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Investigation Of Deflection Of Douglas Fir And White Fir Beams Subjected To Climatic Changes

Claude Feldman PAMBOU NZIENGUI^{1,2}, Rostand MOUTOU PITTI^{2,3}, Eric FOURNELY², Joseph GRIL^{2,4}, Gael GODI²

¹ Ecole Nationale des Eaux et Forêts, BP 3960, Libreville, Gabon

² Université Clermont Auvergne (UCA), CNRS, Institut Pascal, BP 10448, 63000 Clermont – Ferrand, France

³ CENAREST, IRT, BP 14070, Libreville, Gabon

⁴ LMGC, CNRS, Univ. Montpellier, Montpellier, France

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ABSTRACT

Experimental characterization of beams deflections of Douglas fir (*Pseudotsuga Menziesii*) and White fir (*Abies Alba Mil*) are investigated herein, especially the impacts of the relationship of Relative Humidity (RH) and Temperature (T) on their behavior. The creep tests are performed in an uncontrolled environment where the evolutions of climatic parameters (RH and T) and data of the deflection are continually recorded. The results show that, the deflection increases after a delayed time during the drying process and heating phases.

MATERIAL AND METHODS

One (1) beam of Douglas fir (D9) and one (1) beams of White fir (S9) are performed in uncontrolled environment in creep tests (four bending points). Table 1 shows the weight of bloc concrete applied on each beams and their MOE calculated in static bending four points before their loading. Figure 1 shows the experimental device of the tests.

Table 1: Characteristics of bloc concretes and beams used

Species	beams	weight of the concrete load (kN)	MOE (GPa)
<i>Douglas fir</i>	D9	4.150	14.162
<i>White Fir</i>	S9	3.290	8.975



Figure 1: Experimental device use during the creep tests.

RESULTS

Figure 2 shows the typical relationship of deflection versus RH (Fig. 2a) and T (Fig. 2b) of beam D9. The main information observed from this figure is that, the deflection increases during drying process and heating phases after a delayed time τ^{D9} .

Figure 2: (a) Evolution of Deflection of beam D9 versus RH; (b) Evolution of deflection of beam D9 versus T.

Figure 3 shows the typical relationship of deflection of beam S9 versus RH (Fig. 3a) and T (Fig. 3b). According to this figure, there are direct relationships between deflection and climatic parameters (RH and T). As figure 2 and for the deflection of D9, the deflection of S9 growth during the drying process after a delayed time τ^{S9} . These results are in accordance with the literature (Merakeb et al. 2009, Saifouni et al. 2016).

Figure 3: Evolution of Deflection of S9 versus RH (a) and T (b).

REFERENCES

Saifouni, O., Destrebecq, J. F., Froidevaux, J., and Navi, P. (2016). Experimental study of the mechanosorptive behaviour of softwood in relaxation. *Wood Science and Technology*, 50(4), 789-805.

Merakeb, S., Dubois, F., & Petit, C. (2009). Modeling of sorption hysteresis in hygroscopic materials. *Comptes Rendus Mécanique*, 337(1), 34-39.

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