BENDING STRESS AND MOVEMENT FROM CROSS SECTION ANALYSIS OF STACKED WOOD BEAM USED IN WINDOW CONSTRUCTION WITH THERMOPAN GLASS

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Abstract
This work paper presents the bending stress and cross-cut movement section analysis of stacked wood beam. The analysis was making to demonstrate the classical and stacked beam the same characteristics.
In this make calculus we establish in real mode the dangerous cross-cut section where appear cracks.

Key words: Stacked wood beam, bending stress, statically applied uniform distributed disturbance repeated stress.

INTRODUCTION

In this work paper we accomplishment the calculus of continuous stacked wood beam, with cross-cut of rectangular shape. The beam can be used in structure strength [1].

In almost of construction in any shape or form where is necessary to used wood beam is very important to make analyze of bending stress and movement from cross section.

The continuous stacked wood beam (fig. 1) was considered to be a part from straight bar category. They are connected with ground through the medium of more levers. One is articulated and from one another are simply.

Fig. 1 Stacked wood beam

In this situation the calculus has a highest difficulty level. Is due to the facts that breaking stress is bigger then statically balance equation who can be wrote. The considered system is a part from undetermined static system.

In this case we considered a breaking stress beam with 8 [m] length and one intermediary lever. In this situation indeterminate statically pitch is n = 1.

We have uniform distributed static charge apply on beam with intensity load q = 400 daN/m.

MATERIALS AND METHODS

Bending stress and movement from cross section analysis of stacked wood beam suppose the dimensioning, verification and rigidity of bending stress applicant calculation [2] (fig. 2).
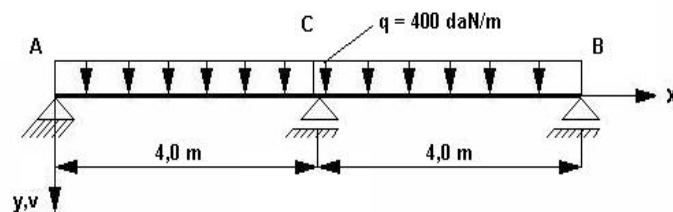

Fig. 2 Distribution of force and bearing on the wood beam

The dimensioning in normal tensions was accomplished. The verification calculation was in normal tensions and tangential tensions.

We take assumption on stacked wood beam of rectangular sections (fig. 3) h/b = 2 with height and width rapport.

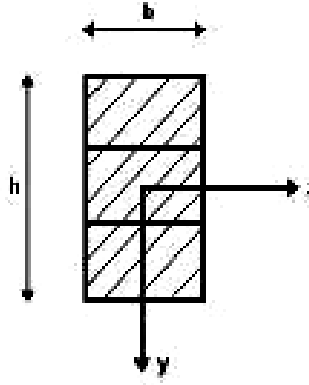h – Height of rectangular sections

b – Width of rectangular sections

Fig. 3 Rectangular sections of wood beam

The rigidity on beam bending (EI) well considered constantly on all length. He is the statement of longitudinal elasticity module multiplication with axial inertness torque of cross-cut section face on beam neutral axis (OZ).

Where:

EI_z - is the rigidity to simply bending of wood beam;

E - is the longitudinal elasticity module of cross-cut rectangular section

I_z - is the axial inertness torque of cross-cut section with neutral axis rapport;

In this situation the structure is submissive to simply bending demands dint statically applied uniform distributed disturbance repeated stress, with repeated stress intensity „q" [3].

The calculus of this structure was accomplished by using force method. We choose so unknown moment of deflection on the intermediary bearing.

Bending moment efforts was considered positive for inferior stretching fiber of beam and negative efforts for superior stretching fiber of beam.

We note with „C" the intermediary support. For this the continuous equation is:

$$\lambda_{AC}M_A + 2(\lambda_{AC} + \lambda_{CB})M_C + \lambda_{CB}M_B + \lambda_{AB}m_C^{st} + \lambda_{CB}m_C^{dr} = 0 ; \qquad (1)$$

$$\lambda_{AC} = l_{AC} \frac{I_0}{I_{AC}}$$ - is the transform length

I_o - Arbitrary axial moment of inertia;

I_{AC} - Axial moment of inertia of cross-cut section „AC" on beam;

Axial moment of inertia is related with neutral axis is the same on all beam length.

$$I_{AC} = I = I_{CB};$$

Where: m_C − is loading factor, with standard values and loading type is tabular.

Elasticity module of breaking stress beam is considered with next values:

$$E = 0{,}1 \cdot 10^6 \left[\frac{daN}{cm^2} \right];$$

Axial moment of inertia of cross-cut section is related with neutral axis and was determined by using the relation:

$$I = \frac{b \cdot h^3}{12} \left[mm^4 \right];$$

For study case of strength beam, with uniform distributed disturbance even load intensity q = 400 daN/cm we considered continuous form equation:

$$\lambda_{AC} M_A + 2(\lambda_{AC} + \lambda_{CB}) M_C + \lambda_{CB} M_B + \lambda_{AB} m_C^{st} + \lambda_{CB} m_C^{dr} = 0 \qquad (2)$$

The case of simple and articulate bearing of end, on movements and bending moment efforts are null:

$$v_A = v_B = 0 \qquad\qquad M_A = M_B = 0$$

From the continuous equation we determined the bending moment effort from intermediary bearing form is:

$$2(\lambda_{AC} + \lambda_{CB}) M_C + + \lambda_{AB} m_C^{st} + \lambda_{CB} m_C^{dr} = 0; \qquad (3)$$

The stability charge factor is:

$$m_C = \frac{q \cdot l^2}{4};$$

The chosen arbitrary moment of inertia was considered to be equal with moment of inertia of cross-cut section in regard to neutral axis.

$$I_0 = I_Z;$$

The transforms length is:

$$\lambda_{AC} = l_{AC} \frac{I_0}{I_Z} = l_{AC} = 4[m]; \qquad \lambda_{CB} = l_{CB} \frac{I_0}{I_Z} = l_{CB} = 4[m]$$

The left and right load factor from the section of intermediary bearing is:

$$m_C^{st} = \frac{q \cdot l_{AC}^2}{4} = \frac{4\left[\dfrac{KN}{m}\right]}{4} l_{AC}^2 = 16[KNm]$$

$$m_C^{dr} = \frac{q \cdot l_{CB}^2}{4} = \frac{4\left[\dfrac{KN}{m}\right]}{4} l_{CB}^2 = 16[KNm]$$

We obtained:
$$M_C = -8[KNm];$$

In intermediary section „C" is make a move an exterior bending moment.

After the determination of unknown bending moment we break off the structure in beam component. We applied on intermediary bearing the good-sized charge given by determined bending moment.
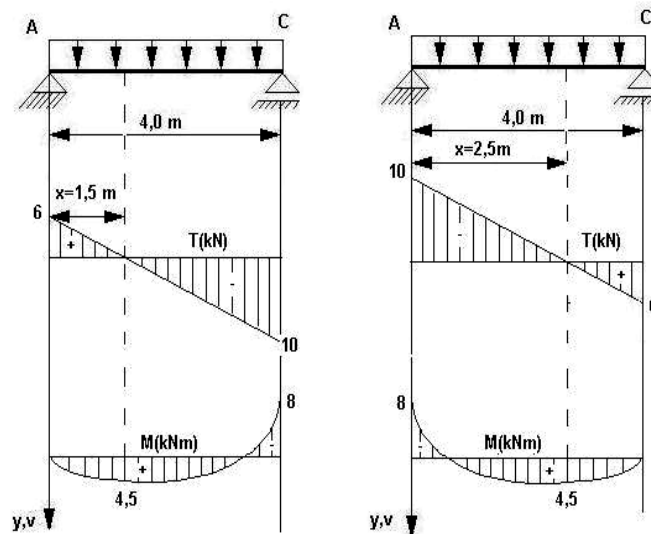

Fig. 4 Variation diagram

286

The dimension calculus was made to the section. The dimensioning porter to the effective values on the initially considered charging action can resist. The maximize tension was under stressed.

DISCUSSIONS AND CONCLUSIONS

The presented case on this work paper gives us the perfect constructive solution from dimensioning and verification beam using in resistance structure.

The variation of sectional effort diagrams we can make a perfect radiography of bending and effort stress from beam. We can see the most dangerous applicant section.

The replace of classical wood beam with stacked wood beam is necessary because is not expensive and is ecological.

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