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Rollover protective structures (ROPS), falling object protective structures (FOPS), operator protective structures (OPS), and tip-over protective structures (TOPS) for mobile machinery — General Canadian requirements

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Preface

This is the third edition of CSA B352.0, *Rollover protective structures (ROPS), falling object protective structures (FOPS), operator protective structures (OPS), and tip-over protective structures (TOPS) for mobile machinery — General Canadian requirements*. It supersedes the previous edition, published in 2009 and *in 1995 under the title Rollover Protective Structures (ROPS) for Agricultural, Construction, Earthmoving, Forestry, Industrial, and Mining Machines — Part 1: General Requirements*.

The major differences from the previous edition include

a) the replacement of references to CAN/CSA-M8082 with references to CAN/CSA 8082-1 and 8082-2;
b) the scope of this Standard has been expanded to include FOPS for agricultural machinery; and
c) revised Clause 5.4.2 to include requirements for welding contractors in order to meet the requirements of the latest edition of CSA W59.

This Standard was prepared by the Technical Committee on Roll-over Protective Structures, under the jurisdiction of the Strategic Steering Committee on Occupational Health and Safety, and has been formally approved by the Technical Committee.

Notes:

1) *Use of the singular does not exclude the plural (and vice versa) when the sense allows.*
2) *Although the intended primary application of this Standard is stated in its Scope, it is important to note that it remains the responsibility of the users of the Standard to judge its suitability for their particular purpose.*
3) *This Standard was developed by consensus, which is defined by* CSA Policy governing standardization — Code of good practice for standardization *as "substantial agreement. Consensus implies much more than a simple majority, but not necessarily unanimity". It is consistent with this definition that a member may be included in the Technical Committee list and yet not be in full agreement with all clauses of this Standard.*
4) *To submit a request for interpretation of this Standard, please send the following information to inquiries@csagroup.org and include "Request for interpretation" in the subject line:*
   a) *define the problem, making reference to the specific clause, and, where appropriate, include an illustrative sketch;*
   b) *provide an explanation of circumstances surrounding the actual field condition; and*
   c) *where possible, phrase the request in such a way that a specific "yes" or "no" answer will address the issue.*

   Committee interpretations are processed in accordance with the CSA Directives and guidelines governing standardization *and are available on the* Current Standards Activities *page at standardsactivities.csa.ca*
5) *This Standard is subject to review five years from the date of publication. Suggestions for its improvement will be referred to the appropriate committee. To submit a proposal for change, please send the following information to inquiries@csagroup.org and include "Proposal for change" in the subject line:*
   a) *Standard designation (number);*
   b) *relevant clause, table, and/or figure number;*
   c) *wording of the proposed change; and*
   d) *rationale for the change.*

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Rollover protective structures (ROPS), falling object protective structures (FOPS), operator protective structures (OPS), and tip-over protective structures (TOPS) for mobile machinery — General Canadian requirements

0 Introduction

This Standard is the Canadian companion document to a series of 13 International Standards that have been adopted or referenced to replace the B352 series of standards (B352.0-95, B352.1-95, and B352.2-95) on ROPS. The series of adopted and referenced standards (referenced as the ROPS/FOPS/OPS/TOPS series) represents the latest thinking, as well as providing international consensus, in operator protection for agricultural tractors, mobile earthmoving machines, construction equipment, mobile mining machines, and mobile forestry machines. The adoption and referencing of the ROPS/FOPS/OPS/TOPS series is both in the interests of international standards harmonization and for the purpose of increasing the scope of operator protection to include FOPS, OPS, and TOPS. The previous B352 series of ROPS standards was already harmonized with international requirements but the standards were not direct adoptions of the ISO standards.

The ROPS/FOPS/OPS/TOPS series details the design, testing, performance, and safety requirements for ROPS, FOPS, OPS, and TOPS for certain types of self-propelled machines for agricultural, construction, earthmoving, forestry, industrial, and mining operations, as follows:

a) The performance requirements, based on destructive testing, for ROPS and FOPS on wheeled or tracked agricultural tractors with a mass greater than 600 kg and with a rear wheel track width greater than 1150 mm are specified in
   i) CAN/CSA-M3463; and
   ii) CAN/CSA-M5700.

   Notes:

   1) *CAN/CSA-M3463 should not be used for tractors with a mass greater than 6000 kg, whereas there is no upper mass restriction for CAN/CSA-M5700.*
   2) *These Standards may also be used as an alternative method for testing ROPS on general purpose industrial tractors.*

b) The performance requirements, based on destructive testing, for ROPS on narrow-track wheeled agricultural tractors with a mass from 600 kg to 3000 kg, with ground clearance less than 600 mm and with a wheel track width less than 1150 mm, are specified in
   i) CAN/CSA-M12003-1; and
   ii) CAN/CSA-M12003-2.

c) The performance requirements, based on destructive testing, for ROPS and FOPS on industrial tractors, motor graders, prime movers, tracked dozers, tracked loaders, wheeled dozers, wheeled

loaders, backhoe loaders, rigid frame dumpers, compactors, and rollers with machine mass greater than 700 kg are specified in
   i) CAN/CSA-M3471; and
   ii) ISO 3449.

d) The performance requirements, based on destructive testing, for ROPS, FOPS, and OPS on self-propelled, wheeled, and tracked forestry machines, including forwarders, skidders, feller-bunchers, processors, harvesters and loaders, are specified in
   i) CAN/CSA-8082-1;
   ii) CAN/CSA-8082-2;
   iii) ISO 8083; and
   iv) ISO 8084.

e) The performance requirements, based on destructive testing, for TOPS on swing boom compact excavators with a mass from 1000 kg to 6000 kg and for specialized FOPS and OPS on these machines are specified in
   i) CAN/CSA-M12117; and
   ii) ISO 10262.

This Standard includes special material requirements and safety requirements related to Canadian operating conditions, which was previously developed by the CSA Technical Committee on Roll-over Protective Structures.

This Standard also includes requirements for the analytical design of ROPS and TOPS for one-of-a-kind machines. These requirements are based on criteria initially developed for ROPS and included in the 1980 edition of CSA B352 and includes the application of these special criteria to TOPS. The scope of the series, to which this Standard is a companion document, includes FOPS, OPS, and TOPS, in addition to ROPS, by adopting or referencing the following standards from the International Organization for Standardization (ISO):

a) adopted standards:
   i) CAN/CSA-M3463;
   ii) CAN/CSA-M3471;
   iii) CAN/CSA-M5700;
   iv) CAN/CSA-8082-1;
   v) CAN/CSA-8082-2
   vi) CAN/CSA-M12003-1;
   vii) CAN/CSA-M12003-2; and
   viii) CAN/CSA-M12117

b) referenced standards
   i) ISO 3449;
   ii) ISO 8083;
   iii) ISO 8084;
   iv) ISO 10262;
   v) ISO 27850;

1 Scope

1.1

This Standard provides requirements for

a) materials, reduced temperature performance testing, and labelling for roll-over protective structures (ROPS), falling object protective structures (FOPS), operator protective structures (OPS), and tip-over protective structures (TOPS);
b) seat belts to be used in conjunction with these systems; and
c) the analytical design of ROPS and TOPS for one-of-a-kind machines.

1.2

This Standard is intended to be used in conjunction with the ROPS/FOPS/OPS/TOPS series summarized in Clause 0.

1.3

The test requirements for ROPS are intended to provide protection for an operator wearing a seat belt under at least the following conditions:

a) a 360° roll about the machine longitudinal axis on a hard clay surface of 30° maximum slope, at forward speeds up to 16 km/h, without losing contact with the slope; and
b) a 180° rear or frontal overturn on a hard, dry surface, without losing contact with the surface.

Note: *The testing of ROPS aims at minimizing the likelihood of operator injury resulting from accidental overturning during normal operation, although ROPS meeting the requirements of the ROPS/FOPS/OPS/TOPS series might not provide crush protection under all circumstances of machine overturn.*

1.4

The test requirements for TOPS on compact excavators are intended to ensure that reasonable crush protection is provided to an operator wearing a seat belt during a 90° tip-over about the swing frame longitudinal axis on a flat, hard soil surface, without losing contact with the surface.

1.5

The test requirements for FOPS are intended to ensure that seated operators are provided with reasonable protection from falling objects, such as trees or rocks.

1.6

The test requirements for OPS on forestry machines are intended to ensure that operators are provided with reasonable protection from penetrating objects, such as saplings, branches, broken winch lines, and poking hazards, but not from small thrown objects, such as chain teeth. The testing of OPS on compact excavators is intended to ensure that operators are provided with reasonable protection from objects entering the front of the workstation.

1.7

In this Standard, "shall" is used to express a requirement, i.e., a provision that the user is obliged to satisfy in order to comply with the standard; "should" is used to express a recommendation or that which is advised but not required; and "may" is used to express an option or that which is permissible within the limits of the standard.

Notes accompanying clauses do not include requirements or alternative requirements; the purpose of a note accompanying a clause is to separate from the text explanatory or informative material.