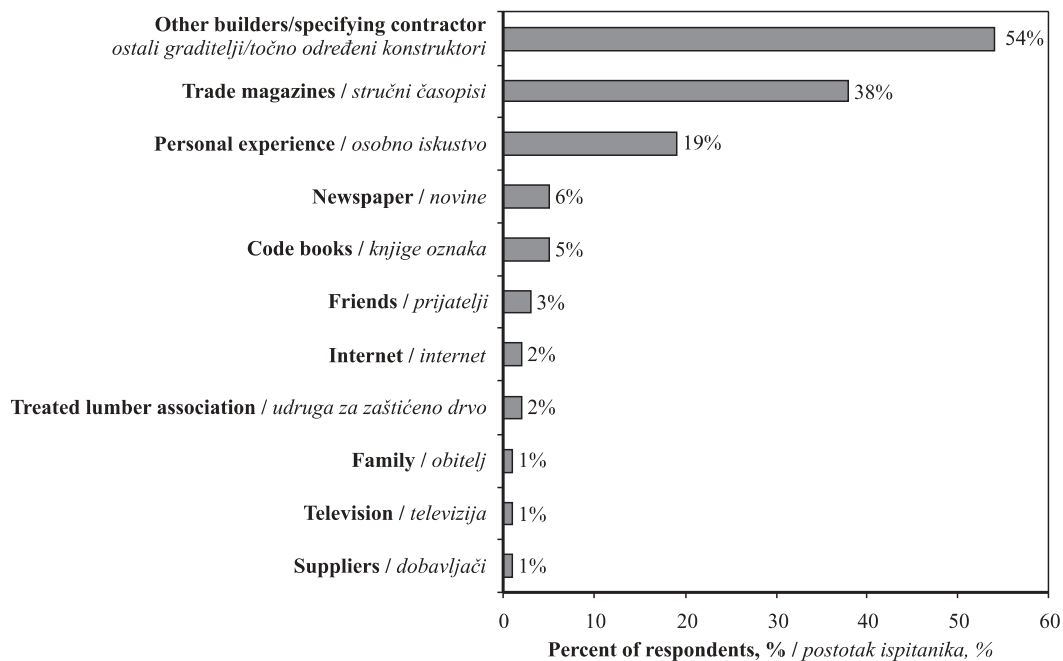


Figure 7 How respondents form opinions about treated wood (n = 119) (multiple responses possible)

Slika 7. Izvori na temelju kojih ispitanici stvaraju svoje mišljenje o zaštićenom drvu (n = 119) (mogućnost višestrukog odgovora)

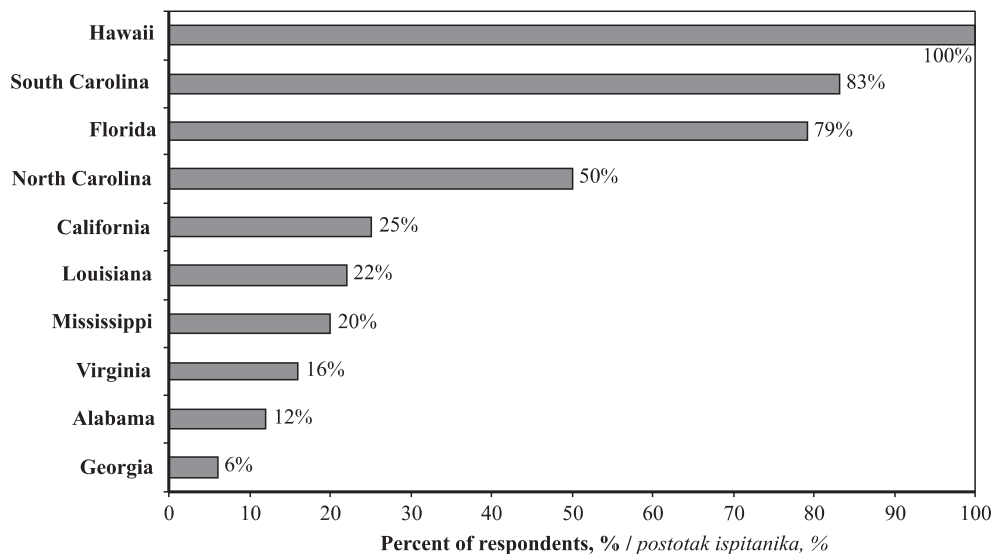


Figure 8 Formosan subterranean termite problems by State

Slika 8. Problemi uzrokovani podzemnim termitima u promatranim državama

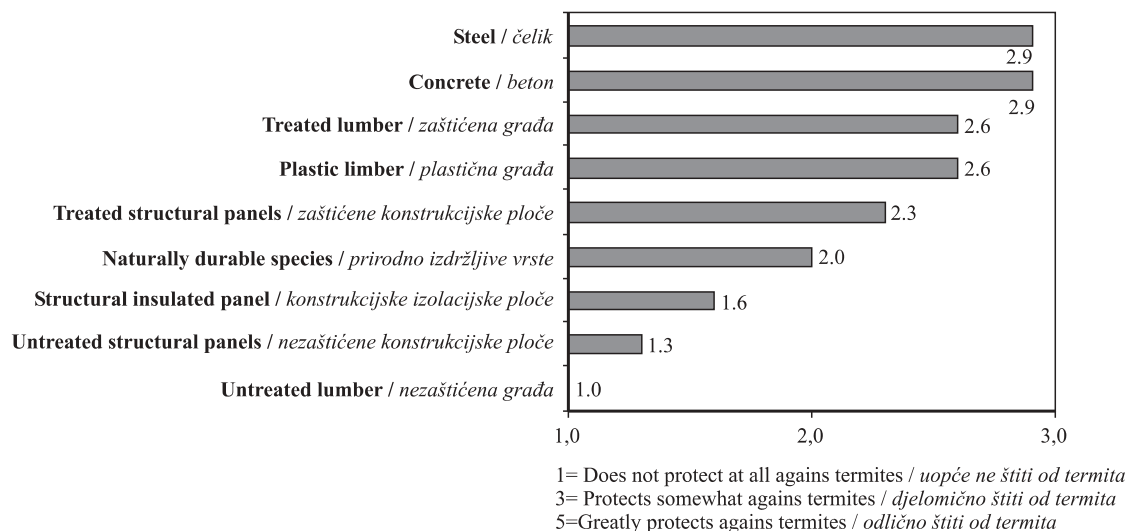


Figure 9 Building materials protection against termites (n = 129)

Slika 9. Zaštita građevnog materijala od termita (n = 129)

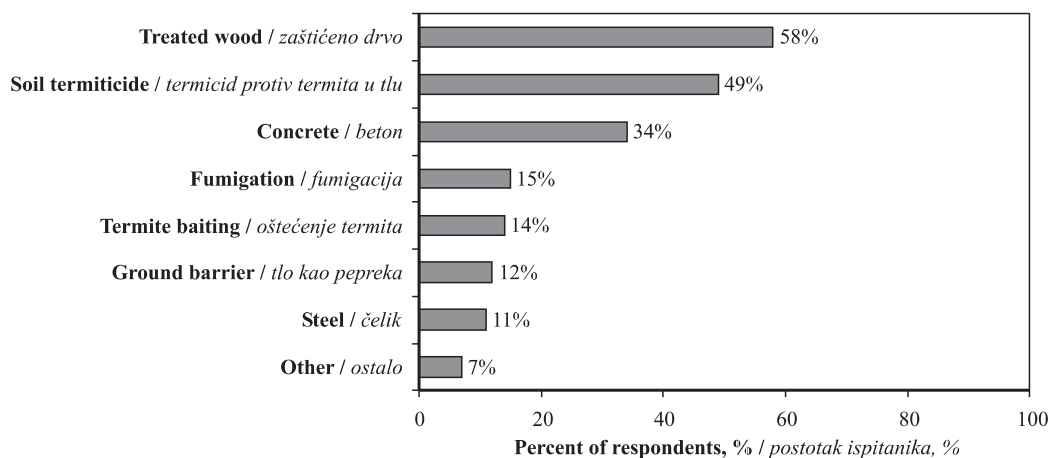


Figure 10 Actions taken to prevent termite attack ($n = 130$) (multiple responses possible)
Slika 10. Postupci za sprečavanje napada termita ($n = 130$) (mogućnost višestrukog odgovora)

that they see in the marketplace for termite prevention. Ten percent of respondents said that demand was extremely high and 28 percent feel demand is somewhat high. On the other end of the scale, 15 percent said demand is extremely low and an additional 23 percent said demand is somewhat low. The remaining 25 percent said demand was neither high nor low.

The second question asked what they felt is the *trend in demand* in the marketplace for termite prevention in the future. Only 1 percent of respondents think demand will decline while 10 percent say demand will increase significantly and 35 percent think demand will increase somewhat. Twenty-five percent say demand will remain flat.

In an attempt to get a perspective on the cost premium the market places on termite prevention, we asked respondents how much of a premium they thought their customers would pay for an assured termite-free new home for 10 years over a home that does not carry this guarantee. For this exercise, a house was hypothetically priced at \$80,000 USD (Table 3). Twenty-five percent of respondents said they did not think that their customers would pay any premium for a termite-free house. Sixty-three percent of respondents believe that customers will pay a premium between 2.5 percent-5 percent and 13 percent of respondents think their customers would pay a premium of 7.5 percent or more.

4 DISCUSSION AND CONCLUSION 4. DISKUSIJA I ZAKLJUČAK

In this paper, we present findings of a primary research study intended to identify experiences, aware-

ness, perceptions, and behaviors regarding treated wood and termites from the perspective of home builders and architects in the United States. The scope of this research did not include a comparative analysis of responses to studies that may have been conducted in the literature.

Durability is an important concern for any building material a home builder might use or an architect might specify. Respondents indicated that two highest ranked criteria they use when building/specifying a new house are treated-wood-related; to be free from mold and to be resistant to decay. These data suggest that the wood preserving industry should continue to strive to produce products that have the highest degree of decay and mold resistance possible. This will be a competitive advantage for those treaters and preservative manufacturers that are first to market with these types of products.

An additional observation is that 61 percent of respondents “somewhat agree” or “strongly agree” that they were familiar with the overall concept of treated wood. This indicates that treated wood is at least positioned in builder and architect respondents’ minds as an existing product. It does not necessarily infer any other perceptual characteristics about treated wood. However, with regard to durability, resistance to decay, and resistance to termites, concrete and steel both ranked higher than treated wood. This offers an opportunity for these two competing building material sectors to potentially capitalize on these perceptions to penetrate markets or increase market share. An apparent anomaly that bears further research is that treated wood was the

Table 3 Respondent customer willingness to pay a premium for a termite-free new home ($n = 130$)

Tablica 3. Spremnost ispitanika na plaćanje premije za kuću bez termita ($n = 130$)

	For a 10-year termite free home I think my customers would pay Iznos koji su potrošači spremni platiti za 10-godišnje razdoblje bez termita						
Percent premium Postotak premije	0%	2.5%	5.0%	7.5%	10.0%	12.5%	More than više od 12.5%
House cost Troškovi kuće	\$80,000	\$82,000	\$84,000	\$86,000	\$88,000	\$90,000	More than više od \$90,000
Percent of respondents Postotak ispitanika	25%	36%	27%	7%	4%	0%	2%

material used most by respondents to combat termites. Concrete was ranked third and steel was ranked seventh. This may be due to cost or aesthetic issues.

Respondents were most familiar with creosote and chromated copper arsenate (CCA) but these two preservatives are perceived to be among the least safe. A passing observation is that respondents seem to be most familiar with the least safe preservatives rather than with the most safe preservatives. This may have implications for the treating industry to a) reduce negative perceptions for CCA and creosote while promoting safer (perceived) preservatives.

Overall, treated wood products appear to be well entrenched in applications used by respondents. Decks, outdoor stairs, and landscaping timbers were among the applications built or specified most. As the market for new home construction fluctuates due to market conditions and economic cycles, one would expect the demand for treated wood to parallel these market movements. Secondly, the repair and remodel demand sector in which decks, stairs, landscape timbers and other treated wood products are used, will influence overall treated wood demand as well. New home construction with treated wood framing is an emerging and potentially important demand application. Respondents are in overall agreement that treated wood is appropriate for framing if used properly and safely.

Overall, respondents have a favorable view of treated wood for a myriad of applications. Although there are safety concerns for certain preservatives, respondents indicate that this material is not only acceptable but is desirable as a material in the homes they build or specify. As new, safer, and more ecologically friendly preservatives come to market, the future will be positive for the treated wood industry in the United States in general and specifically in those states where termites are pervasive.

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