

Metal Silo

Handling stored grain

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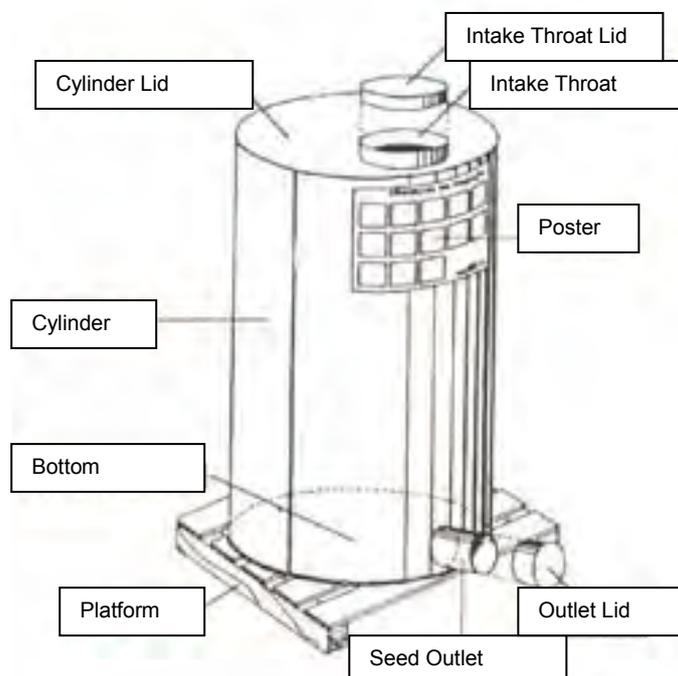
1. Description

Metal silos are containers for storing maize, beans and other grain. They have a cylinder shape and are manufactured with galvanised sheets.

Both the upper lid of the silo and the bottom are flat. The upper lid has an opening with a lid that serves to put grain inside the silo. Large-size silos, have an opening that allows for one person to enter and clean the inside of the silo. The bottom part of the silo has an opening with a lid that serves to take the grain out.

A poster is glued on the silo to explain step-by-step the use and handling of the silo.

The table below shows measurements for the various silos and the necessary quantity of metal sheets to build each one in accordance with their respective holding capacity.



TECHNICAL DIMENSIONS FOR METAL SILOS

DETAILS		DIMENSIONS	CAPACITY					
			180 kg	270 kg	360 kg	540 kg	800 kg	1,360 kg
90cm x 180 cm metal sheet calibre 26		#	2	2,2	2,5	4,3	4,5	6,2
Tin		kg	0,25	0,25	0,25	0,4	0,4	0,5
Silo	Height	cm	90	90	90	120	180	180
	Diameter	cm	58	65	77	86	86	114
Intake Throat	Diameter	cm	25	25	25	37	37	37
	Location		Centre	Centre	Centre	Side	Side	Side
Intake Neck	Height	cm	7.7	7.7	7.7	9.7	9.7	9.7
Intake Throat Lid	Height	cm	5	5	5	6	6	6
Seed Outlet	Diameter	cm	12	12	12	15	15	15
	Length	cm	11,5	11,5	11,5	14,5	14,5	14,5
	Height	cm	1,5	1,5	1,5	2,5	2,5	2,5
Seed Outlet Lid	Length	cm	8	8	8	10	10	10

2. Handling

(See drawings on the following page)

1. Dry and clean the grain before storing in the silo. This operation can be carried out while preparing the silo. Before filling up the silo, leave the grain for cooling at ambient temperature. If, based on your experience, you believe that the grain is dry and ready for storage in the silo, leave it out in the patio under the sun for three more days.
2. Clean the silo inside and outside with a wet cloth and dry it immediately afterwards. Check the silo for any holes. Repair any damage caused by use, such as holes, oxidation spots (scrub with sandpaper, solder, and paint), and loose soldering.
3. Place the silo on an even wooden platform to avoid contact with the ground.
4. Place the silo under a roof to protect it from the rain and avoid exposing it to the sun. This will prevent water condensation or vapor inside the silo that will generate humidity and leads to proliferation of fungi, thus damaging the grain.
5. Store grain that is clean and dry and has less than 14% moisture content. High moisture content will lead to proliferation of fungi and excess heat, as a result of which all the grain contained in the silo will be lost.
6. Fumigate the grain with phosphine tablets (PHOSTOXIN, GASTION, and DETIA). Use one tablet for every 227 kg of silo holding capacity.
7. The silo should be kept closed and tightly sealed for a minimum of 10 days. It can be sealed with tallow, wax, and grease or by means of a rubber band or tape (see the brochure “Phosphine” and “StripCartoon: On Every Cloud a Silver Lining”).
8. Check for leaks two hours after placing the tablets inside the silo. If there is a leak there will be a smell like that of garlic. Cover the defective spot with wax or soap, or call in the manufacturer to make the necessary repairs.
9. For fumigation to be effective the silo should be kept closed and tightly sealed for 10 days. **The grain will be ready to be eaten 6 days after the fumigation period is over.**
10. During periods when there is no grain consumption, check it every 30 days and seal the silo hermetically. If live insects are detected, you will have to fumigate again. Even a single live insect mean that you will have to fumigate once more.
11. Do not put heavy objects on top of or near the silo. Avoid any exposure to the sun or contact with products such as fertilisers as this may cause oxidation.

12. Do not tilt the silo to pour the last kilograms of grain out. Use a T-shaped wooden hoe.

Once the silo is empty, you should repeat the aforementioned steps before using it again.

These steps are graphically shown on the “Metal Silo, Use and Handling” poster. This is intended to facilitate appropriate step-by-step silo use and handling.

Metal Silo Use and Handling



1. Drying and Cleaning: 3 more days



2. Silo Maintenance



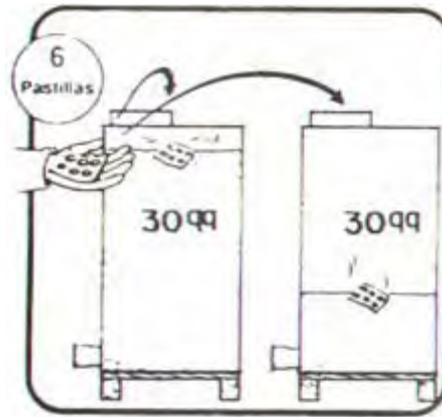
3. Wrong Silo Location: No



4. Correct Silo Location: Yes



5. Incorrect Placement of Tablets: No



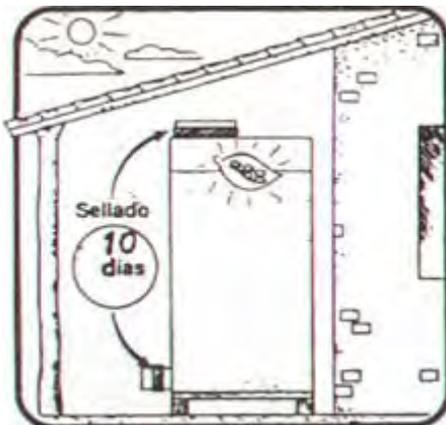
6. Grain Fumigation: 6 tablets for 1,360 kg Silos



7. Sealing the Silo: Rubber Strip



8. Checking for Leaks: 2 hours later



9. Fumigation Period: Sealed for 10 Days



10. Periodical Checking: Dry Grain without Live Insects



11. Silo Hygiene and Care: No



12. Wrong Emptying: No

180 kg	1 tablet
360 kg	2 tablets
540 kg	3 tablets
800 kg	4 tablets
1,360 kg	6 tablets

Name of the Institution
 Manufacturer's Name
 Date of Manufacture
 Silo Holding Capacity
 Silo Price

Number of Tablets
 Silo Number

Capacidad del Silo	Nº de Pastillas
4 qq	1 Past
8 qq	2 Past
12 qq	3 Past
18 qq	4 Past
30 qq	6 Past

Nombre de la Institución _____
Nombre del Fabricante _____
Fecha de Construcción _____
Capacidad del Silo _____ NUMERO DE PASTILLAS _____
Precio del Silo _____ Número del Silo _____

POSTCOSECHA

3. Advantages

1. The silo may be manufactured anywhere with a galvanised metal sheet. The total weight of all necessary tools is 3 kg. They can be carried in a light bag.
2. The properly used silo provides protection against insects, fungi, rodents, birds, and theft, thus considerably reducing grain losses in contrast with other storage systems.
3. Conserves grain safely for a longer storage period without quality and physical losses that reduce food security for farmers, particularly during times of shortage.
4. Phosphine tablets are successful in eliminating insects and easy to use in the silo.

5. Silos allow for safely storing grains until market prices are high. This is an additional benefit in terms of income and food security.
6. The 10-20% reduction in grain losses by using a metal silo helps allows for covering a large portion of the cost of the silo.
7. The silo takes up less space than open-air storage when storing maize on the cob.
8. The silo is light and easy to handle.
9. Materials to build the silo are easily available.
10. The silo will last for over 20 years when properly cared for.
11. The structure of the silo is widely accepted by small-scale farmers in Central America.

4. Disadvantages

1. Trained staff and special equipment is needed to build metal silos, i.e. to cut and solder galvanised sheets.
2. Farmers must dry the grains to hold less than 14% moisture content.
3. Wrong handling of the grain (i.e. maize with over 14% moisture content, unclean grain or grain infested with fungi) causes considerable losses. Fungi develop much faster in the silo than in open-air storage. Heat may affect the grain and cause lumps to form. Losses may be as high as 100%.
4. When not properly maintained, the metal silo may be ruined in a short time.
5. Faulty fumigation and sloppy checking could cause grain losses due to insects.
6. Good handling of grain and silos requires proper technical training and follow-up.

5. Purchasing a Metal Silo

The *Postharvest National Programme in Central America* is in charge of training artisans who manufacture metal silos of different holding capacities throughout the country. If you are interested in contacting one of these artisans, you may obtain his/her address from the *Postcosecha* technical staff in your area or the corresponding *Postharvest National Programme*. The agency or person who hands out this leaflet should inform you where to locate the closest artisan of metal silos.

5.1 Quality of the Silo

The *Postharvest National Programme* provides follow-up attention to trained artisans so as to ensure manufacture of good quality silos (i.e. sheets with folded joints and lids with overlaps well and uniformly set, as well as smooth and even soldering without tin clots). Through direct control, the *Postharvest National Programme* ensures the quality of the calibre 26 galvanised sheet sold to artisans.

The role of the artisan is to manufacture the silo, sell it at a fair price and place the *Postcosecha* “Silo Use and Handling” poster on the outside. Furthermore, the artisan contributes to proper use of the silo by explaining the poster to the new owner and visiting the house of the customer so as to verify and ensure appropriate use and handling of the silo. Promotion includes follow-up, as this promotes demand for more silos.

A good artisan receives the title of “Qualified Artisan”. Monitoring is provided by the *Postharvest National Programme* that authorises the artisan to place the “*Postcosecha* Quality Seal” on silos. This seal certifies that the silo meets all quality requirements set forth by the *Postharvest National Programme* in the Manual for Manufacturing Metal Silos for Grain Storage.