TECHNICAL REPORT

ISO/TR 21704

First edition
2017-02

Toughness of round steel link chains — Test with sub-size specimens

Ténacité de la chaînes en acier rond — Essai avec les éprouvettes sous-dimensionnées

Reference number
ISO/TR 21704:2017(E)

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Foreword

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This document was prepared by Technical Committee ISO/TC 111, *Round steel link chains, chain slings, components and accessories*, Subcommittee SC 1, *Chains and chain slings*.

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Introduction

This document provides the results of testing on the toughness of round steel chains.

In an initial study programme, the fundamental effects on the load bearing capacity of round steel chains were examined. The material strength and material toughness along with the temperature were incorporated in the tests. The tests were conducted on chains 16 x 48 and the specimens taken from these. To determine the toughness of sub-size round steel link chains, the required tests were performed with sub-size notch impact specimens that were taken from the unwelded legs of the chains.

The safety of round steel link chains was examined in detail in a load bearing concept and in a brittle fraction transition temperature concept, see Figure A.1. Temperatures and minimum notch impact energy values were determined using fracture mechanics methods, with the aim of ensuring sufficient load bearing capacity for a damaged chain at design temperature. These tests and their results are documented in ISO/TR 23602.

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Toughness of round steel link chains — Test with sub-size specimens

1 Scope

This document contains investigations and investigation results on toughness of round steel link chains, tested with sub-size specimens.

It applies to round steel link chains for hand operated chain hoists of grade TH and VH and for sling chains used for chain slings of grade 8.

NOTE 1 Associated International Standards are ISO 16877, ISO 16872 and ISO 3076. In future it is intended to implement the results on toughness derived in this document in new standards.

Eleven steels, provided by four manufacturers, were tested to find a test regime on sub-size specimens and requirements on the notch impact toughness values at design temperature which resulted out of the tests. These requirements are adjusted to the toughness values of full size ISO-V specimens.

NOTE 2 The requirements are also valid for other cross sections of the chain than round.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

No terms and definitions are listed in this document.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— IEC Electropedia: available at http://www.electropedia.org/

— ISO Online browsing platform: available at http://www.iso.org/obp

4 Abbreviated terms

$(Bb)_{full}$	width x height of the ligament of full size ISO-V specimens
$(Bb)_{sub}$	width x height of the ligament of sub-size specimens
C_1, C_2	correlation factors of the cross section of sub-size to full size specimens
$DBTT_{full\text{-}size}$	ductile-brittle transition temperature calculated for full size ISO-V specimens
$DBTT_{sub\text{-}size}$	ductile-brittle transition temperature tested with sub-size specimens
E_D	design energy at T_D (design notch impact energy at T_D)
E_{full}	calculated energy of full size ISO-V specimens
Ei	energy upon reaching the maximum force in the instrumented notch impact test
Ei_{sub}	Ei of sub-size specimens
Ep	energy component after exceeding the maximum force in the instrumented notch impact test
Ep_{sub}	Ep of sub-size specimens
E_{tot}	total energy: Ei + Ep

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