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Excerpts of a Letter of Professor F. Leonhardt to Professor Ch. Massonnet (Reproduced with the Permission of Professor F. Leonhardt)

Extraits d'une lettre du Prof. F. Leonhardt au Prof. Ch. Massonnet
(reproduits avec la permission du Prof. F. Leonhardt)

Auszüge aus einem Brief von Prof. F. Leonhardt an Prof. Ch. Massonnet
(abgedruckt mit Bewilligung von Prof. F. Leonhardt)

For the stiffened bottom plate or the bottom flange of a box-girder under negative moments, with compression in the bottom flange, there is almost no post buckling carrying capacity, as the example of the Danube-Bridge demonstrated. After buckling of the bottom flange, the box can usually carry only more or less as a hinge in the elevation of the stronger orthotropic top plate. This situation makes it necessary to calculate the bottom flange more or less like a compressed column with a buckling length equal to the distance of the transverse stiffeners, if the stiffeners have sufficient rigidity. With soft stiffeners the buckling length becomes even larger. Also in this case, we assume a certain excentricity of the compressive force to take care of unavoidable deviations from the straight line of the axes of the cross-section of a flange (plate plus longitudinal stiffeners). For the longitudinal stiffeners we usually take profiles with a top flange.

The deviations of the actual profiles from the straight lines, which we assume in our calculations, must be laid down on the working drawings and specifications as allowable tolerances and immediately after the erection of portions of the box girder, the actual deviations must be checked and must be kept within these limits.

For the bottom flanges we must also keep in mind, that the principal compressive stresses in the plate are not parallel to the longitudinal axis of the box-girder, but inclined and the angle of inclination depends upon the shear force and the torsion. This can have some influence on the spacing of longitudinal stiffeners and on the buckling safety of the bottom plate itself.

Dimensioning the bottom flange in this way does usually result in only a very small amount of additional steel quantity, because the increased stiffness of the longitudinal stiffeners allows to use a thinner plate. Only the additional rigidity of the transverse stiffeners may increase the weight.

But also here the difference is so small, that it should not count economically.

I am sending to you a drawing of a cross-section of Moseltal-Brücke Winnigen, which we have designed along these lines about 2 years ago and which is under construction just now. It has spans up to 240 m and is erected by the free-cantilevering method, giving rather high compressive force to the bottom slab.

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