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Relationships Between the Results of Nail Impact Bend Tests and Selected Nail Material Properties

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Abstract

Selection criteria for nails vary significantly. Some fastener specifications contain criteria based on hardness tests; others are based on yield strength or the results of impact bend tests (MIBANT). Selection may also be based on the carbon content or SAE class of the nail wire. To assist the specifier in the nail selection process, the relationship was studied between the MIBANT angle, an apparent flexural yield strength, the hardness, and the carbon content of nails. Carbon content was found to have a small influence on the mechanical properties of non-hardened nails. Because of apparent variations in work hardening during wire drawing and nail manufacture, carbon content is not a reliable criterion for the selection of non-hardened steel nails. Conversely, carbon content significantly influences the properties of hardened steel nails when the steel carbon content is greater than 0.10%. MIBANT angle, Vickers hardness number, and flexural yield strength are highly correlated for lowcarbon steel nails. Empirical relationships between these properties are presented. MIBANT angle was found to be a better indicator of the flexural yield strength of nails than Vickers hardness number.

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