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GRAIN AUGERS

INDUSTRY SAFETY STANDARD

MAY 2009

making a difference

THE GOVERNMENT OF WESTERN AUSTRALIA

State Government Victoria

New South Wales Government

CONTENTS

1. INTRODUCTION

The Industry Solutions Program is a research and development initiative undertaken by WorkCover NSW, which has worked with industry to devise practical solutions to problematic issues in an industry. It recognises the need for assistance in some industry sectors to overcome particular difficulties or challenges in order to improve workplace safety.

Solutions to safety issues are developed in partnership with industry within a three-month period and then released for industry-wide implementation. Within 12 months an evaluation is conducted jointly with industry to determine the effectiveness and practicality of the solutions. If necessary, further refinements, including additional solutions, are included after the evaluation.

The Industry Solutions Program identified that the use of grain augers is a hazardous operation and there was no practical guidance for their design and use, hence this industry safety standard was developed and published in April 2007. A review of the standard was completed in September 2008.

Contributors to this industry safety standard include:

- Australian Workers Union
- Beulah Enterprises
- Farmsafe Australia Inc
- Grainline
- Motor Traders' Association NSW
- Nowra Truck and Tractor Repairs Pty Ltd (FIMDA)
- NSW Farmers Association
- Online Safety Systems
- Tractor and Machinery Association of Australia.

This industry safety standard provides practical assistance for designers, manufacturers, suppliers and users of grain augers. Occupational health and safety regulations require the control of risk to health and safety and following this industry safety standard is a means to achieve such compliance.

1.1 ENDORSEMENT

This industry safety standard has been reviewed and endorsed by:

- Workplace Health and Safety Queensland
- WorkSafe Victoria
- WorkSafe Western Australia.

1.2 STATE OHS LEGISLATION

For specific occupational health and safety (OHS) state requirements, refer to:

New South Wales

- *Occupational Health and Safety Act 2000*
- *Occupational Health and Safety Regulation 2001*

Queensland

- *Workplace Health and Safety Act 1995*
- *Workplace Health and Safety Regulation 2008*
- *Electrical Safety Act 2002*
- *Electrical Safety Regulation 2002*

Note: Users of grain augers are urged to adopt and develop safe systems of work as specified in section 7.

Victoria

- *Occupational Health and Safety Act 2004*
- *Occupational Health and Safety Regulations 2007*

Western Australia

- *Occupational Safety and Health Act 1984*
- *Occupational Safety and Health Regulations 1986*

To contact your OHS state authority, refer to appendix C.

2. SCOPE

This industry safety standard covers the design and use of all new grain augers, including pencil, transportable and self-propelled grain augers. It does not cover the design and use of fixed or permanent grain augers.

This industry safety standard also covers used grain augers for resale.

3. DEFINITIONS

competent person for any task means a person who has acquired through training, qualifications or experience, or a combination of them, the knowledge and skills to carry out that task.

hostile operating environment an operating environment at a place of work where an item of electrical equipment is in its normal use subject to operating conditions that are likely to result in damage to the item of equipment.

This includes an operating environment that may:

- cause mechanical damage to the equipment, or
- expose the equipment to moisture, heat, vibration, corrosive substances or dust that is likely to result in damage to the equipment.

must indicates that the requirements are mandatory under OHS legislation.

owner the person who possesses the grain auger for their own or others' use. **Note:** In this document, the owner is usually the person designated as the *employer* under OHS legislation.

pencil grain auger a lightweight auger with a bore of up to 150 mm that can be relocated manually.

self-propelled grain auger an auger that can be moved by a motive force that is an integral part of the auger.

should indicates a recommendation to do something that is not a mandatory requirement under OHS legislation.

supplier includes dealers, retailers and importers.

transportable grain auger an auger that can be moved without breaking it down into its components.

4. DESIGN

4.1 GUARDING

4.1.1 General

Guards must be used to prevent access to dangerous parts. They must be designed as an integral part of the grain auger.

Guards must be effective to protect people while allowing grain to flow, as serious injury or death can result if guards are removed.

Different grains have different flow characteristics. It is recognised that mesh and other safety features can impede the grain flow. It is important that grain flow is not impeded by the mesh and other guards. Mesh of a maximum 100 x 100 mm apertures is sufficient to enable all types of grain to flow at a sufficient rate into the grain auger while maintaining an acceptable level of safety when used with an inner guard. If mesh with a smaller aperture is used, it is essential that its grain flow limitations are clearly identified and information provided to this effect.

4.1.2 Drive belts, pulleys, chains, sprockets and drive shafts

All drive belts, pulleys, chains, sprockets and drive shafts, and other nip, shear and crush points, must be fully guarded, including 'back guarding' to prevent contact from behind.

The guards must be secured in position so they cannot be removed without the use of tools, unless an interlocking device is provided to automatically stop the grain auger in the event of the removal or opening of such guarding.

Chains and sprockets must be fully enclosed for their whole length.

4.1.3 Auger/screw flighting

The auger or screw flighting must be effectively guarded. This requires two levels of guarding: an inner guard that is permanently fitted over the flighting, and a fitted outer guard.

Inner guard

The inner guard must be an integral part of the screw-bearing assembly to enable bearing maintenance. It must be permanently fixed to the grain auger as close as practicable to the flighting. As a minimum, it must comprise longitudinal bars at a maximum of 75 mm spacing and be of sufficient strength to prevent deformation – eg 10 mm diameter steel. The bearing end of the grain auger must not have apertures greater than 75 mm.

Outer guard

The outer guard must comprise mesh with a maximum of 100 x 100 mm apertures. It must not be flush with the inner guard. Instead, there should be at least 120 mm between it and the inner guard. It must be secured in position. However, it may be removable if the removal does not affect the safe operation of the grain auger.

Where a grain auger is operated without a hopper, the outer guard (apart from its ends) should be cylindrical (or part cylindrical if the flighting is partly enclosed by the shell of the grain auger) and fit directly over the inner guard while maintaining 120 mm minimum clearance over the inner guard.

The outer guard must be fitted at the time of supply.

Where a grain auger is operated with a hopper, the outer guard may be designed to fit on the face of the hopper while maintaining at least 120 mm clearance over the inner guard.

Note: If the grain auger is intended to operate both with and without a hopper, the design should incorporate both types of outer guards.

4.2 CONTROLS AND EMERGENCY STOPS

All grain auger controls should be clearly and permanently identified.

An emergency stop should be fitted as close as practicable to the inlet of the grain auger. The emergency stop should be a button in the case of an electrically-powered grain auger or a 'kill switch' for an internal combustion powered or hydraulic-driven grain auger.

4.3 POWER WINCHES

Winches must comply with Australian Standard 1418 *Cranes, hoists and winches,* Part 1: *General requirements* and Part 2: *Serial hoists and winches*, including the design of wire ropes, sheaves and drums. Wire ropes used for raising and lowering the grain auger must be fastened using swaged, socketed, or spliced eyes and thimbles. Wire ropes, when used in this application, must not be fastened by using rope grips, such as bulldog grips, or knots.

Some key features in AS 1418.2 relating to power-operated wire rope hoists include:

- Guards must be provided to prevent a hand being caught between the wire rope and the wire rope sheave(s).
- If there is a possibility of the rope being dislodged from the sheave – eg when the rope is not continually under load – the sheave must be provided with means to retain the rope in the groove.
- The rope angle should not exceed 45 degrees (see figure 1).

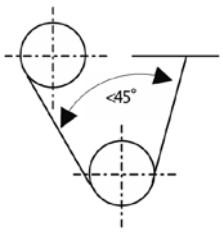


Figure 1 – Rope angle

- Wire ropes must comply with Australian Standard AS 3569 *Steel wire ropes* or an equivalent international standard.
- Lang's lay ropes, other than non rotating ropes, must not be used.
- A device must be provided to ensure that the wire rope is correctly wound on the drum.
- All rope end fastening devices used for wire rope must have a safety factor of five or more, including the effect of rope friction – where rope friction is taken into account, a friction coefficient of 0.1 applies.

- The drum and sheave diameter depends upon the classification of the hoist – as a minimum, the drum diameter cannot be less than 11.2 times the diameter of the rope, the sheave diameter cannot be less than 12.5 times the diameter of the rope, and the rope equaliser sheave diameter cannot be less than 11.2 times the diameter of the rope.
- Top and bottom limits must be fitted where necessary.

4.4 STABILITY

The grain auger must be designed so that it remains stable in its range of working configurations and normal operational condition. When the inlet end is lifted, the grain auger should not go beyond its fulcrum point until that end is at least one metre above the ground. This should apply with all motors and drive equipment mounted in position, any hydraulic reservoir no more than 50 per cent full and the fuel tank empty.

If the hydraulic reservoir and/or fuel tank are mounted on the A-frame furthest from the inlet end, the grain auger should not go beyond its fulcrum point with that reservoir or tank full.

Note: A jockey wheel may be used to aid manoeuvrability.

4.5 HYDRAULIC SYSTEMS

All hydraulic hoses must have a safety factor of 4:1 of the minimum burst pressure of the hose to the maximum dynamic working pressure.

4.6 ELECTRICAL SAFETY

An electrically-powered grain auger should be designed and manufactured in accordance with Australian/New Zealand Standard AS/NZS 3100 *Approval and test specification – General requirements for electrical safety.*

Overload protection should be provided for electric winches fitted to the grain auger.

Portable electrically-powered grain augers should be protected by a 30 mA residual current device at the power outlet.

If an electrically-powered grain auger is used in a 'hostile operating environment' it must be regularly inspected and tested by a competent person. Guidance on inspection and testing methods can be found in the Australian/New Zealand Standard AS/NZS 3760 *In-service safety inspection and testing of electrical equipment.*

Note: Due to the nature of a grain auger operation it is likely that a risk assessment would determine that it is operating in a hostile operating environment and therefore would require regular inspection and testing.

4.7 SAFETY SIGNS

Every grain auger must clearly display pictorial and written signs warning against the serious safety risks outlined in this industry safety standard. The signs should include the following warnings:

- Keep grain auger clear of overhead powerlines.
- Empty and lower grain auger before moving.
- Do not run grain auger when empty.
- Do not operate grain auger with the guards removed.

Examples are provided in appendix A.

Where possible, information should be represented by symbols that conform to Australian Standard AS 1319 *Safety signs for the occupational environment*. All words should be in English and units should be metric.

4.8 RETENTION OF INSTRUCTIONS

The grain auger must include a weatherproof receptacle in which to store the operating instructions in good condition. The receptacle must be labelled accordingly.

4.9 TRANSPORTATION

Transportable and self-propelled grain augers must be designed so they can be safely transported within a property and on a public highway, and must comply with road transport legislation.

5. MANUFACTURER

5.1 MANUFACTURER'S RESPONSIBILITIES

The manufacturer must ensure that the grain auger is manufactured in accordance with the design specifications.

The manufacturer's identification details and model number must be clearly and permanently marked on the main body of the grain auger.

5.2 MANUFACTURER'S INSTRUCTIONS

The manufacturer must develop instructions that clearly specify all the information necessary to ensure the safe use of the grain auger, including all limitations on its use, and an inspection and maintenance schedule.

The instructions should include as a minimum:

- the safe positioning and handling of the auger
- means for safe storage and transport of the grain auger
- safe operating instructions
- a warning about overhead power lines
- details of the inspection and maintenance requirements for separate items and components, and for the grain auger as a whole
- advice that when the grain auger is not in operation it must be immobilised – ie turned off and key removed from power source
- advice on the use of guards
- the stowing configuration for transportation, where appropriate
- necessary personal protective equipment.

A manufacturer supplying a grain auger without a drive motor or equipment for installation by others should provide adequate information to indicate the range of motor masses for which the grain auger is designed to maintain stability.

The manufacturer should provide practical means for communicating the operating instructions. Such means may include an instruction video or DVD, or an instruction package.

6. SUPPLIER

6.1 GENERAL

The supplier should ensure that the grain auger complies with this industry safety standard or an equivalent level of safety. The supplier should ensure the checklist items at appendix B are addressed.

6.2 PROVISION OF INFORMATION

The manufacturer's instructions and all other information relevant to the safe use of the grain auger must be provided at its point of supply. For grain augers imported, either from another country or from another state or territory, the supplier must still ensure that the manufacturer's instructions are available.

6.3 PRACTICAL SAFETY INFORMATION

The supplier should establish a means to instruct persons purchasing grain augers in their safe operation.

Note: Such means may include a video or DVD, an instruction session, or an explanation of the manufacturer's safety instructions.

7. USE

7.1 PRE-PURCHASE

The purchaser of the grain auger should discuss their needs with the supplier prior to purchase to ensure the grain auger is the most appropriate for their needs. The supplier must ensure the manufacturer's instructions are available at the point of purchase.

The purchaser should also seek practical advice and instruction from the supplier on the use of the grain auger.

Note: When a person is taking possession of the grain auger on a temporary basis – eg by way of loan – they should seek safe use instructions from the person supplying it.

7.2 SAFETY INSTRUCTIONS

The owner must provide safety instructions to all persons involved in using the grain auger. The safety instructions must be kept with the grain auger in the receptacle provided for that purpose.

Note: The safety instructions should generally be the manufacturer's instructions. Variations from the manufacturer's instructions must be based on a risk assessment, must not remove any of the safety features and must not expose persons to risks.

7.3 USE

The grain auger must be used in accordance with the safety instructions (see note in section 7.2).

Prior to use, the grain auger should be inspected to ensure it is functioning correctly, including all its safety features, such as guards. If any safety feature is not functioning correctly, the grain auger must not be used.

The inner guard must be in position at all times when the grain auger is in use. The outer guard must be in position when using a hopper and wherever practicable for all other applications. Where it is not practicable to use the outer guard and it is removed – eg when the grain auger is being used in a silo with a narrow discharge chute that the guard will not fit into – persons must not be directly exposed to the auger flighting during operation. In such situations it may be necessary to provide an alternative outer guard. The inner guard should not be relied upon by itself as an appropriate risk control measure.

The area where the grain auger is to operate must be assessed for hazards that may affect the safe operation of the grain auger, including the location of overhead power lines, and the terrain where the grain auger will be used.

When operating an auger near overhead power lines, it is essential to maintain the following approach distances:

- 3 m – up to and including 132,000 volts
- 6 m – above 132,000 volts up to and including 330,000 volts
- 8 m – above 330,000 volts.

Note: Regulatory jurisdictions have different approach (or separation) distances for work in close proximity to overhead power lines. The distances above apply for NSW. Refer to your OHS or electrical regulator for the relevant distances in your jurisdiction.

These clearances must allow for the sagging or swinging of the power lines due to their expansion or the affects of the wind.

7.4 COMPETENCE

The owner must ensure that persons operating the grain auger, and those otherwise involved in its operation, are competent to do so. All persons involved in the operation of the grain auger must be instructed in the safe operating instructions.

7.5 PERSONAL PROTECTIVE EQUIPMENT (PPE)

The employer must provide appropriate PPE to those involved in the grain auger operation. Hearing protection must be worn.

7.6 DEACTIVATING THE GRAIN AUGER

When the grain auger is not in use, it must be immobilised – ie turned off and key removed from power source.

7.7 STORAGE AND TRANSPORT

When not being used, the grain auger must be safely stored in accordance with the manufacturer's instructions so that it will not fall accidentally. Particular care should be given to ensure it is stable and does not pose a risk of falling onto a person who is preparing it for use, or falling onto a person accidentally.

The grain auger must be stowed in the correct transportation configuration prior to it being transported. Where a chain or a similar restraining device is required for transportation, it must be used.

Note: There may be different requirements between transporting within a property and on a public highway.

7.8 INSPECTION, MAINTENANCE AND REPAIR

The grain auger must be inspected regularly in accordance with the manufacturer's instructions to ensure it is functioning correctly. All problems identified must be rectified prior to its use. All safety features must be maintained to ensure they are functioning as intended. Where parts or components require replacing, replacements must be identical or equivalent to the original parts and components.

If the grain auger needs repairing, the repairs should be carried out according to the manufacturer's instructions. Where there are no instructions available for the particular repair required, the owner should seek advice from the manufacturer or their agent, or have the necessary work completed or specified by a competent person.

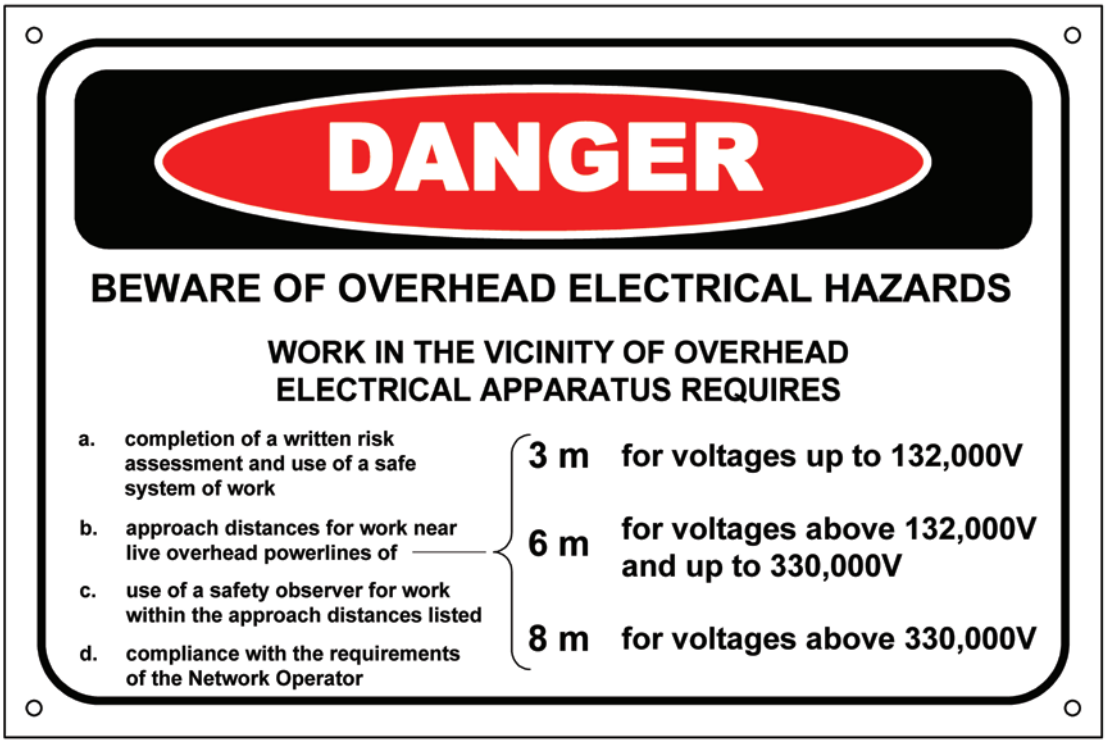
7.9 MODIFICATIONS

A grain auger should not be modified or altered. However, if it is necessary to modify one, all modifications must be done by a competent person, based on a risk assessment. It is important to emphasise that the competent person who undertakes the modification assumes the role of the designer and manufacturer. All safety features must be retained in the modified machine.

Safety instructions must be reviewed after all modifications are carried out, and revised where necessary.

APPENDIX A – SAFETY SIGNS

Every grain auger must clearly display pictorial and written signs warning against the serious safety risks outlined in this industry safety standard. The following are examples of safety signs that may be used:


DANGER
BEWARE OF OVERHEAD ELECTRICAL HAZARDS
WORK IN THE VICINITY OF OVERHEAD ELECTRICAL APPARATUS REQUIRES
a. completion of a written risk assessment and use of a safe system of work
b. approach distances for work near live overhead powerlines of
c. use of a safety observer for work within the approach distances listed
d. compliance with the requirements of the Network Operator
3 m for voltages up to 132,000V
6 m for voltages above 132,000V and up to 330,000V
8 m for voltages above 330,000V

APPENDIX B – PRE-PURCHASE CHECKLIST

The following checklist can be used by a person wishing to purchase a grain auger, to ensure it complies with the important safety features specified in this industry safety standard. It should be used prior to purchasing the grain auger. Some items need to be addressed prior to purchasing – eg ensuring that there is a safe storage area.

Tick **YES** or **NO** as appropriate against each item. If you review and complete this checklist with all 'yes' answers, your grain auger should enable you to meet your legal safety obligations. Where you answer 'no' to any question, you will need to address the issue to ensure that you comply with those obligations.

ITEM	YES	NO	COMMENTS
Is the grain auger appropriate for the intended operation?			
Are drive belts, pulleys, chains, sprockets and drive shafts fully guarded, including 'back guarding' to prevent contact from behind? (See section 4.1.2)			
Does the fixed inner guard have bars with maximum 75 mm spacings? (See section 4.1.3)			
Does the removable outer guard have mesh of a maximum 100 x 100 mm apertures? (See section 4.1.3)			
Is the distance between inner and outer guards a minimum of 120 mm? (See section 4.1.3)			
Is the emergency stop near the grain auger inlet? (See section 4.2)			
Are winches properly guarded to prevent a hand being caught between the winch drum and the wire rope? (See section 4.3)			
Are all lifting ropes fastened using swaged, socketed or spliced eyes and thimbles and not fastened by bulldog grips or knots? (See section 4.3)			
Is a device provided to ensure that the wire rope is correctly wound on the winch drum? (See section 4.3)			
Is a jockey wheel fitted to aid manoeuvrability if necessary? (See section 4.4)			
Are safety signs clearly displayed warning of the serious safety risks? (See section 4.7 and appendix A)			
Is a weatherproof receptacle for storing the operating instructions provided and labelled accordingly? (See section 4.8)			

ITEM	YES	NO	COMMENTS
Are safety instructions provided with the grain auger? (See section 7.2)			
Are transportation aids (eg safety chain) included? (See section 7.7)			
Is information provided on safe storage of the grain auger? (See section 7.7)			
Are inspection and maintenance requirements provided? (See section 7.8)			

APPENDIX C – FOR FURTHER INFORMATION

WorkCover NSW

- **Go to** WorkCover's website at **www.workcover.nsw.gov.au**
- **Call** the WorkCover Assistance Service on **13 10 50**
- **Call** the WorkCover Publications Hotline on **1300 799 003**
- **Visit** your nearest WorkCover office
- For technical specifications for grain augers, contact your local manufacturer.

Workplace Health and Safety Queensland
GPO Box 69
Brisbane 4001
Workplace health and safety infoline: 1300 367 915
Electrical safety infoline: 1300 650 622
Website: www.worksafe.qld.gov.au

WorkSafe Victoria
Advisory Service
222 Exhibition Street
Melbourne VIC 3000
Telephone: 03 9641 1444
Toll free: 1800 136 089
Email: info@worksafe.vic.gov.au
Website: www.worksafe.vic.gov.au

WorkSafe Western Australia
1260 Hay Street
West Perth WA 6005
Telephone: 08 9327 8777
Toll Free: 1300 307 877
Email: safety@commerce.wa.gov.au
Website: www.worksafe.wa.gov.au

AUSTRALIAN STANDARDS

Australian Standards can be purchased from SAI Global by contacting the Customer Service Centre on 131 242 or over the net at **www.saiglobal.com/shop**

AS 1318	*Use of colour for the marking of physical hazards and the identification of certain equipment in industry* (known as the SAA Industrial Safety Colour Code)
AS 1319	*Safety signs for the occupational environment*
AS 1418.1	*Cranes, hoists and winches, Part 1 – General requirements*
AS 1418.2	*Cranes, hoists and winches, Part 2 – Serial hoists and winches*
AS/NZS 3000	*Electrical installations* (known as the Australian/New Zealand Wiring Rules)
AS/NZS 3760	*In-service safety inspection and testing of electrical equipment*
AS/NZS 3190	*Approval and test specification – Residual current devices (current operated earth leakage devices)*
AS/NZS 3100	*Approval and test specification – General requirements for electrical equipment*

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WorkCover NSW 92-100 Donnison Street Gosford NSW 2250
Locked Bag 2906 Lisarow NSW 2252 WorkCover Assistance Service **13 10 50**
Website **www.workcover.nsw.gov.au**

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