Testing calibration issues in resistance drilling applied to timber elements

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ABSTRACT

Diagnosis of current state of timber components in existing buildings is supported by investigation tools applied onsite as non-destructive (ND) and minor-destructive (MD) test procedures [1] [2]. Among them, resistance drilling devices (e.g., Resistograph®) [3] are commonly used to check the conservation condition of wood and detecting possible inner flaws, joints, etc. This device provides a densimetric profile along the investigated section, based on the drilling power consumption (RM) of a thin long needle driven into the wood at speed rates kept constant by electronic control [4].
Being a local test method, timber components in existing buildings often require multiple measures, depending on specific problems to investigate (e.g., beam ends threatened by moisture due to masonry contact, presence of decay, cracks), which progressively change the needle conditions.
The paper investigates the influence of consumption of the needle tip due to wear by comparing the profile results obtained on a series of 21 old and 12 new timber beams, representative of various species (spruce, larch, oak, elm, pine) in different conditions (e.g., presence of joints, moisture content). Each beam was investigated on two adjacent sides with about 4 to 10 measurement stations per side.
The consumption of the needle tip was first quantified by testing a spruce board element (27 mm thick at 12% MC, classified as C24 according to UNI EN 338 (2016) [5] at various speed rates (drill one kept constant when feed one varying and vice versa), which provided data for test calibration according to this specific issue. The C24 element was then applied before the timber surface of the investigated beams to compute normalized values of RM, which can be considered more representative of the evaluation of the actual state of wood and more reliable for the test repeatability and the comparison among different cases and conditions.

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