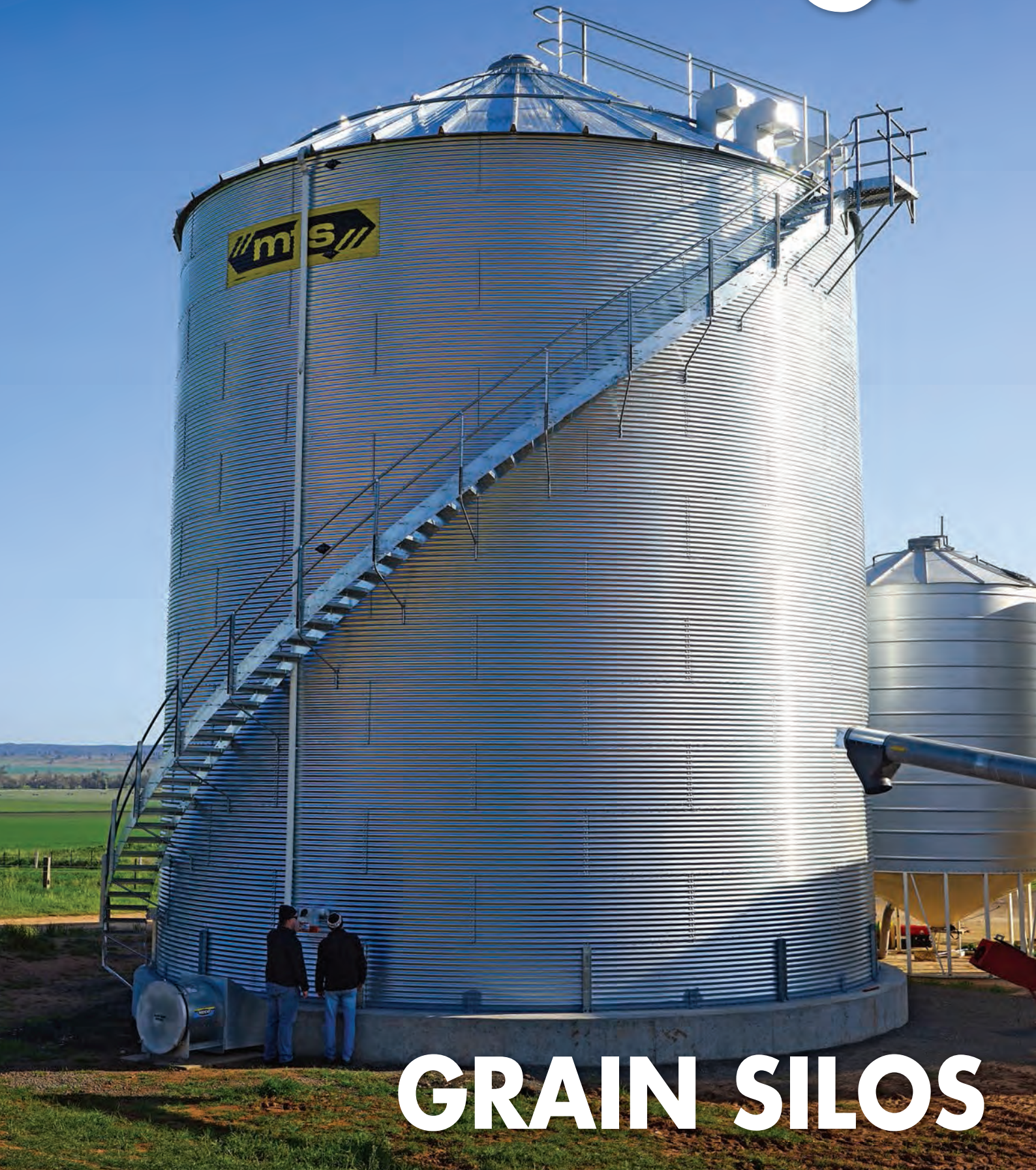


ResearchReport

Kondinin Group

SEPTEMBER 2015 No. 068 www.farmingahead.com.au



GRAIN SILOS

Independent information for agriculture

Testing times: Dozens of silos were inspected, photographed and pressure tested according to Australian Standards.



Silo selection requires research

Since deregulation, there has been a growing trend to store an increasing amount of grain on farm. But maintaining the quality of grain in storage requires planning, knowledge and the right gear, none more important than the silo itself. Kondinin Group engineer, Ben White, travelled 8,000km across every mainland state to inspect nearly 60 silos on-farm from different manufacturers, taking photographs and undertaking a pressure test according to Australian Standards where applicable. By **Ben White**

WHY SEAL SILOS?

Contrary to popular belief, silos do not seal to physically keep insects out. Sealing a silo stops fumigants like phosphine from escaping the silo.

Maintaining fumigant levels at adequate concentrations for seven to ten days is needed to disinfect grain and kill insects at all life stages including adults, pupae and larvae as they move through the life cycle.

If a silo does not seal to be gas-tight and meet the Australian Standard, it cannot be used with fumigants to provide an effective disinfestation option.

Flat-bottom silos are larger with more sealing faces and are by nature more difficult to seal than elevated cone-base silos. When asked to provide an example of a large, recently installed sealed flat-bottom silo, only two manufacturers were able to provide an example for testing.

The majority of the flat-bottom site

constructed brands of silos are imported from North America where sealing is not required thanks to their freezing winter conditions which eliminates most insect infestation issues. This adds a level of complexity when it comes to sealing the silo to meet the Australian standard with inlet and access doors, out-loaders, roof vents and aeration fan couplings proving to be common places for air leaks.

NON-SEALING OPTIONS

If silos do not seal to meet AS2628, options include aeration or seed protectants like Conserve OnFarm or K-Obiol. These protectants are not registered for use in Western Australia where the export market is dominant. Growers outside WA should check with buyers regarding protectants to ensure potential markets are not limited.

All growers should read and carefully follow chemical label information.

AUSTRALIAN STANDARD 2628

AS2628-2010 was established to provide a minimum standard of sealing required to maintain fumigant gas concentrations to kill all lifecycles and disinfest grain.

Terms like “semi-sealed” are confusing and meaningless.

If you want to fumigate effectively in a silo insist the manufacturer seals it to AS2628 on delivery and get a guarantee in writing.

After pressurising to 25mm water gauge, a silo sealed to AS2628-2010 will maintain more than 12mm of water gauge pressure for more than five minutes when new. For older silos, 3-minutes is acceptable.

AERATION OPTIONS

Regardless of your location, it is worth considering the installation of an aeration fan and controller when purchasing a new silo.

The use of an aeration controller switches air flow on and off to meet required ambient temperature and humidity limits.

Aeration will not kill insects but can be used to cool grain, significantly slowing insect life-cycles and maintaining uniform moisture levels in the stored grain. Seed germination and vigour can also benefit as a result of aeration cooling.

FULL FLOOR AERATION

There are arguments for and against full floor aeration in flat-bottom silos. On one hand it does offer even airflow through the grain stack, but full-floor aeration can be difficult to maintain good hygiene with grain and dust settling below the vented floor. This can be difficult to disassemble for a thorough clean-out.

IMPORTANCE OF PLANNING

Before investing in new grain storage facilities, ensure you have a sound plan for the facility and future expansion. Include considerations like weighbridges, lighting, electrical needs and hardstands.

TRANSPORT COSTS

Always compare the cost of the silo delivered and erected on-farm. Silo transport costs can vary depending on dimensions, pilot requirements, distance and state government transport requirements.

GALVANISING AND WALL THICKNESS

Wall thickness and galvanising grades can vary between silo manufacturers and models. Enquire with suppliers about wall thickness to compare gauges but also consider the wall design strength and stiffening ribs as some designs can be stronger than others.

CONCRETE PADS

Ask your silo supplier about the requirements for concrete pads.

Most will provide a recommendation for thickness and reinforcing which can vary depending on silo size and soil type.

LADDERS AND ACCESS

Every silo should be fitted with a ladder or be able to be accessed easily and safely. Even “no-climb” silos will need to be climbed at some stage to maintain seals, replace springs on closing mechanisms or repair auger bump damage.

Cages provide additional levels of safety and remember that a climbing harness is a good insurance policy and should be worn when climbing a silo.

FUMIGATION

Ground level fumigation is becoming increasingly popular but some attempts are better than others. Look for a ground application system with airflow to and from the headspace for optimal results.

Always follow the label rates and allow sufficient time for the full fumigation to be conducted including ventilation and withholding periods.

ELEVATED CONE-BASE VERSUS LARGE FLAT BOTTOM

Larger flat bottom silos tend to be lower cost per tonne of stored grain but are more difficult to seal. Only two manufacturers were able to demonstrate a flat bottom silo sealed to AS2628.

Some farmers opt for non-sealed flat bottom silos with a quality aeration system but back this up with gas-tight sealed silos for treating insect infestations if they occur.

Elevated cone-base silos are usually easier to clean out and smaller sizes allow for additional levels of segregation but often come at a higher cost per tonne of stored grain.

COMPARING CAPACITY

Silo volumes are quoted in a wide range of capacities including cubic volumes, tonnages of varying grains, bushels and even bags.

While cubic volume in meters cubed is strictly more accurate, for ease of comparison in this report we have converted all capacities back to tonnes of wheat stored.

BUYERS CHECKLIST

- ☒ Has a pressure relief valve large enough to suit the silo with clear marking for pressure testing
- ☒ Has a facility to add air, for example, a tyre valve stem, to conduct a half-life pressure test
- ☒ Has high density rubber seals with strong memory and UV resistance
- ☒ Lasting seals between sheet joins, rivets, screws and bolts
- ☒ Maintains seal integrity when filled
- ☒ Has sealing plates to cover aeration fans for fumigation
- ☒ Has fans sized appropriately to deliver 2-3 litres per second per tonne of capacity for cooling grain
- ☒ Has fans sized appropriately to deliver 15-20 litres per second per tonne of capacity if planning to dry grain
- ☒ Has an aeration distribution plenum to disperse air evenly throughout the grain
- ☒ Has ground opening lids
- ☒ Allows easy ground access for cleaning out the silo
- ☒ Has an easy to clean design including aeration ducting, particularly in flat-bottom silos
- ☒ Has a workplace health and safety compliant ladder
- ☒ Is fabricated with a sturdy steel cone fabrication with quality weldments and a galvanised or quality painted finish
- ☒ Has a sealed thermosiphon recirculation system if larger than 150-tonnes capacity which is uv stabilised and will not compromise seal integrity in the future
- ☒ Has a sealed fumigation application chamber for phosphine with a sufficiently large tray to spread tablets without excessive stacking and passive or active sealed recirculation to carry released gas out of the chamber.
- ☒ Has wall sight glasses or level sensors to indicate grain level particularly near the top and bottom of the silo to assist filling and emptying.

Source: www.storedgrain.com.au

For more information:

The GRDC have a site dedicated to grain storage packed with useful information: www.storedgrain.com.au

KONDININ GROUP TESTS SILOS

Kondinin Group engineers inspected silos from 21 manufacturers including both elevated cone-base and flat bottom silos.

Manufacturers were asked to provide contact details of a number of farmers who had made a sealed silo purchase, preferably within the last 12-months.

Kondinin Group then contacted farmers and made arrangements to see the silos first-hand. In all instances the silos inspected were empty.

Components inspected included the base structure, cone, welding and construction quality, lid and vent opening mechanisms, manhole, base to wall joins and wall sheet overlaps, thermosiphon tubes, ladders and walkways, sight windows and outlet mechanism.

After checking all lids and access doors were closed, a high volume air-compressor or cordless blower was used to add 25mm of water-gauge (250 Pascals) pressure to the silo in accordance with the Australian Standard AS2628. The half-life time was

recorded for each silo in the empty state only. Some silo manufacturers were unable to provide a recent example of a sealed flat-bottom silo. In most instances these manufacturers were continuing to work on the requirements to meet AS2628 with some being closer than others.

If you need your flat bottom silo to be sealed, ensure you have a written guarantee from the manufacturer once installed and consider witnessing the pressure testing process prior to signing off on the final payment for the installation.



Allied (MFS) Silos

YOUNG NSW based Allied Grain Systems offer both the elevated cone-base and flat bottom range of imported MFS silos with modifications to enable sealing to AS2628. Both utilise large Grain-Guard pressure relief valves with the large flat-bottom models using two with a gate valve for isolation when aerating. Cone-base models have a bolted sectional base cone and use a slide-plate mechanism on the out-load door with a large plate attachable for sealing.

SEAL STATUS

Both elevated cone-base and flat bottom silos passed AS2628 half-life pressure testing.

WHAT WE LIKED:

- Both cone-base and flat-bottom met AS2628 sealing standard.
- Top access rails on cone-base models.
- Accessible top-vent placement and simple sealing mechanism.
- Base structure on cone-base was solid.

WHAT COULD BE BETTER:

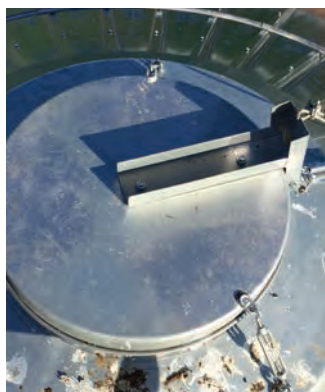
- Lockout gate on large flat-bottom model.
- Stiffening of top platform and roof walkway on flat-bottom model.
- Turnbuckles on top lid can be fiddly to tighten.
- Bottom seal plate on cone-bottom model is a two-person job.

INDICATIVE PRICING:

For the sealed units inspected, owners paid on average around \$130/tonne for flat bottom silos and \$204/tonne for elevated cone-base including concrete slab and aeration in both instances including GST.

Contact:

www.alliedgrainsystems.com.au
Phone: 1800 689 433



Inlet lid: On both elevated cone-base and flat bottom silos, the ground operated, spring-closing lid is opened using a pull-rope and sealed using three turnbuckles.



Internal: "X-shaped" aeration in-floor venting and unloading auger.



Top access: Access at the top of the silo features hand and mid railings making climbing more reassuring although additional struts on the large flat-bottom model would be beneficial.



Sealing plate: The lower access door on the flat-bottom model utilised a galvanised sheet sealing plate over the opening with 8 bolts holding it in place.



Sturdy base: The galvanised SHS-constructed base structure on the elevated cone-base was well made and offered good auger access.



Roof vents: Roof vents are accessible from the walkway on both cone-base and flat bottom models with over-centre latches used to seal the vents.



Ahrens

THE Ahrens group have acquired a number of silo manufacturers over the years including Websters, Sherwell and Jaeschke, so branding can become confusing between the various manufacturing locations. Larger flat-bottom Chief branded silos currently imported are constructed nationally but both installations inspected were used in high-volume industrial applications, not typical of farm installations.

Manufacturing plants in Nhill and Tarranyurk in Victoria, Sheoak Log and Cleve in SA, Gilgandra NSW, Goombungee (Toowoomba) Queensland and Westbury Tasmania all see silos with the Ahrens branding constructed.

Cone-base silos are manufactured at all locations while site constructed components are manufactured by Ahrens and constructed nationally.

Cone-base silos have welded cones while wall sections uniformly feature three convex ribs and are lap-riveted. This design is typical across all Ahrens facilities. ►

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SEAL STATUS

Elevated cone-base silos from the Gilgandra plant and Nhill plant were tested to meet AS2628 half-life pressure testing.

WHAT WE LIKED:

- Ladder and cage on Gilgandra-built models.
- Ground application phosphine using outlet lid on Nhill-built models and phosphine box on Gilgandra made models is easy to use.
- Visible oil level in pressure relief valve for transportable elevated cone-base models.
- Level indicator windows numerous and easy to see.

WHAT COULD BE BETTER:

- Attention to detail on construction and

installation with transportable units should be improved with forthcoming QA process.

- Bottom slide gate needs to be operable remotely without crawling under silo to actuate or adjust.
- Phosphine application box on Gilgandra model needs a larger silo entry port.
- Extensive range of construction styles, locations and build variances can be confusing.

INDICATIVE PRICING:

Indicative pricing for transportable cone-base silos ranges from \$127-158/tonne ex works depending on location.

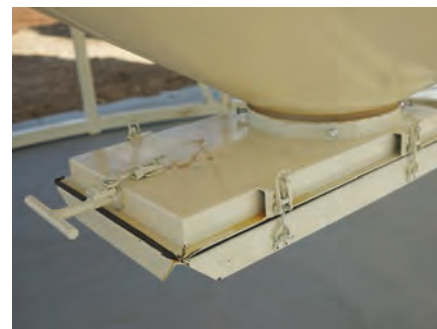
Contact:

www.ahrens.com.au

Phone: 1800 810 420



Ladder access: Ladder access with cage on the Gilgandra-built model inspected was well-constructed and provided reassurance for climbing.



Outlet door: The outlet door could be improved with a remotely operable outlet slide.



Phosphine box: A dedicated box for the application of phosphine at ground level makes the job easier although would benefit from a slightly larger silo entry port to aid phosphine flow.



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Bird's Silos

POPANYINNING Western Australia built Birds Silos are transportable models with two ribs per wall section and flat-face sealing between sections. All ring sections have a window to determine grain level in the silo.

A large thermosiphon from the headspace is connected to a semi-opaque pressure relief valve to monitor oil levels and undertake pressure testing. The outlet seal bowl can be used for fumigation.

Lid actuation provides a positive and evenly distributed downforce. Base construction is solid in pipe section with vertical struts and cross-bracing.

SEAL STATUS

Silos passed AS2628 half-life pressure testing.

WHAT WE LIKED:

- Lid actuation is simple and effective.
- Oil levels in pressure relief valve can be clearly seen.
- Ground application of phosphine is simple.

WHAT COULD BE BETTER:

- Demand can impact lead time.
- Elevating shims on base could assist cleaning around silo.

INDICATIVE PRICING:

List price is \$136/tonne for 80-tonne inclusive of GST.

Contact:

birdssilos.com.au

Phone: (08) 9887 5055



Inlet lid: Easy to operate, the Bird's ground operated lid has a unique action.



Ground application: The application of phosphine is made simple with the outlet seal-bowl.



Optional nitrogen kit for controlled atmosphere storage of grain.



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Brock Silos

BROCK silos are imported from North America and distributed nationally through Silo Services. Both cone-base elevated and flat-bottom silos are offered.

Silo Services has offices in Perth, Bendigo and Artarmon as well as a distributor in Narrabri.

Construction of most components is from folded sheet-metal of varying gauge while wall sections are corrugated galvanised sheet. Side-wall spiral ladders provide roof access on large flat bottom silos while vertical ladders are fitted to cone-base silos.

SEAL STATUS

Manufacturer was unable to provide Kondinin Group with an example meeting AS2628.

WHAT WE LIKED:

- Side steps and inlet platform.
- Large inlet lid.
- Manufacturer working on attaining seal to AS2628.

WHAT COULD BE BETTER:

- Components refined to improve sealing status.
- Thermosiphon pipes could be better supported with additional wall brackets.
- Improved rooftop walkway to lid access platform.

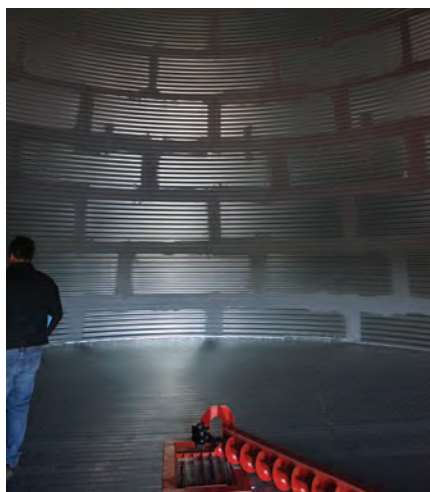
INDICATIVE PRICING:

Example pricing estimate installed in Northern NSW, with aeration, ladders, sealing and foundation: \$165/tonne for 500 tonne, \$135/tonne for 1000 tonne and \$105 for 1500 tonne.

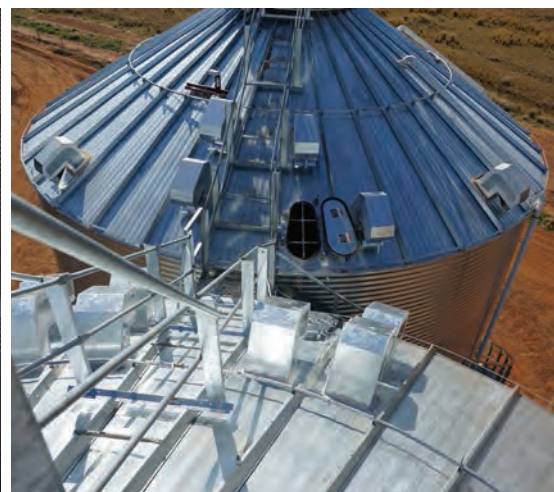
Contact:

siloservices.com.au
Phone

0402 794 288



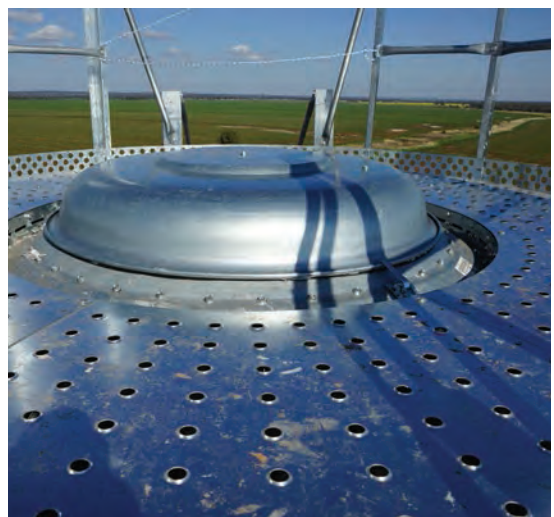
Internal: Full-floor aeration and wall section sealing.



Headspace vents: Due to high volumes of air used by this owner, numerous manually latched roof vents were fitted but outer vents may be difficult to access.



Outlet: Bottom outlet doors on elevated cone-base silos are actuated with a hand-wheel.



Top lid access: Ladder access can be shared between two silos which then branches to walkways up to the top lid with a healthy platform for access.

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Good people to know.



Campbell Silos

CAMPBELL silos builds elevated cone-base silos in Nhill in Western Victoria.

Wall construction is zincalume with two v-shaped ribs and lapped ring sheets.

Base is all SHS construction with vertical and angled supports with cross-bracing. There are sealing plates for the bottom outlet, and phosphine application box while a tie-bar retains the man-hole access door.

SEAL STATUS

Silos passed AS2628 half-life pressure testing AS2628.

WHAT WE LIKED:

- Phosphine ground application system is standard.

- Sealing door for outlet easy to fit.
- Ground operated lid provides a uniform seal.

WHAT COULD BE BETTER:

- Ladder does not have a cage.
- Oil valve pipe difficult to read.
- Needs a tyre tube valve as standard for pressure testing.

INDICATIVE PRICING:

List price \$11,715 for 85t unit inspected including GST.

Contact:

campbellsilos.com.au
Phone (03) 5391 1102



Outlet seal: Simple sealing of the sliding door on the outlet using the cover seal plate.



Top lid: The flip-over lid is ground operated and pressure is applied with a spring to the centre to provide a uniform seal.



Phosphine box: The ground application phosphine box makes phosphine application simple, but the pressure relief valve is difficult to read for pressure testing.

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"STRENGTH IN DESIGN"

Cyclone Silos

CYCLONE silos are distributed nationally through a number of constructors including Optimum Engineering Solutions (OES) who arranged for two Cyclone silos to inspect in southern NSW. Cyclone offers silos with capacities ranging from 344 to 1,720 tonnes.

The 600 tonne unit on-farm was constructed in 2014 and while not sealed, was fitted with an aeration fan. The 1300 tonne unit installed at a commercial grain mill was also unsealed but aerated. Bolt-together corrugated wall sections are common across the range.

Both featured OES designed and built outload augers and internal sweep augers which were well made.

SEAL STATUS

Manufacturer was unable to provide Kondinin Group with an example meeting AS2628.

WHAT WE LIKED:

- Ladder and rooftop walkway sturdy and reassuring
- OES outload auger was of solid construction
- Access doors well-made and easily used on 1300t model

WHAT COULD BE BETTER:

- Additional wall sight-windows would be beneficial
- Spring on top lid subject to corrosion
- In viewed form do not meet AS2628 and therefore cannot be fumigated

INDICATIVE PRICING:

Pricing for silos as inspected built on site start at \$137.50 per tonne including GST for 600 tonne silo and \$110 per tonne including GST for 1300 tonne silo. Both include ladders as shown, OES out-loading augers and aeration fans.

Contact:

www.optimumengineering.com.au

Phone: (02) 6382 5905

www.cycloneproducts.com.au

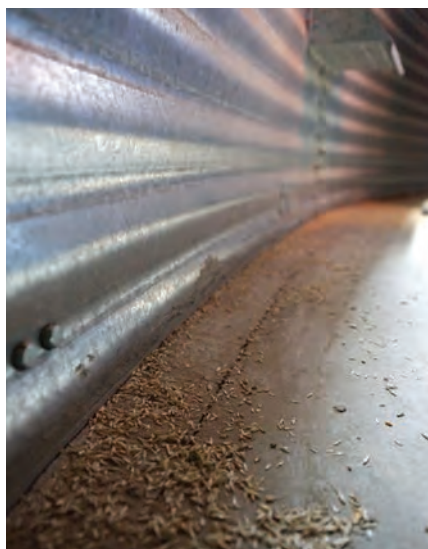
Phone: 1800 199 450



Top lid: A pull cable operates the top lid which has a spring return and is easy to use and access if required although the spring looked to be suffering from anodic attack.



Access: Well-constructed access ladders, walkways and platforms made rooftop and vent access simple.



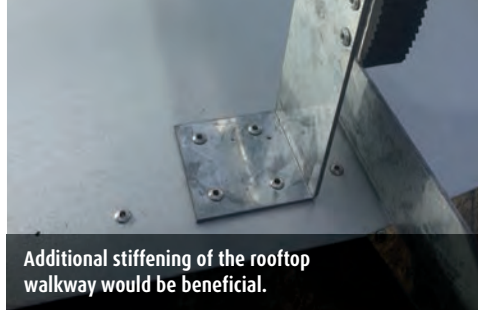
Grout: Pads are poured with a stepped gap internally which is later grouted.



Outload: OES manufactured outloaders on the 1300-tonne model were solidly constructed.



Ground-opening lid via an over-centre adjustable handle works well.



Additional stiffening of the rooftop walkway would be beneficial.

DE Engineers

BELLVUE WA based DE Engineers builds a range of transportable silos from three to 87 tonnes with larger on-site constructed silos up to 250 tonnes. Kondinin Group engineers inspected a recently delivered 73tonne transportable cone-base silo with a 50mm galvanised pipe steel constructed base with smaller section cross-bracing.

Wall sections are zincalume with two rolled concave ribs and two mid-section convex ribs.

Wall sections join using a horizontally rolled profile between wall rings.

Fumigation utilising bag-chains is facilitated via the thermosiphon tube.

SEAL STATUS

Silos passed AS2628 half-life pressure testing.

WHAT WE LIKED:

- Solid base construction.

- Ground fumigation system easy to use and integrated into thermosiphon.
- Visible oil level in pressure relief valve.
- Level indicator windows numerous and easy to see.

WHAT COULD BE BETTER:

- Needs fitment of tyre valve for pressure testing.
- Roof walkway requires additional bracing and stiffening.
- Bottom access ladder sections need end-plugs.

INDICATIVE PRICING:

Around \$11,000 inclusive of GST ex works as inspected.

Contact:

www.deengineers.com.au
08 9274 2632



Fumigation tube: An integrated fumigation tube built into the thermosiphon tube is used for ground-level fumigation.



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Dennys Silos

ALLORA based Dennys Engineering was recently purchased by Japanese company Satake and builds a range of site-built elevated cone-base silos with a fabricated sectional base comprising 6 sections bolted together.

Base and wall construction is sound with three prominent convex rib sections in the walls sections and bolted fixings of wall sections. All access lids are sealed using adjustable over-centre latches.

Three windows per silo are fitted, one near the base and one towards the top of the top two rings of wall sheets.

Ladder access is solid with caging and mid-way transition platforms but a single handrail on the roof instead of one each side appears to be an unnecessary shortcut.

SEAL STATUS

Silos passed AS2628 half-life pressure testing.

WHAT WE LIKED:

- Heavily built base structure.
- Design easily adapts to aeration system fumigation recirculation.
- Most access ports and outlets are easily sealed and seal force adjusted.

WHAT COULD BE BETTER:

- Inconvenient pressure relief valve location for servicing.
- Vents on inlet extension trap debris
- Single rooftop handrail.

INDICATIVE PRICING:

Around \$37,829 inclusive of GST ex works for 228T sealed as inspected

Contact:

www.dennys.com.au

Phone: 07 4666 3266



Solid: Cone-base construction is solid and bolted in 6 sections, each section having three welded sheet panels.



Trapped: Inlet extension vents trap grain and dust on filling.



Cheap: A single-side rooftop handrail seems like an unnecessary shortcut.



Recirculation: Fitment of a pipe attachment plate to the aeration intake and thermosiphon allows for simple fumigation recirculation via an optional fumigation box.

Eglinton Silos

BUILT in Waikerie South Australia, Eglinton silos are galvanised construction with 3mm galvanised SHS base construction and 1.6mm wall sections with two large convex ribs per wall section and overlap riveted joints on both vertical and horizontal transitions.

The cone-base is 2mm welded sheet in 8 sections. A top lid sealing clamp and outlet sealing plate is awkward and the manhole door had to be pulled to apply sealing force for testing and no tyre pressure valve is fitted. But changes to these areas are reportedly being made and overall construction is relatively solid.

An oil pressure relief valve is fitted but is opaque making determination of oil levels difficult. The silos inspected were all 90T capacity.

SEAL STATUS

Silos passed AS2628 half-life pressure testing with applied pressure on manhole door.

WHAT WE LIKED:

- Solid base structure design.
- Met AS2628.
- Ground operated lid actuator works well for simple opening and closing.

WHAT COULD BE BETTER:

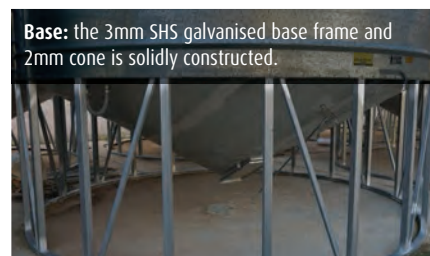
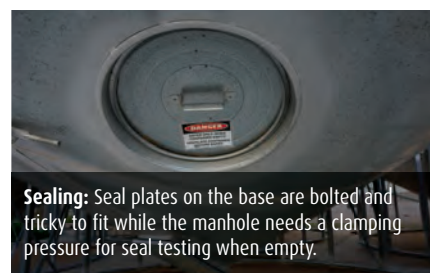
- Requires tyre valve and visible oil valve for pressure testing.
- Inlet and outlet seal mechanisms are both awkward to use.
- Ladder would feel safer with a cage and improved rooftop handrails are needed.

INDICATIVE PRICING:

Around \$14,000 inclusive of GST ex works for 90T sealed as inspected.

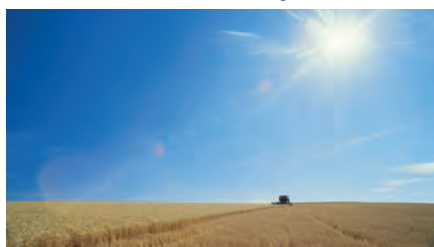
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www.eglintonilos.com.au
Phone: 08 8541 2411



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GE Silos

FABRICATED in Goornong Victoria, GE Silos builds transportable silos up to 110tonne capacity.

Base fabrication on the 110 tonne units inspected is from 75mm galvanised SHS with smaller section SHS diagonal bracing.

A secondary mid-cone support frame is built into silos over 50-tonne capacity. The cone is fabricated from 1.6mm galvanised steel welded from 9 sections. Walls feature one convex mid-rib and another rib near the top where sheets are rivet joined.

External c-channel stiffening struts run from the base to the top and three-quarters the silo height on every second stiffener. Stiffeners are riveted to the wall rib profiles. A clear GrainGuard pressure relief valve is easily accessed at ground level and two phosphine application tubes are mounted in the cone but have no circulation plumbing.

SEAL STATUS

Silos passed AS2628 half-life pressure testing.

WHAT WE LIKED:

- Solid base structure design with secondary support ring.
- Sight glasses on every wall ring.
- Ground operated lid mechanism works well for opening, closing and sealing.

WHAT COULD BE BETTER:

- Ladder and rooftop walkway is fabricated using small diameter section which may make gripping difficult. There is no top handrail, cage or mid-transition platform on a relatively high silo.
- Ground application fumigation port would be improved with connectivity to the headspace.
- Outlet seal plate tricky to fit by one operator.

INDICATIVE PRICING:

Around \$17,380 inclusive of GST ex works for 110T sealed as inspected.

Contact:

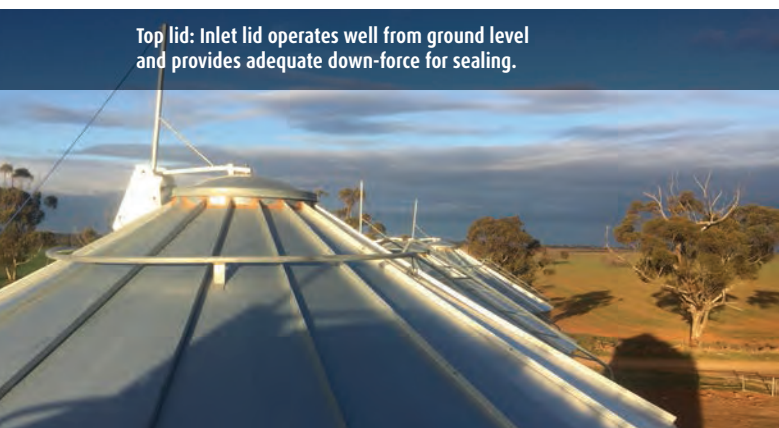
www.gesilos.com.au
Phone (03) 5432 2384



Sealing: Seal plates on the outlet use over centre latching but need to be juggled into place.



Base: 75mm SHS main base frame with secondary cone support ring. Phosphine ground application system can be seen mounted to the cone but would benefit with connection to the headspace



Top lid: Inlet lid operates well from ground level and provides adequate down-force for sealing.



Wall: Two convex ribs per wall sheet with stiffening c-channel riveted to the ribs.

GrainGuard Silos

VICTORIAN company Harberger Farm Supplies and distributes the imported GrainGuard silos, but declined to supply details of any recent GrainGuard installations.

Kondinin Group engineers happened to be travelling past the Donald head office of Harberger to find an installed GrainGuard which was subsequently viewed.

SEAL STATUS

The viewed unit did not pass an AS2628 test.

WHAT WE LIKED:

- External vertical stiffening ribs.
- Good access ladder and platforms.

Internal: Full floor aeration in the GrainGuard silo.



- Accessible pressure relief valves.

WHAT COULD BE BETTER:

- Example sighted requires development to meet AS2628 seal standard.
- Small port-hole access makes silo entry difficult for cleanout.
- Distributor cooperation and communication.

INDICATIVE PRICING:

Not supplied.

Contact:

harberger.com.au
Phone (03) 54971 420



Inlet: Inlet lid is manually operated.



Accessible: Easily accessible pressure relief valves.



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Grainmaster Silos

TOOWOOMBA Queensland based Davey Group builds the range of Grainmaster silos from 5 tonne to 1,200 tonne. The 160 Tonne units inspected featured 75mm pipe uprights on the base frame and 40mm cross-bracing.

Cone-base is solidly fabricated with two bolt-together sections while wall construction features three ribs per ring section, overlapped and solid riveted.

Fumigation system is well designed and simple to operate. Ladder access is good but the silos inspected only had a single top handrail. Top-lid springs to seal are difficult to apply.

SEAL STATUS

Silos passed AS2628 half-life pressure testing.

WHAT WE LIKED:

- Ground fumigation system.

- Base designed for easy cleanout (no ground ring).
- Sturdy wall ladder.

WHAT COULD BE BETTER:

- Top lid springs could be replaced with adjustable over-centre turnbuckles.
- Single rooftop handrail.
- Evidence of rust under paint on cone of three-year-old model.

INDICATIVE PRICING:

160 tonne with aeration, recirculation and roof vents as inspected \$30,500 including GST ex works.

Contact:

thedaveygroup.com.au
Phone: (07) 4634 7767



Cone: Base cone is fabricated in two halves and bolted together.



Base: The base frame has no ground level ring making cleanout easy.



Inlet: Top inlet lid springs are difficult to apply



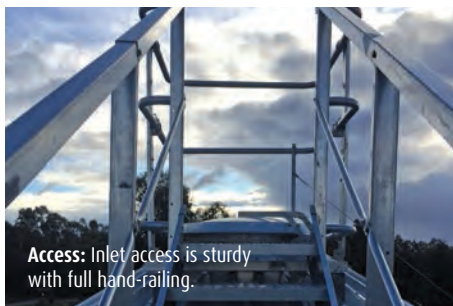
Fumigation: Ground level recirculated fumigation system is simple to operate.



GSI Silos



Roofing vent: Actuation of the roof vent is from ground level and is adjustable.



Access: Inlet access is sturdy with full hand-railing.



Pressure relief: easily accessed pressure relief valve for monitoring and maintenance.

OWNED by agricultural machinery manufacturer AGCO, GSI silos are imported from North America where in addition to silos, GSI manufacture a large range of ancillary grain handling equipment. Outloaders are built by Eaglehawk Victoria manufacturer and construction partner Keogh and Sons.

A bolt-together corrugated wall section silo, the GSI silo inspected featured external stiffening ribs and a spiral wall staircase.

Lid access was sturdy with good handrails and stepped to from the staircase platform.

SEAL STATUS

An example sealing to AS2628 could not be tested to be confirmed.

WHAT WE LIKED:

- Easily accessed pressure relief valves.
- Rooftop walkway.

WHAT COULD BE BETTER:

- Sealing claims could not be tested to AS2628.

INDICATIVE PRICING:

Including GST, on-farm constructed cone-base silos range from \$255 to \$178 per tonne for 110 to 422 tonne capacities respectively. Flat bottom silos range from \$89 to \$81 per tonne for 1017 to 2365 tonne capacity respectively.

Pricing are subject to exchange rates, includes sweep and out-loader but excludes foundations and travel. Keogh unloader, stairs, aeration and aeration control are available at additional cost.

Contact:

Agco Australia
Phone: (03) 9313 0313



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Kotzur Silos

KOTZUR is a well-known silo brand headquartered in Walla Walla New South Wales, building a wide range of silos in capacity and dimension.

Kondinin Group engineers inspected and tested both elevated cone-base silos and flat bottom silos from Kotzur and found all to meet AS2628.

Elevated cone-base silos feature wall section profiles with a top and bottom interlocking rib which is solid riveted.

Bases are galvanised 75mm SHS with diagonal cross-bracing. Internal stiffeners were installed up to the top of the second ring on the 132 tonne models inspected.

Flat bottom silos feature a large 'bulged' look convex centre profile with a rolled top and bottom horizontal lip which are sealed and bolted.

Flat bottom access door is easy to operate and effective.

SEAL STATUS

Both elevated cone base and flat-bottom silos passed AS2628 half-life pressure testing.

WHAT WE LIKED:

- All models met AS2628.
- Ladder, handrails and walkway on flat-bottom silo very sturdy.



Fumigation: Thermosiphon piping is used for ground application of phosphine in bag-chains.

- Door closing mechanism on flat bottom silo easy to operate and effective.
- Thermosiphon fumigation design simple and effective on cone-base models.
- Lid and vent actuation simple and effective.
- Sealing plate on aeration fans simple to install.

WHAT COULD BE BETTER:

- Actuating the outlet requires the operator to go under the silo.
- Sharp edges on sealing clamps on elevated cone-base.
- Pressure relief valve on elevated cone-base too high for servicing.
- In-floor venting screens heavy to lift for cleanout in flat-bottom silos.

INDICATIVE PRICING:

Pricing of models pictured: K4144S 117t wheat capacity, sealed with 5yr warranty \$19,918. Ladders and aeration optional extras. GP1810 flat-bottom 1518t wheat capacity with four aeration fans, sweep and unload augers, vents, ladders, walkways and platform, allowance for concrete base and 5yr warranty \$181,500 including GST.

Contact:

kotzur.com
Phone: (02) 6029 4700



Base: SHS with diagonal cross bracing provides good under-silo access.



Outlet gate: While the cone angle permits easy under-base access, the actuator for the slide-gate requires the operator to go under the silo.



Sharp: Edges on the outlet seal plate are sharp and prone to catching hands when applying seal plate pressure



Door: The access door on flat-bottom models is simple to use and effective.



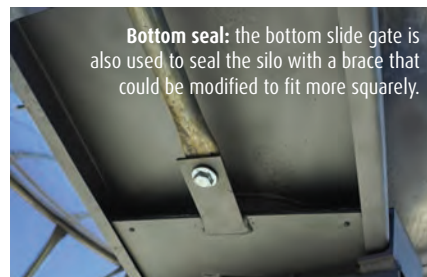
HE Silos



Ladder: Sturdy access ladder with transition platform.



Top lid: Springs used to apply pressure could be replaced with over-centre turnbuckles.



Bottom seal: the bottom slide gate is also used to seal the silo with a brace that could be modified to fit more squarely.

GUNNEDAH NSW is the home to HE silos who manufacture silos up to 120 tonne capacity. Featuring a SHS and pipe constructed base, 1.2mm wall sections with an interlocking top and bottom rib and a ladder with cage and transition platform.

Cone-base is 1.5mm welded from 6 segments while the outlet is a slide gate with actuation possible from outside the silo base. Pressure relief valve is an older design, small capacity style and sealing of doors and access points requires fitment of springs to the top lid, bottom pressure plate clamp and application of pressure on the manhole to maintain a seal.

SEAL STATUS

Silos passed AS2628 half-life pressure testing.

WHAT WE LIKED:

- Access ladder was sturdy.

- Lid actuation for simple opening and closing.
- Externally actuated outlet.

WHAT COULD BE BETTER:

- Top lid springs could be replaced with adjustable over-centre turnbuckles for sealing.
- Single point application of pressure on bottom slide for sealing.
- Low capacity pressure relief valve.

INDICATIVE PRICING:

100 tonne model with access ladder and cage: \$16,650 including GST ex-works, add \$1,134 for aeration fans.

Contact:

hesilos.com.au

Phone: 1300 764 700



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Outlet: A slide-gate outlet is operable from outside the silo base.



Valve: Locating the pressure relief valve at the top of the silo makes servicing difficult.



Wall: Wall joins are solid riveted with interlocking top and bottom ribs. Vertical crimping is unique to Nelson silos.



Nelson Silos

NELSON silos has manufacturing plants in Rochester, St Arnaud Victoria and Parkes NSW and builds sealed silos up to 250 tonne capacity. The silos inspected in northern Victoria were 100 tonne capacity and sat on SHS fabricated bases with a mid-cone support ring applicable for all Nelson silos over 100 cubic metres capacity.

Wall section profile features three convex ribs with the top and bottom of each sheet interlocking and fixed with solid rivets while vertical crimping is spaced about every 250mm around each ring.

A phosphine delivery port is poked in the side of the cone but has no connection to the headspace of the silo.

Cone fabrication is in five welded sections while outlet actuation is from outside the silo base.

SEAL STATUS

Silos passed AS2628 half-life pressure testing.

WHAT WE LIKED:

- Solidly constructed base with secondary cone support ring.
- Ground operated lid actuation is simple.
- Large, easy to see sight windows.

WHAT COULD BE BETTER:

- Ladder has no cage, no top handrail, ladder is fabricated using small profile material and may be difficult to grip.
- Phosphine application system is not linked to the headspace.
- Pressure relief valve is located at the top of the silo making it difficult to service.

INDICATIVE PRICING:

100 tonne model as inspected: \$19,426 including GST ex-works.

Contact:

nelsonsilos.com.au
Phone 1800 801 966

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Moylan Silos

WA MADE Moylan silos are fabricated in the wheat-belt town of Kellerberrin.

With sizes from 4 tonne to 74 tonne, Moylan bases are galvanised 75mm SHS with smaller SHS cross-bracing.

Wall profiles feature two convex flat-bottom v profiled ribs and two concave ribs with horizontally rolled top and bottom ribs connecting wall rings.

A simple to use ground application fumigation chamber is connected to the thermosiphon which has an opaque pressure relief valve.

An angled, caged ladder and sturdy handrails make climbing the silo easier when required although the lid is ground operated and sealed from ground level.

SEAL STATUS

Silos passed AS2628 half-life pressure testing.

WHAT WE LIKED:

- Angled access ladder, cage and handrails are sturdy.
- Ground operated lid is easy to use.
- Phosphine application system simple to use and connected to the headspace.

WHAT COULD BE BETTER:

- Outlet seal plate is difficult to line up and clamp.
- Opaque pressure relief valve makes checking oil level difficult.
- Available capacity limited to 74 tonnes.

INDICATIVE PRICING:

74 tonne model as inspected with ladders and fumigation pot: \$10,912 inc GST ex-works.

Contact:

moylans.com.au

Phone: 1800 454 305



Inlet lid: Ground operated inlet let is simple and can be locked in position.



Access: ladder walkways and access on top of the Moylan are sturdy.



Valve: An opaque valve makes checking oil levels more complicated.



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Twister Silos

TWISTER is a North American built silo distributed by Cowra NSW based Geronimo farm equipment. Wall construction is a 100mm corrugate galvanised sheet of varying gauge depending on wall height and the total silo capacity.

New models are mounted on concrete slabs, feature rectangular access doors and wider corrugations than outgoing models as well as full height wall stiffening struts. Kondinin Group engineers inspected silos at two locations and while wall construction was sound with heavy gauge corrugated sheets, some variance in construction quality between the two particularly in the stairs and external aeration ducting attachment was noted. Twister silos offer optional full-floor aeration, and are fitted with sweep and out-load augers which appear to be well made with easy to operate floor gates.

SEAL STATUS

Manufacturer was unable to provide Kondinin Group with an example meeting AS2628.

WHAT WE LIKED:

- Outload auger and gate actuation.
- Manhole entry door provides easy access into silo.
- Relatively low cost per tonne stored.

WHAT COULD BE BETTER:

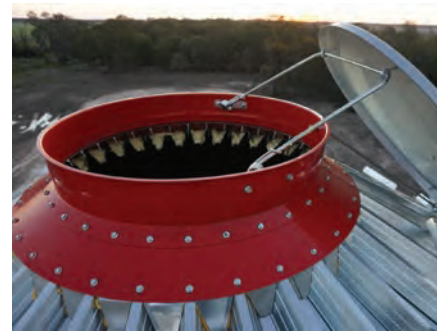
- Consistency of build quality on stairs and external aeration ducting.
- Aeration fan mounting platform appears temporary.
- No demonstrated sealing to meet AS2628.

INDICATIVE PRICING:

633 tonne with full floor aeration, fan and transition (33-08S) \$75,900 including GST.
1,000 tonne as inspected with full floor aeration, fan and transition (36-11S) \$100,100 including GST.

Contact:

www.geronimo.com.au
Phone: (02) 6341 3369



Inlet: A ground operated pull-cord lid opening mechanism when infilling provides good inlet access.



Outlet: The outloading auger door actuators were simple to operate.



New versus old: New style elevated aeration fans look more temporary than outgoing ground mounted models.



Shared stairs: Spiral wall mounted stairs for access to the lid varied in construction quality between silos inspected.

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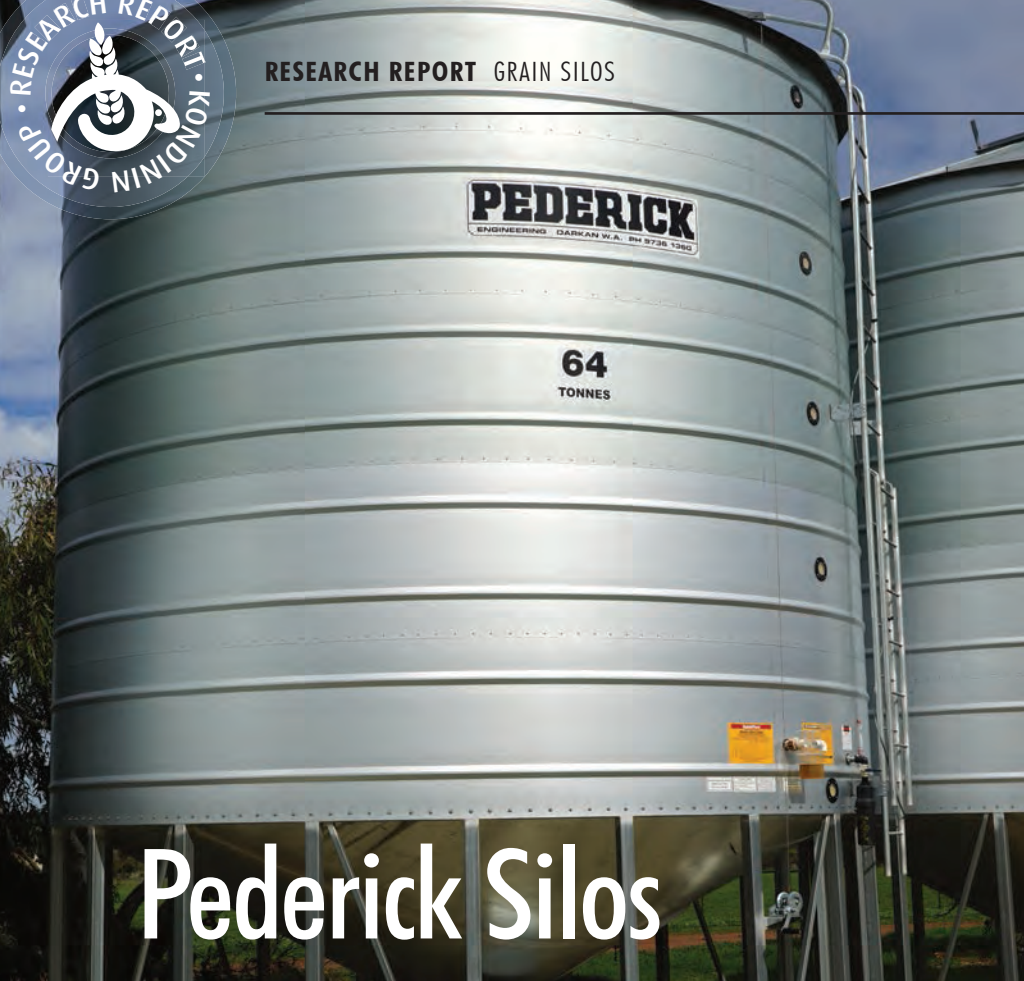
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Pederick Silos

MADE in Darkan WA, Pederick manufactures silos to 90 tonnes capacity. Wall sections feature two prominent convex ribs per ring with a simple overlap and solid rivet join. Base frame is galvanised SHS construction with diagonal bracing.

Windows are spaced in every ring with the top and bottom positioned closer to the roof and the cone respectively. Lid opening is via a winch release with the release rope remaining over the inlet when opened.

The phosphine ground application system should be urgently revised as it provides insufficient surface area for tablets and will contribute to potential phosphine resistance.

A fall-cable is fixed to the silo near the ladder but would require the operator to be wearing a harness with the appropriate attachment.

SEAL STATUS

Silos passed AS2628 half-life pressure testing.

WHAT WE LIKED:

- Solidly constructed SHS base with cleanout gaps under the base ring.
- Plentiful and well positioned sight-windows.
- Cone neatly fabricated

WHAT COULD BE BETTER:

- Phosphine application canister poorly designed
- Release rope for lid remains in the centre of the infill opening and has potential to damage silo if overtightened
- Top walkway needs to be wider with handrails.

INDICATIVE PRICING:

64 tonne model as inspected: \$10,120 including GST ex works.

Contact

pederickengineering.com.au
Phone (08) 9736 1360



Inlet lid: Release cable remains in the centre of the lid in the fully open position.



Poor design: Ground application system is poorly designed, does not allow sufficient air movement over phosphine tablets and is not connected to the headspace.



Windows: Sight windows are well placed and plentiful.

Westeel Silos

WESTEEL silos are imported from North America and distributed through Western



Australian based Burando Hill. Capacities range from 500 tonne to 2000 tonne in a flat bottom configuration. Aeration options include full-floor or trench delivery of air.

Kondinin Group researchers were unable to inspect and test a Westeel silo.

SEAL STATUS

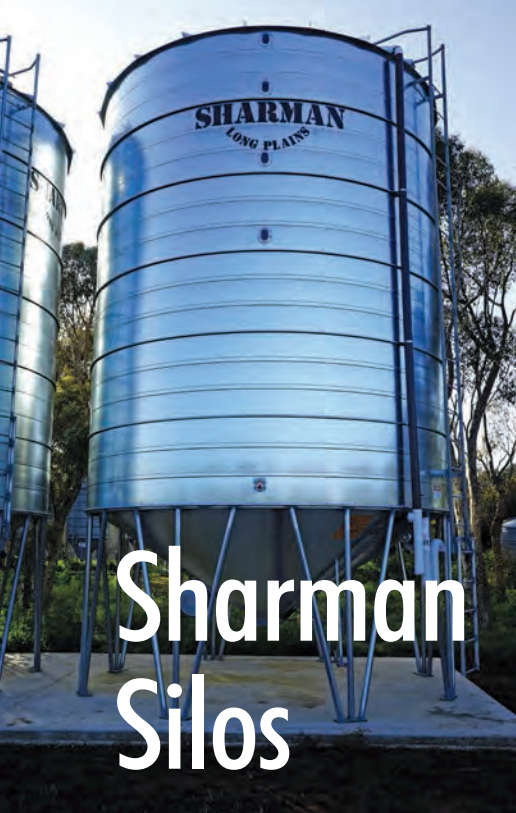
An example meeting AS2628 could not be tested.

INDICATIVE PRICING:

Around \$143 per tonne for 500-1000 tonne capacity or \$88-\$110 per tonne for 1000 to 2000 tonne capacity, inclusive of GST, an allowance for base construction and basic aeration.

Contact:

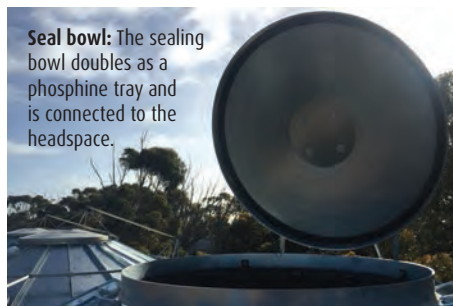
www.burandohill.com.au
Phone: (08) 9821 4422



Sharman Silos



Inlet lid: a large opening lid makes filling easier but means a large sealing face and down-force to maintain the seal.



Seal bowl: The sealing bowl doubles as a phosphine tray and is connected to the headspace.



Legs: The ease of cleaning under the Sharman silos is significantly aided by the lack of a ground ring.

SHARMAN silos are made in Long Plains about an hour north of Adelaide in South Australia and build silos in 58 tonne and 70 tonne configurations.

Construction is all galvanised sheet metal and pipe with an unusually designed tri-support pole upright design making cleanout under the silo very easy.

Top lid opening is very large at 1.2 metres diameter. Clamping the large sealing face is an over centre ground operated latch arrangement which can be adjusted.

Butterfly valve outlet operation is via a lever, mounted to the uprights on the base.

SEAL STATUS

Silos passed AS2628 half-life pressure testing.

WHAT WE LIKED:

- Large inlet opening.

- Bottom seal bowl can be used for phosphine application and is connected to the headspace.
- Ease of cleaning underneath silo without on-ground base ring.

WHAT COULD BE BETTER:

- Top lid has a large sealing face and could do with latches to assist with sealing.
- Top lid tension adjustment requires tools, trial and error to get right.

INDICATIVE PRICING:

Indicative pricing: 70t wheat as pictured \$11,700 including GST ex works.

Contact:

www.sharmans.com.au

Phone: (08) 8527 0000

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Superior Silos

SUPERIOR silos are an imported North American silo distributed through Ag Hub Industries. The two silos inspected in Western Victoria were four, 1,000 tone units and shared a spiral wall-mounted ladder.

Full floor aeration was installed in all four silos while ladder and top lid access were sturdy and the lid opening mechanism was simple but effective. Ladder angle was considered marginally too steep but handrails were sound.

While efforts had been made to seal the silo, it did not pass an AS2628 test.

SEAL STATUS

The inspected unit did not pass an AS2628 test.

WHAT WE LIKED:

- Roof handrail and walkway access.
- One set of pressure relief valves were easy to access.
- Manhole entry door provides easy access into silo.

WHAT COULD BE BETTER:

- Sealing to meet AS2628.



Rooftop: Walkways and handrails on the roof were sturdy.



Internal: Full-floor aeration and sweep-auger.



Steep: Stairs were considered a little too steep, particularly when descending but handrails made navigating the ascent and descent easier.

- One set of pressure relief valves difficult to reach.
- Spiral stairs too steep.

INDICATIVE PRICING:

\$126,500 for 1000t capacity installed including base allowance, full floor aeration and fan.

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