

# Fatigue TN Curves for Chain, Wire, and Polyester Mooring Lines (Including Corrections for High-tension Ranges)

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## Contents

	Page
1 Introduction.....	1
2 Chain TN Fatigue Curves.....	1
3 Steel Wire Rope TN Fatigue Curves.....	3
4 Polyester Rope Fatigue Curves.....	3
Annex A (informative) Polyester Rope Fatigue Test Data.....	12
Bibliography.....	18

## Figures

1 Proposed High-load Range/Low-cycle Corrections to API's TN Curves for Chain and Wire Rope, and Polyester TN Curves including Spiral Strand $\times 6$ .....	1
2 High-load Range Correction for R4 Studless Chain Based on API's TN Curve for Studless Chain and Minimum Yield Stress for R4 Steel Grade.....	4
3 Upper Bound, High-load Range Correction for R4 Studless Chain Based on the Mean Regression Curve for Studless Chain and a Yield Stress of 821 N/mm <sup>2</sup> for R4 Steel.....	5
4 High-load Range Corrections for R3 and R4 Studless Chain Based on API's TN Curve for Studless Chain and Minimum Yield Stresses for R3 and R4 Steel Grades.....	6
5 High-load Range Corrections for R3 and R4 Studlink Chain Based on API's TN Curve for Studlink Chain and Minimum Yield Stresses for R3 and R4 Steel Grades.....	6
6 High-load Range Corrections for IWRC and Spiral Strand Wire Based on API's TN Curves and Elastic Tension Range Limits of 40 % and 50 % of CBS.....	8
7 Polyester Rope Durability JIP Test Results for 10-tonne Rope Normalized by CBS and Average Break Strength (ABS).....	9
8 Polyester Rope Durability JIP Residual (see Figure 7) for 10-tonne Rope Normalized by CBS and Average Break Strength (ABS).....	9
9 Polyester Rope Fatigue Test Results Normalized by CBS compared with API 2SK's TN Fatigue Curve for Spiral Strand Steel Wire Rope and Six Times API's Spiral Strand Rope TN Curve.....	11

## Tables

1 API Studlink and Studless TN Fatigue Curve Parameters.....	2
2 Minimum IACS Requirements for Studlink and Studless Chain.....	3
3 API IWRC and Spiral Strand Wire TN Fatigue Curve Parameters.....	7
4 Polyester Rope Durability JIP—Loading Regime for 10-tonne Fatigue Tests (28).....	10
5 Polyester Rope Durability 10-tonne Fatigue Curve Parameters.....	11
A.1 Polyester Rope Durability JIP Fatigue Data for 10-tonne Ropes by Manufacturer A (NEL Table 6.2.1).....	13
A.2 Polyester Rope Durability JIP Fatigue Data for 10-tonne Ropes by Manufacturer B (NEL Table 6.2.2).....	14
A.3 Polyester Rope Durability JIP Fatigue Data for 10-tonne Ropes by Manufacturer C (NEL Table 6.2.3).....	15
A.4 Polyester Rope Durability JIP Fatigue Data for 6-tonne Sub-ropes (ND Slide 3).....	16
A.5 Polyester Rope Fatigue Data in API 2SM, First Edition.....	17

# Fatigue TN Curves for Chain, Wire, and Polyester Mooring Lines (Including Corrections for High-tension Ranges)

## 1 Introduction

This report summarizes the derivation of high-load range, low-cycle corrections to API 2SK, Third Edition studlink and studless chain fatigue curves, and in this respect supplements the derivation of standard fatigue curves reported in API TR 2FC-1, First Edition. In addition, low-cycle, high-load range corrections to API 2SK's independent wire rope core (IWRC) and spiral strand (SS) wire rope fatigue curves are proposed, and polyester rope fatigue data are reviewed and compared with the recommendations presently contained in API 2SM, API 2SK, and ISO 19901-7. The proposed corrections to API's TN curves and the chain and polyester fatigue test data are shown in Figure 1. The lower part of the piecewise linear TN curves (in the log-log space) are the same as in API 2SK, while the upper part is the correction or change proposed.

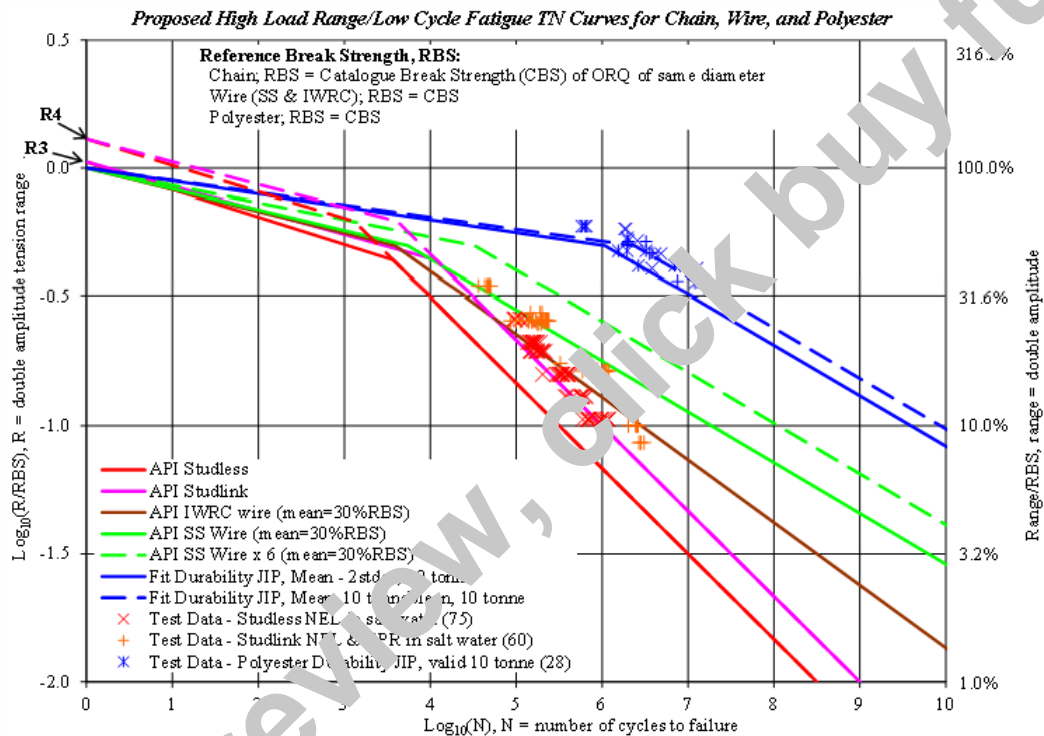


Figure 1—Proposed High Load Range/Low-cycle Corrections to API's TN Curves for Chain and Wire Rope, and Polyester TN Curves including Spiral Strand × 6

Large tension ranges resulting from vortex induced motions of a Gulf of Mexico spar first led to the identification of the need to add a correction for high-tension range, low-cycle fatigue damage to the existing fatigue curves contained in API 2SK, Appendix H. More recently, a "Cyclic Integrity Test (20-hurricane test)" consisting of 20,000 cycles between 15% and 45% of the ropes break strength has been proposed for polyester ropes. Consequently, it seems appropriate at this time to review existing fatigue curves and test data, and propose corrections for low-cycle, high-tension range fatigue damage.

## 2 Chain TN Fatigue Curves

Equation (1) expresses API 2SK's TN curves for chain mooring lines in tension as:

$$\log_{10}(N) = m \log_{10}(T) + \log_{10}(a) \tag{1}$$