AS 5047—2005

Australian Standard™

Hydraulic shoring and trench lining equipment

This Australian Standard was prepared by Committee ME-082, Shoring and Trench Lining. It was approved on behalf of the Council of Standards Australia on 22 June 2004. This Standard was published on 2 June 2005.

The following are represented on Committee ME-082:

Australian Industry Group
Civil Contractors Federation
Construction, Forestry, Mining and Energy Union
Institution of Engineers Australia
Master Plumbers and Mechanical Services Association of Australia

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This Standard was issued in draft form for comment as DR 04004.

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First published as AS 5047—2005.

Published by Standards Australia, GPO Box 5420, Sydney, NSW 2001, Australia

ISBN 0 7337 6750 8

PREFACE

This Standard was prepared by the Standards Australia Committee ME-082, Shoring and Trench Lining.

The objective of this Standard is to provide a specification for hydraulic shoring and trench lining equipment that achieves an acceptable level of safety, for reference by manufacturers, suppliers, users and regulators.

Statements expressed in mandatory terms in notes to tables are deemed to be requirements of this Standard.

The terms ‘normative’ and ‘informative’ have been used in this Standard to define the application of the appendix to which they apply. A ‘normative’ appendix is an integral part of a Standard, whereas an ‘informative’ appendix is only for information and guidance.

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FOREWORD

Hydraulically operated shoring systems comprise prefabricated equipment to provide primary support to the side of excavations. This Standard covers three types of equipment whose resistance and adjustment is hydraulic or by a combination of hydraulic and mechanical means, as follows:

(a) Hydraulic bracing frames.

(b) Hydraulic waler frames.

(c) Hydraulic soldier sets.

A variety of components when assembled form a full system. The prefabricated components are used to make assemblies of different dimensions and structural capacities.

Hydraulically operated shoring equipment has a limitation in use in that it is dependent on a competent person relating soil conditions to the use of the equipment.

This Standard gives specific requirements on the main characteristics of hydraulically operated pumps, hoses and associated equipment, but does not provide requirements for their specification or assessment.

Hydraulically operated shoring equipment is frequently used in conjunction with supplementary equipment, e.g., sheet piling, trench sheeting, knee braces and intermediate bracing struts. Such supplementary equipment is not covered in the Scope of this Standard.

The characteristic resistance values specified in this Standard form a reference level.

Appendix A gives information about the values of partial safety factors for materials (γ_M) and partial safety factor for actions (γ_F). Appendix B gives information on the application of characteristic resistance values to a safe working value.

Hydraulic bracing frames have a restriction limiting the length of a single leg to 20 m. Longer lengths of hydraulic frame legs are possible, but these may require an engineering design input that is not covered in this Australian Standard.

Statements expressed in mandatory terms in notes to Tables and Figures are deemed to be requirements of this Standard.

STANDARDS AUSTRALIA

Australian Standard
Hydraulic shoring and trench lining equipment

S E C T I O N 1 S C O P E A N D G E N E R A L

1.1 SCOPE

This Standard specifies constructional and structural requirements for hydraulically operated shoring systems made from steel and aluminium for groundwork support. It also specifies methods of calculation and test to assess compliance with this Standard. It specifies minimum characteristic resistance for equipment and is limited to assemblies with components having hydraulic rams (see Note 1).

Materials other than steel and aluminium are not precluded; however, this Standard does not specify methods of assessment for equipment made of these materials.

This Standard also provides information on some of the main characteristics of hydraulically operated pumps, hoses and associated equipment, but does not cover assessment of these items.

NOTES:

1 Assemblies without hydraulic rams may be designed in accordance with AS 4100.

2 Information on the values of partial safety factors is given in Appendix A.

3 Information on the application of characteristic resistance values is given in Appendix B.

1.2 NEW DESIGNS, INNOVATIONS AND DESIGN METHODS

This Standard does not preclude the use of materials, designs, methods of assembly, procedures and the like which do not comply with a specific requirement of this Standard, or are not mentioned in it, but which can be shown to give equivalent or superior results to those specified.

1.3 NORMATIVE REFERENCES

The following documents are referred to in this Standard.

AS	
1180	Methods of test for hose made from elastomeric materials
1391	Methods for tensile testing of metals
1554	Structural steel welding (all parts)
1665	Welding of aluminium structures
1815	Metallic materials—Rockwell hardness test
1816	Metallic materials—Brinell hardness test
1817	Metallic materials—Vickers hardness test
2019	Fluid power—Hydraulic and pneumatic cylinders—Bore and rod dimensions
2074	Cast steels
2321	Short-link chains for lifting purposes

AS	
2845	Water supply—Backflow prevention devices
2845.1	Part 1: Materials, design and performance requirements
2848	Aluminium and aluminium alloys—Composition and designations—Wrought products
3791	Hydraulic hose
3997	Fluid power—Fire-resistant hydraulic fluids
3997.1	Part 1: Classification
4041	Pressure piping
4100	Steel structures
4744	Steel shoring and trench lining equipment
4744.1	Part 1: Design
AS/NZS	
1664	Aluminium structures
1664.1	Part 1: Limit state design
4291	Mechanical properties of fasteners (all parts)
ISO	
DIN 51524-1	Pressure fluids; hydraulic oils; HL hydraulic oils; minimum requirements
DIN 51524-2	Pressure fluids; hydraulic oils; HLP hydraulic oils; minimum requirements
DIN 51524-3	HVLP hydraulic oils; minimum requirements
SAE MS 1004	Lubricants, industrial oils, and related products Type H (hydraulic fluids)—Specification
CE TOP RP91 H	Fluids for hydraulic transmissions

1.4 TERMS AND DEFINITIONS

For the purposes of this Standard definitions below apply.

1.4.1 Characteristic axial compression resistance (R_{KC})

Resistance of a hydraulic bracing frame leg, or a ram or a waler frame/soldier set strut with the piston rod of the ram fully extended.

1.4.2 Characteristic axial resistance for the return capacity of a double acting ram (R_{TA})

Resistance of the return capacity of a double acting ram.

1.4.3 Characteristic bending resistance for a leg at a reduction in section (R_{KB2})

Resistance of a hydraulic bracing frame leg where there is a reduction in section.

1.4.4 Characteristic bending resistance of a hydraulic bracing frame leg at a specified length ($R_{KB\text{-}N}$)

Bending resistance of a hydraulic bracing frame leg at a specified length and of a specified assembly.

NOTES:

1 The assembly of components can take several forms to produce a given length of a hydraulic bracing frame leg (see Appendix C).

2 A hydraulic bracing leg is usually formed from a number of components and may also have a significant resistance in one direction of action.

1.4.5 Characteristic bending resistance of the inner tube of an adjustable leg ($R_{KB.RI}$)

Resistance of the inner tube of an adjustable telescopic hydraulic bracing frame leg.

1.4.6 Characteristic bending resistance of the main section of a leg (R_{KB1})

Resistance of the main section of a hydraulic bracing frame leg.

1.4.7 Characteristic bending resistance of the outer tube of an adjustable leg ($R_{KB,RO}$)

Resistance of the outer tube of an adjustable telescopic hydraulic bracing frame leg.

1.4.8 Characteristic bending resistance on the compressive side of a joint to an extension leg ($R_{KB,JC}$)

Resistance of the compressive side of a hydraulic bracing leg under the arrangement of loading given in Figure 3.1.

1.4.9 Characteristic bending resistance on the tension side of a joint to an extension leg ($R_{KB,JT}$)

Resistance of the tensile side of a hydraulic bracing leg under the arrangement of loading given in Figure 3.1.

1.4.10 Characteristic compressive failure pressure (F_{KC})

Internal pressure at which compression failure occurs in a ram when extended to approximately 10% of its possible range.

1.4.11 Characteristic minimum bending resistance (R_{KB})

Bending resistance of a hydraulic bracing frame leg, soldier rail or a waler rail when assembled in the most onerous configuration.

1.4.12 Characteristic return failure pressure (F_{TA})

Internal return pressure in a double acting ram at failure of the ram.

NOTE: Clause 1.4.10 defines cylinder assembly failure pressure of a ram whereas Clause 1.4.1 defines the characteristic compression resistance of the complete ram with the ram leg fully extended, which takes into account ram leg buckling.

1.4.13 Competent person

A person who has acquired through training, qualification, experience or a combination of these, the knowledge and skill enabling that person to correctly perform the required task.

1.4.14 Cylinder end block

Component that terminates the cylinder tube and provides a connection for attaching hydraulic fittings and isolation valves and connection points to the surrounding structure (see Figures 1.1, 1.2 and 1.3).

1.4.15 Cylinder tube

Outer cylinder of the ram that resists the internal pressure and provides the outer sealing surface to the piston (see Figures 1.1, 1.2 and 1.3).

1.4.16 Double acting ram

Hydraulic ram that both extends and retracts under hydraulic pressure (see Figure 1.3).

NOTE: These rams primarily take compressive loads but also have a tensile capacity.

1.4.17 Extension leg for hydraulic bracing frame leg

Component that is either fixed or mechanically adjustable to extend a hydraulic bracing frame leg (see Figure 1.8).

NOTE: The joint between the component and its parent has a moment capacity.