1 February 2021

An error in the blade fatigue design criteria in the Finnish-Swedish Ice Class Rules

There is an error in Section 6.6.2.3 of the 2017 version of the Finnish-Swedish Ice Class Rules (FSICR, Traficom´s regulation TRAFI/494131/03.04.01.00/2016). The error concerns the simplified methodology that can be used to indicate that fatigue calculations can be omitted from the design process. In the case that Equation 6.40 of FSICR, given below for reference, is satisfied, no further fatigue calculations are required by FSICR.

$$\sigma_{exp} \geq B_1 \sigma_{ref2}^{B_2} \log(N_{ice})^{B_3}$$

The parameters for fatigue calculation, stated in FSICR 2017 table 6-14, were revised for the 2017 version of the FSICR to increase safety. This was agreed in the IACS machinery group. In practise, the C_1 value was increased 5%. Coupled with the lowering of static stress safety factor from 1.5 to 1.3 this also affected the calculation of the simplified method in equation 6.40. At this point, an error was made when recalculating parameters B_1 , B_2 and B_3 for the simplified method (table 6-13). The erroneous values, as well as the new corrected values, are show in table below.

Open propeller

	2017 FSICR	**Corrected value**
B_1	0.00246	0.00328
B_2	0.947	1.0076
B_3	2.101	2.101

Ducted propeller

	2017 FSICR	**Corrected value**
B_1	0.00167	0.00223
B_2	0.956	1.0071
B_3	2.470	2.471

This error means that the simplified criterion is not conservative as intended and can lead to designs passing the simplified criterion even though they would not pass the full fatigue criteria in Section 6.6.2.3 and 6.6.2.4 of the FSICR.

The intention of the Finnish Transport and Communications Agency is to correct the values of B_1, B_2 and B_3 to the FSICR as soon as possible. However, due to the

procedures involved in revising national regulations, this will take some time and the Finnish Transport and Communications Agency advises all concerned parties that the revised values can be used immediately.

The Finnish Transport and Communications Agency has informed the Swedish Transport Agency of this error in the course of our cooperation concerning the FSICR.

The 2017 version of the FSICR, which this error concerns, applies to ships contracted for construction on or after 1 January 2019 with possibility of voluntary application from 1 December 2017. The intention of the FSICR is to give the minimum requirements for Finnish and Swedish ice classes. The Finnish Transport and Communications Agency will not unilaterally lower the Finnish ice class of any vessel built according to the 2017 FSICR due to this error in the propeller fatigue design criteria of the rules. Classification Societies who have implemented the FSICR as part of their rules may of course consider any actions they see fit with regard to vessels they have classified.

A report made by the Technical Research Center of Finland, VTT, with a more detailed description of the problem is attached to this letter.

The Finnish Transport and Communications Agency also welcomes any comments you may have concerning the simplified methodology for propeller blade fatigue design or the planned corrective actions described in this document. You may contact me directly with any comments or questions concerning this matter or the FSICR more generally.

Sincerely,

Finnish Transport and Communications Agency

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Appendices Report "Revision of blade fatigue design criteria for Finnish-Swedish ice class rules"