GRAINPRO®GAS-HERMETIC FUMIGATION SELF-VERIFYING COCOON™

INSTRUCTION MANUAL

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GRAINPRO
STORING THE FUTURE

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1. INTRODUCTION

The GrainPro® Gas-Hermetic Fumigation Self Verifying Cocoon™ (G-HF SVC) is a flood-protected, hermetic gas-tight storage designed for insecticide-free fumigation specifically CO_2 fumigation to immediately control any infestation and safe storage of durable agricultural commodities. G-HF SVC™ is either standard-size or custom-made to enclose stacks of boxed, crated, or bagged agricultural commodities. It is made of flexible UV-resistant Polyvinyl Chloride that is resistant to rodents and has low permeability to oxygen (O_2), and moisture. Includes one transparent plug to monitor the relative humidity (RH) inside.

The G-HF SVC can withstand floods below the zipper line and maintain the gas resulting from the respiration of insects and commodities; low oxygen and high carbon dioxide levels will control infestation and mold growth.

1.1. FEATURES AND ADVANTAGES:

1.1.1. Preserves the quality of the stored commodities.
1.1.2. The moisture level of the commodity remains constant.
1.1.3. The commodity can be stored at ambient temperature instead of using energy-consuming cold storage methods where sub-zero temperatures are required to prevent insect infestation and biochemical deterioration.
1.1.4. Installation demands little infrastructure.
1.1.5. Weather-resistant and UV-protected (could be used indoors or outdoors).
1.1.6. Inhibits aflatoxin growth and suffocates pests and insects.
1.1.7. Allows users to check oxygen and relative humidity levels.
1.1.8. Easy to maintain and repair.
1.1.9. “Green” fumigation technology is acknowledged as organic fumigation using CO_2.

1.2. PRODUCT GUARANTEE:

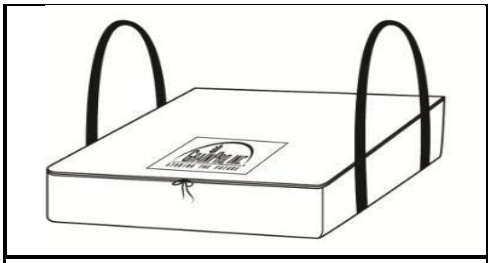
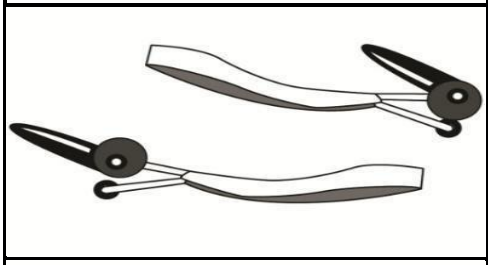
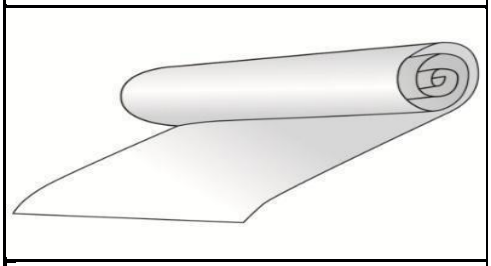
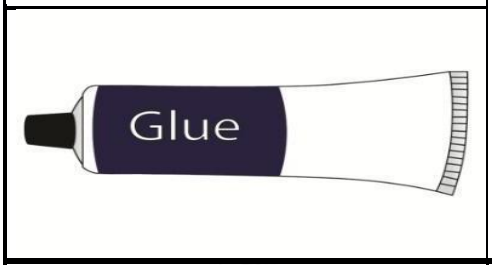
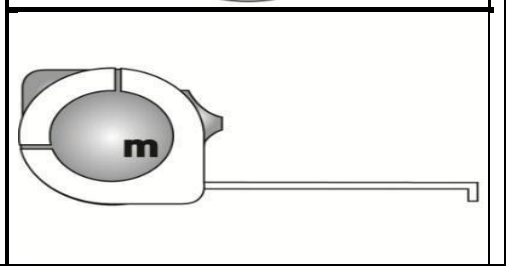
1.2.1. In accordance with the terms and conditions herewith, GrainPro, Inc. guarantees the quality of this product per its written warranty provided it is used according to the instructions in this manual.
1.2.2. Please read and understand the manual thoroughly before using the G-HF Cocoon.

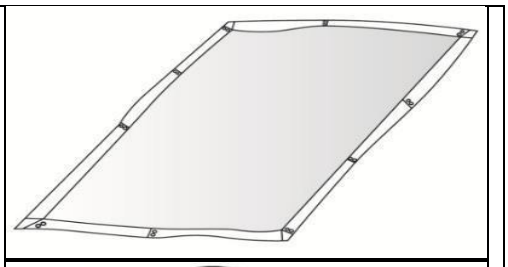
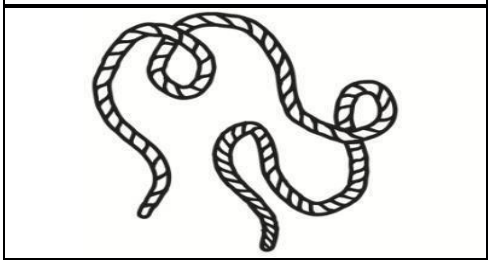
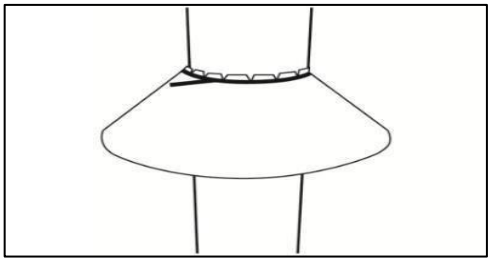
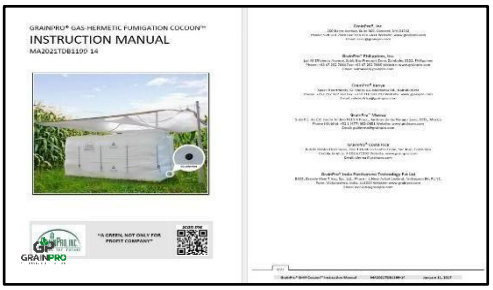
1.3. COMMENTS, COMPLAINTS, AND/OR CLARIFICATIONS:

1.3.1. Please contact customercare@grainpro.com.
1.3.2. All queries will be answered by our team of post-harvest solutions experts.

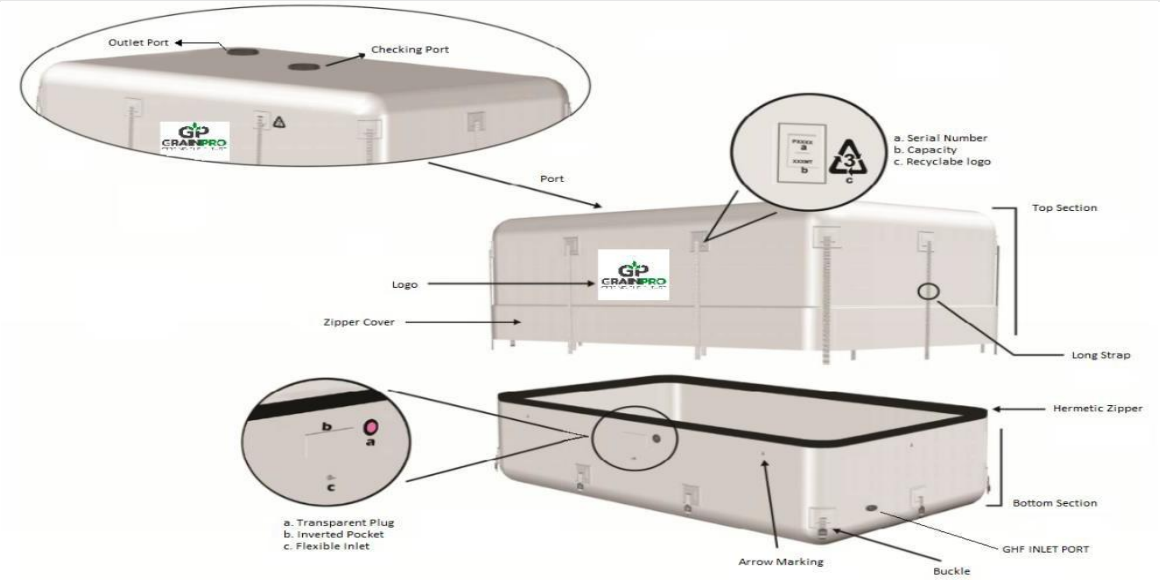
2. CHECKLIST

Please inspect your GrainPro G-HF/S-VC Cocoon to ensure that the package includes the following items:

PART NAME	DESCRIPTION	IMAGE
2.1. CARRY BAG	2.1.1. Contents: a. G-HF Cocoon (Top and Bottom) b. GrainShade™ c. Small parts d. Repair kit e. Instruction manual	
2.2. ZIPPER PULL	2.2.1. For zipper sealing 2.2.2. One (1) set (left and right)	
2.3. PATCHING MATERIAL	2.3.1. White-colored PVC roll for patching holes and other damages (30cmx1.5m). 2.3.2. One (1) piece	
2.4. GLUE	2.4.1. For patching PVC materials. 2.4.2. One (1) tube	
2.5. SILICON SPRAY	2.5.1. For zipper lubrication. 2.5.2. One (1) can (for 5-150MT) 2.5.3. Two (2) cans (for 300MT and above)	
2.6. TAPE MEASURE	2.6.1. For checking the height of the stack. 2.6.2. One (1) piece	

2.7. GRAINSHADE™	2.7.1. Reflective cover material for outdoor installation. 2.7.2. (One) 1 piece	
2.8. EXTRA ROPE	2.8.1. For tying the GrainShade™. 2.8.2. Ten (10) meters long (min.)	
2.9. RODENT GUARD	2.9.1. For platform post to prevent rodent access when storing the empty G-HF Cocoon. 2.9.2. Four (4) pieces per pack	
2.10. INSTRUCTION MANUAL	2.10.1 Installation instructions. 2.10.2 Maintenance instructions. 2.10.3 Frequently asked questions and answers. 2.10.4 Warranty clause.	

3. COMPONENTS



4. SPECIFICATIONS

4.1. MATERIALS	
PARAMETERS	STANDARD
Material	Polyvinyl Chloride
Color	White
Thickness, cm (inch)	0.083(0.033) ±7%
Material Weight, g/m^2	1,050
OTR (Oxygen Transmission Rate), cc/m^2/day	<500
WVTR (Water Vapor Transmission Rate), g/m^2/day	<9
Sealing mechanism	PVC Hermetic Zipper
Shelf Life, years	15
Warranty, years	5

4.2. PRODUCTS					
G-HF COCOON	CAPACITY (MT)*	LENGTH cm (inch)	WIDTH cm (inch)	HEIGHT cm (inch)	VOLUME m^3 (ft^3)
GP Mini Cocoon	0.6	120 (47.24)	120 (47.24)	95 (37.40)	1.368 (48.27)
GP G-HF Cocoon-005	5	297 (117)	165.0 (65)	150.0 (59)	7.4 (260)
GP G-HF Cocoon-010	10	330 (130)	298 (117)	150.0 (59)	14.7 (520)
GP G-HF Cocoon-020	20	389 (153)	380.0 (150)	200.0 (79)	30.2 (1,067)
GP G-HF Cocoon-2-050	50	890 (350)	440 (173)	200 (79)	78.3 (2,765)
GP G-HF Cocoon-3-050	50	595 (234)	435 (171)	300 (118)	77.7 (2,742)
GP G-HF Cocoon-100	100	860 (339)	580 (228)	300 (118)	149.6 (5,284)
GP G-HF Cocoon-3-150	150	890 (350)	850 (335)	300 (118)	226.9 (8,014)
GPG-HF Cocoon-4.5-150	150	750 (295)	680 (268)	450 (177)	229.5 (8,104)
GP G-HF Cocoon-300	300	1187.5 (467.5)	1176.5 (463.1)	300 (118)	419.1 (14,800)

*Based on the bulk density of wheat

5. WARNINGS!

5.1. Do not put fresh produce or commodities with high moisture content inside the G-HF Cocoon.
5.2. Do not wear shoes with spikes as this might cause damage to the G-HF Cocoon.
5.3. Do not directly install the G-HF Cocoon without clearing away debris and other foreign materials.
5.4. Do not smoke while installing. Cigarette butts might burn and damage the G-HF Cocoon.
5.5. Do not put the G-HF Cocoon on top of a wooden pallet or equivalent to prevent puncture by sharp edges and nails.
5.6. Do not keep the G-HF Cocoon unclean. Please refer to 12.5 for proper safekeeping.
5.7. Do not allow loading vehicles (i.e., forklifts/trucks) to run over the G-HF Cocoon as this will cause damage to the PVC materials.

6. Recommended maximum moisture content for safe storage (wet basis)

COMMODITY	RECOMMENDED MC
Barley	12%
Black Pepper	10%
Cashew nuts	8%
Chia seeds	7%
Chickpeas	12%
Cocoa beans	7%
Coffee beans	12%
Cotton seed	10%
Cowpea	12%
Maize	13.5%
Millet	12%
Mung bean	12%
Oats	12%
Paddy	13.5%
Paddy, rice bran	11%
Peanuts, shelled	7%
Red Chili Pepper	8.10%
Rice, Milled	12%
Rye	12%
Sesame	5.5%
Sorghum	12%
Soybean	12%
Sunflower	7%
Wheat	13%

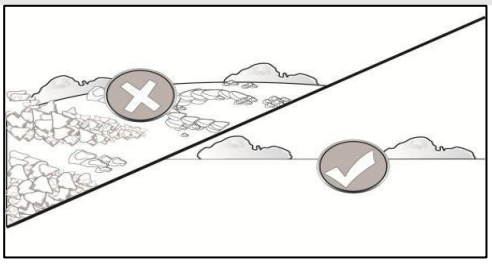
You may also contact us through customercare@grainpro.com for more information or for commodities that are not on the list.

7. INSTALLATION

7.1. SITE SELECTION

7.1.1. In selecting a site, look for:

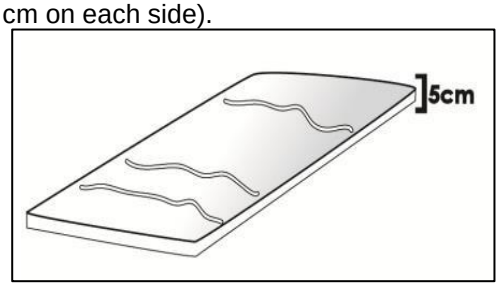
a. The G-HF Cocoon is designed for both indoor and outdoor installations.
b. A smooth area away from standing or running water.
c. Ensure that the site is protected from stray animals and theft.
d. Shade (otherwise under a GrainShade™) to minimize temperature differences.



7.1.2. Prepare the selected site by clearing away all sharp objects (stones, broken glass, nails, etc.) that may puncture the G-HF Cocoon. Allow for sufficient space to accommodate the G-HF Cocoon and an inspection path around (at least 50 cm on each side).

7.1.3. If the ground will be used as flooring, put a layer (5 cm) of fine sand (or any equivalent) on top of the soil as a ground foundation.

NOTE: It is strongly recommended that a tarpaulin or equivalent material be placed at the bottom of the Cocoon for added protection with the same dimensions as the Cocoon, depending on its capacity.



7.1.4. During loading, make sure that workers do not wear shoes with spikes that may damage the G-HF Cocoon. Preferably, choose a site that offers ease in loading/unloading, away from crowded areas and rubbish. For indoor installation, clean the area to remove sharp objects.

8. TERMITE CONTROL

8.1.1. Overview of Termite:

8.1.1.1. The two most common types of termites are “dry wood” and “ground,” or subterranean termites.

8.1.1.2. Termites need moisture to survive and will die if exposed to sunlight or open air for more than a few minutes. Their tunnels protect them from the elements.

8.1.1.3. High moisture areas like basements and crawlspaces are very attractive to termites and can serve as starting points for an infestation.

8.1.2. Description (Subterranean Termite).

8.1.2.1. Food and moisture:

- Need a great deal of moisture such as from soil and damp wood, Cellulose (from wood) is their diet.

8.1.2.2. Habitat:

- Usually, they live in the soil but can be above ground if enough moisture is present. They have large colonies.

8.1.2.3. Evidence of activity:

- Protective mud tubes ascending from the ground to the structure or protruding from walls, etc.

8.1.2.4. Prevention:

- Treat the soil before construction-pretreat with a termiticide.
- For more information, go to Chemical Soil Treatment.
- A termite bait station monitoring system to monitor termite activity and bait placements after detection.
- Regular inspections.

8.1.2.5. Control Measures:

- With current activity use a baiting program or a termite barrier treatment.

8.1.3.Termite Treatments:

8.1.3.1. The traditional method of controlling subterranean termites is to apply a liquid pesticide, known as a termiticide, to the soil. This chemical treatment relied on the application of a chemical barrier around and beneath the structure that is designed to block all possible routes of termite entry. Any termites attempting to penetrate through the treated soil will be either killed or repelled.

8.1.3.2. There are several different insecticides currently used by pest control operators for termite soil treatments. All of them are safe and effective when used per label directions. The insecticides remain effective in the soil for approximately 5 to 10 years.

8.1.3.3. Effective termite treatments require a great volume of termiticide.

9. RODENT CONTROL

9.1.1. Prevention:

9.1.1.1. Eliminate unnecessary folds on the sidewalls of the G-HF Cocoon when installed.

9.1.1.2. Remove all potential sources of food from the premises, such as scattered grains, etc.

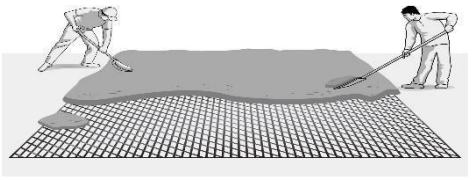
9.1.1.3. Remove all trash and debris around the G-HF Cocoon as it may become shelter for rodents.

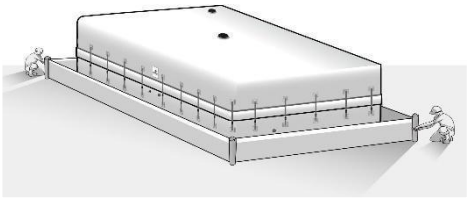
9.1.1.4. Keep trash cans closed with tightly fitted lids and be away from the G-HF Cocoon.

9.1.1.5. Trim trees, bushes, and vines at least 1.5 meters away as they may be used by rodents to crawl on top of the G-HF Cocoon.

9.1.2. Procedure for installing wire mesh: (Optional)
For ground installations and areas with a high risk of rodent attack, it is highly recommended to use wire mesh not larger than ¼ inch to exclude mice.

9.1.2.1. To install the wire mesh, prepare the selected site by clearing away all sharp objects (stones, broken glass, nails, etc.) that may puncture the G-HF Cocoon. (Refer to 5.1.2)
9.1.2.2. Cut the wire mesh at least 50 centimeters wider than the bottom of the G-HF Cocoon.
9.1.2.3. Spread the wire mesh before the fine sand and equivalent as a recommended protection of the G-HF Cocoon.
9.1.2.4. Then, follow the standard procedure on how to install G-HF Cocoon. (Refer to 5.1.3)





9.1.3. Procedure for installing GI sheet: (Optional)

9.1.3.1. Install the GI sheet 1 meter away from the sidewall of the G-HF Cocoon.
9.1.3.2. Make sure that the GI sheet has wooden posts or any equivalent that can withstand the wind.

9.1.4. GI sheet requirement:

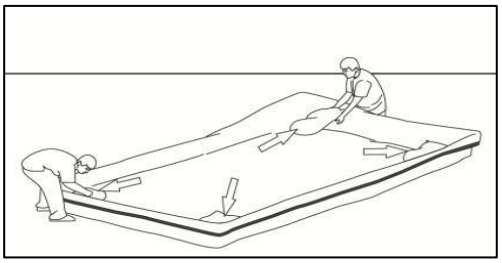
9.1.4.1. Length varies on the capacity/measurement of the G-HF Cocoon.
9.1.4.2. Height is at least 80 centimeters.
9.1.4.3. The gauge or thickness is at least 16.

10. LOADING

10.1.1. Check the moisture content of the commodity to ensure the MC is at a safe level.

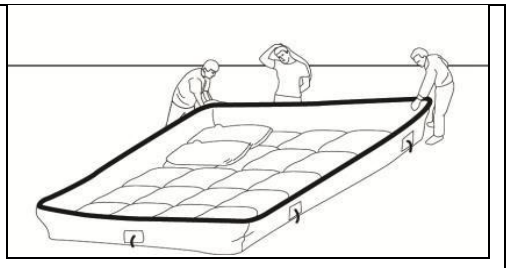
10.1.2. Loading the bottom section:

a. Unfold the bottom section of the Cocoon and lay it out on the prepared site.
b. Start piling the sacks on the bottom section.
c. Put down the first four bags each in every corner of the G-HF Cocoon.
d. Make sure that the bottom section is stretched by pulling the corners with the bags. Stretching will reduce the risk of rodent damage.



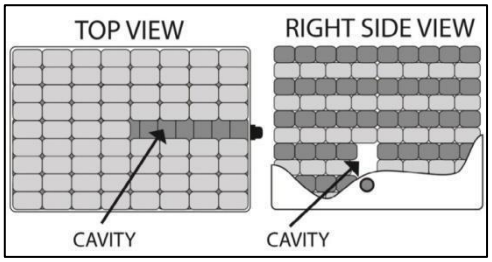
10.1.3. Required stack height:

a. Load the first layer of sacks in one direction.
b. Continue adding layers in an interlocking manner (crisscross), i.e. one layer on the top of the previous layer.
c. Stacked sacks to the corresponding height.



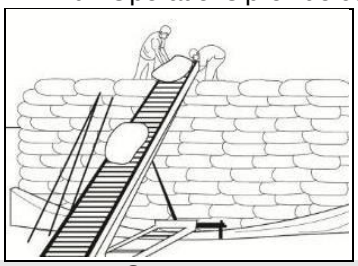
10.1.4. Providing a cavity/canal for CO_2 flushing:

a. Create a cavity/canal about 1-2 layers (20cm wide-up) aligned with the inlet port to the center of the stack.
b. This will help facilitate CO_2 flushing and avoid dry ice build-up that may cause the G-HF Cocoon liner to become brittle and eventually crack or explode.

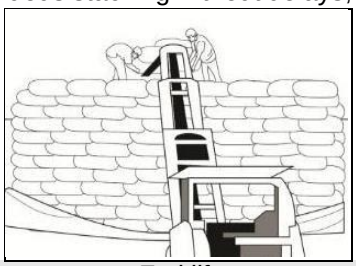


10.1.5. Mechanical loading of the bagged commodity (optional for larger G-HF Cocoon):

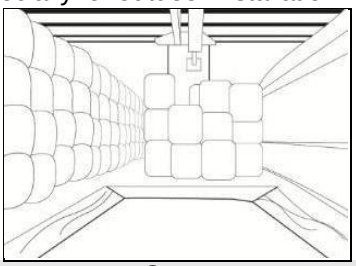
a. Stacking of grains involves diverse equipment such as a conveyor, forklift, or crane.
b. Operations provide continuous stacking without delays, especially for outdoor installation.



Conveyor



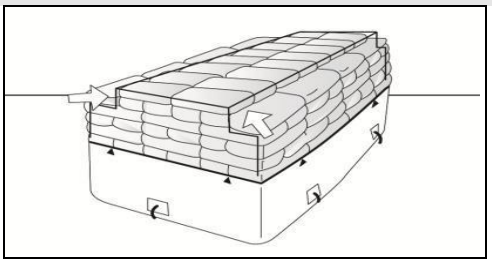
Forklift



Crane

10.1.6. The top layer:

a. Continue piling the sacks until the desired G-HF Cocoon height is reached.
b. Once you have reached the required stacking height, provide one line of sacks in the middle along the longitude of the stack.
c. This creates a crest that will keep rainwater from accumulating on the top of the G-HF Cocoon.



10.2. FORKLIFT LOADING PROCEDURE

10.2.1. Forklift loading makes the loading process faster and easier. Bagged commodities are loaded into big bags or pallets. However, certain procedures must be observed to ensure that the G-HF Cocoon™ is not damaged throughout the loading process.

a. Roll the bottom of the G-HF Cocoon™ lengthwise, leaving space for commodities in big bags or pallets.

b. Cover the G-HF Cocoon™ material with cartons or equivalent, and then stack the first layer lengthwise with the forklift.

c. Ensure that the forklift does not touch or run over the G-HF Cocoon™, as this will cause damage to the PVC materials.

d. When the desired height of the first stack is reached, unroll the bottom part for the next stacking.

NOTE: To ensure the safety and stability of the stack, make sure that the foundation of the stacked commodities is firm and durable enough to handle the G-HF Cocoon's recommended height, which varies in capacity.

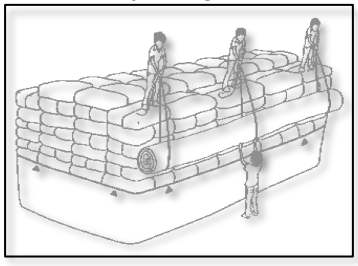
e. Continue filling until the desired height is achieved.

f. If there are any free spaces in the bottom section of the G-HF Cocoon™, it is recommended to place sacrificial commodities in bags to fully utilize the capacity of the Cocoon.

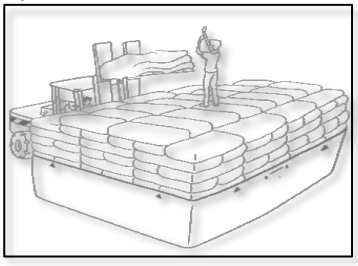
10.2. POSITIONING THE TOP SECTION

10.2.1. There are several ways to place the top section:

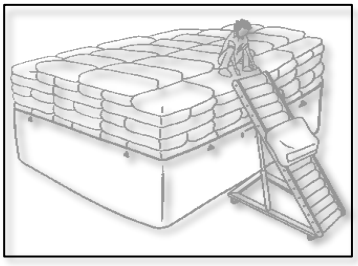
a. By rolling.
b. By using a forklift or conveyor.



Rolling method



Use of forklift



Use of conveyor

10.2.2. Unfold the top section over the stack, making sure that the top and bottom section arrows are aligned, and tension straps are outside.

10.2.3. One pair of arrows is painted green. Match these arrows for the correct front and back orientation of the Cocoon.

10.2.4. Pull the sides all the way down over the stack.

10.2.5. Do not use tension straps to pull or carry the top section.

10.3. USE OF DESICCANT (CALCIUM CHLORIDE, $CaCl_2$) – (Recommended)

10.3.1. Required dosage of Calcium Chloride, $CalCl_2$.

G-HF COCOON	CAPACITY	Desiccant Require ($CaCl_2$) for 1 month of Storage	Desiccant Required ($CaCl_2$) for 6 months of Storage
	(MT)	grams	grams
GP G-HF Cocoon-005	5	50	300
GP G-HF Cocoon-010	10	100	600
GP G-HF Cocoon-020	20	200	1200
GP G-HF Cocoon-2-050	50	600	3600
GP G-HF Cocoon-3-050	50	600	3600
GP G-HF Cocoon-100	100	1000	6000
GP G-HF Cocoon-3-150	150	1600	9600
GP G-HF Cocoon-4.5-150	150	1600	9600
GP G-HF Cocoon-300	300	3000	18000

10.4.2. Place the packed desiccant (Calcium Chloride, $CaCl_2$), at the middle-top portion of the bags inside the G-HF Cocoon before Zipping.

10.4.3. If it will be in six (6) months of storage, spread out the packed desiccant (Calcium Chloride, $CaCl_2$) at the top portion of the bags inside the G-HF Cocoon™ before zipping.

10.4. ZIPPING

10.4.1. Preparing to zip:

a. Insert one hand inside the inverted pocket and engage the zipper track for the top and bottom liners by pressing the zipper against the other hand.

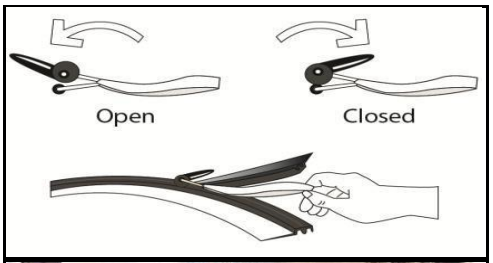
b. Manually close the zipper track to a length of 10 cm before using the zipper pull

NOTE:

- There are zipper pulls that zip to the right for right-handed users [marked with “RIGHT”] and zipper pulls that zip to the left for left-handed users [marked with “LEFT”], select the direction in which you are most comfortable.

10.4.2. Engaging the zipper pull:

a. Open the zipper mechanism by moving the black plastic handle projecting from the large wheel away from the flexible pulling loop.



b. Starting from the inverted pocket, place the smaller black running wheel inside the liner facing upward to engage the bottom liner zipper track.

c. Place the larger wheel outside the liner facing upward to engage the outside of the top liner zipper track.

10.4.3. Using the zipper pull:

a. Rotate the zipper pull's plastic handle 180° toward its pulling loop, forcing the tongues and grooves of the two zipper tracks together. Slide the zipper pull around your G-HF Cocoon™.

b. Shut the zipper track where you've done zipping while continuing to zip the rest.

NOTES:

- To make zipping easier, a second person should pull the top and bottom liners' zipper tracks close to each other as the zipper pull advances.
- Apply the silicone spray to the zipper track to ensure ease of pulling the zipper pull.

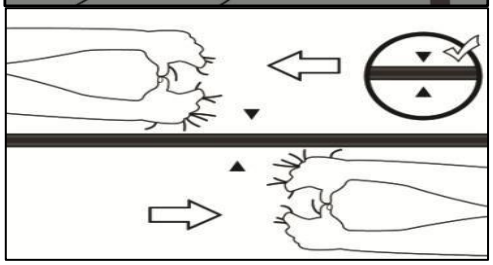
10.4.4. Completing the zipping process:

a. As you go around the G-HF Cocoon™, take note of the marks ("arrows") printed on both the top and bottom sections in pairs. The markings at the top section are located on the protective flap.

b. If you reach a pair that does not match, you can slide the already zipped tracks by pulling the top and bottom liners in opposite directions until the marks meet.

NOTE:

- If marks do not align, the two zippers may have been exposed to different temperatures resulting in the elongation of the zipper exposed to a higher temperature.
- Wait until both sections are at the same temperature and repeat this step.



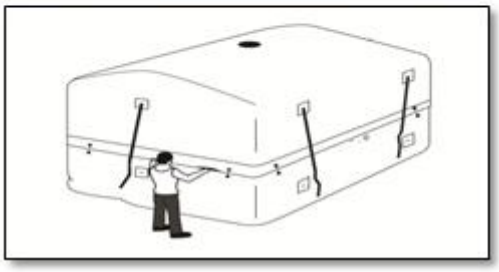
10.4.5. Removing the zipper pull:

a. When you have zipped all G-HF Cocoon™ sides and reached the inverted pocket, take the zipper pull off the track by rotating the plastic handle 180° away from the zipper pull loop.

b. Close the last few centimeters of the zipper track by sliding the fingers of one hand into the inverted pocket behind the zipper track, located at the front of the G-HF Cocoon™ under the flap.

10.4.6. Ensuring a complete hermetic closure:

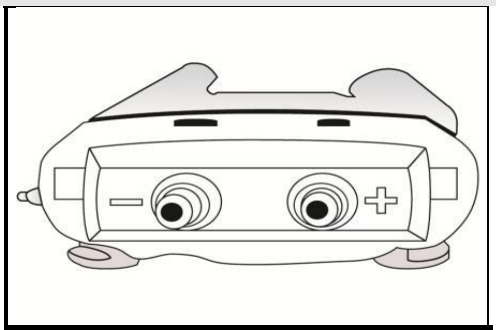
a. Check to ensure the entire length of the zipper track is fully closed.
b. If not, press the zipper halves together by hand.
   NOTE:
   - Dirt or other objects on the zipper track can prevent it from closing completely.



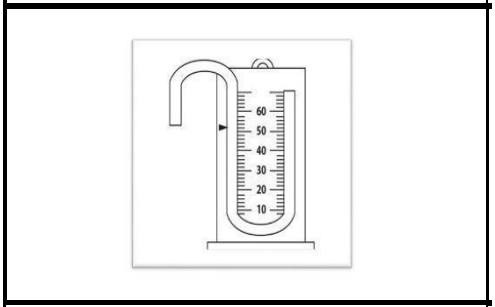
10.5. PRESSURE DECAY TEST (PDT)

10.5.1. After completely zipping and closing all the ports of the G-HF Cocoon™, perform a Pressure {Vacuum} Decay Test (PDT) to ensure gas-tightness:

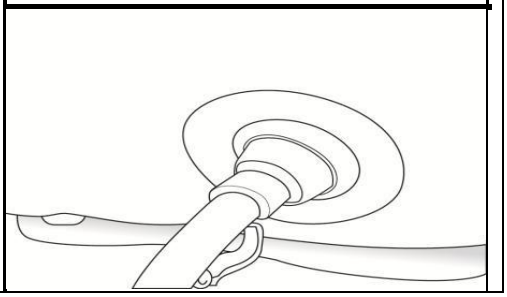
a. Use a digital manometer.



b. Either a commercially available or improvised U-tube manometer can be used to monitor the pressure.

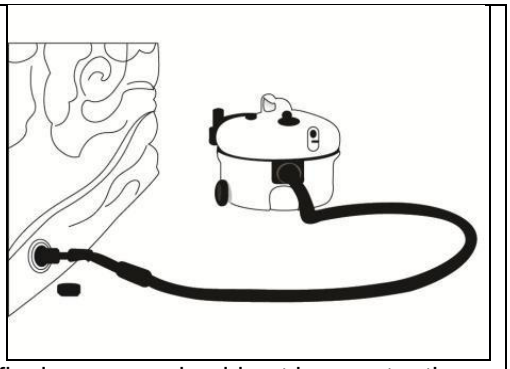


10.5.2. Connect the manometer hose to the flexible inlet of the G-HF Cocoon™.



10.5.3. Use a vacuum pump [at least 2.3 cubic meters per minute with 600 Watts (0.80 horsepower) centrifugal pump]:

a. Connect the vacuum pump hose to the inlet port of the G-HF Cocoon™.
b. Create at least -250 Pascals (Pa) or -25 millimeters' water (mm H_2O) vacuum. Doing this can also help engage the zipper tracks properly as there may be imperfections during zipping.



c. For it to be considered sufficiently airtight, the final pressure should not be greater than one-half (½) of the initial pressure (created by the vacuum pump) within five (5) minutes.
d. If the PDT test failed, check for holes/tears and poorly sealed zippers then repeat the PDT procedure.

10.6. USE OF SECURITY TAPE - (OPTIONAL)

Note: The security tape is not included in the package.

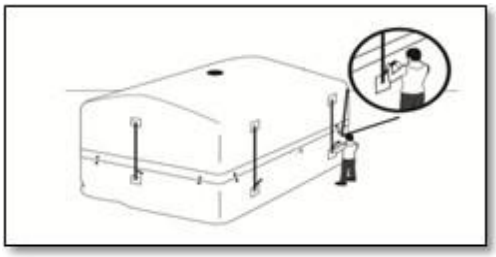
Security tapes are recommended to help us or our customers identify if the Cocoon zipper has been deliberately opened, either because of improper closing or high forces.

10.6.1. After the Pressure Decay Testing (PDT), properly place security tape around the G-HF Cocoon's hermetic zipper.

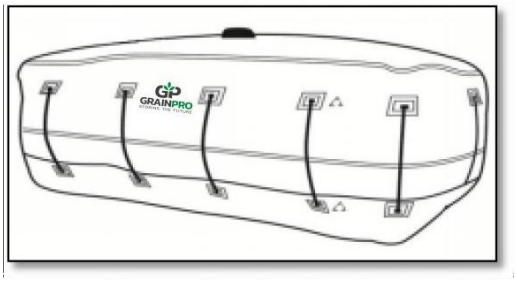
10.6.2. If the G-HF Cocoon™ has been deliberately opened, prints in the tape will remain in the zipper area.

10.7. TENSIONING OF STRAPS

10.7.1. Pull the protective flap down over the zipper track. Tighten the straps to pull any slack sidewall up away from the ground. Check that the protective flap over the zipper track has not been displaced.



10.7.2. The tension straps are long enough to raise and apply tension to the sides of the G-HF Cocoon™, even if it is only three-quarters full. The required tension can be achieved by attaching the cords to the buckles of the G-HF Cocoon™.



10.8. PROCEDURE FOR PURGING CARBON DIOXIDE (CO_2)

10.8.1. Calculation:

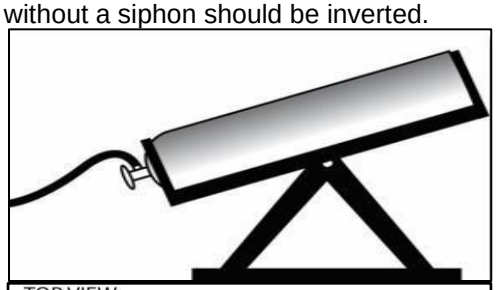
a. Total Volume – Volume Occupied by the Commodity.
b. For every 2.0kg of CO_2 replace 1 cubic meter of air.
c. An additional 15% will be added to the total capacity.
d. Formula: (1-Bulk Density) x Volume x 2 x 1.15.

COMMODITY	BULK DENSITY MT/m^3	AMOUNT OF CARBON DIOXIDE (CO_2) FOR PURGING, kg							
		5MT 7.50	10MT 15.0	20MT 30.0	50MT 78.32	100MT 150.0	150MT 227.0	300MT 414.0	320MT 856.0
Barley	0.62	7	13	23	68	131	198	362	750
Cashew nuts	0.50	9	17	30	90	173	261	476	987
Chia seeds	0.68	6	11	19	57	110	167	304	630
Chickpeas	0.74	4	9	16	47	90	136	248	513
Cocoa beans	0.56	8	15	26	79	152	230	419	868
Coffee beans	0.59	7	14	25	74	141	214	390	809
Cotton seed	0.40	10	21	36	108	207	313	571	1184
Cowpea	0.75	4	9	15	45	86	131	238	493
Maize	0.72	5	10	17	50	97	146	267	553
Millet	0.63	6	13	22	67	128	193	352	730
Mung bean	0.75	4	9	15	45	86	131	238	493
Oats	0.43	10	20	34	103	197	298	543	1125
Paddy	0.60	7	14	24	72	138	209	381	789
Paddy, rice bran	0.55	8	16	27	81	155	235	428	888
Peanuts, shelled	0.64	6	12	22	65	124	188	343	710
Rice, milled	0.80	3	6	11	32	62	94	171	355
Rye	0.72	5	10	17	50	97	146	267	553
Sesame	0.59	7	14	25	74	141	214	390	809
Sorghum	0.72	5	10	17	50	97	146	267	553
Soybean	0.75	4	9	15	45	86	131	238	493
Sunflower	0.41	10	20	35	106	204	308	562	1164
Wheat	0.77	4	8	14	41	79	120	219	454

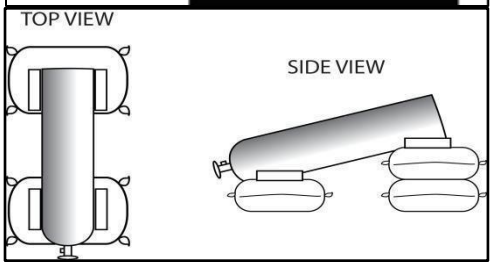
10.8.2. CO_2 application:

a. Make sure that enough CO_2 is available on-site. The weight of the CO_2 in the cylinder is supplied by the industrial companies (i.e., 22 kg standard capacities which may be used to calculate the number of cylinders required). CO_2 cylinders are available with or without a siphon (dip tube). For rapid flushing, the cylinder without a siphon should be inverted.

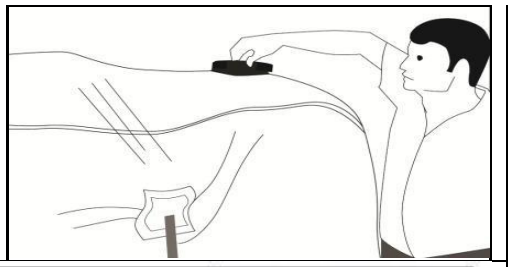
b. For rapid flushing, the cylinder should be inverted using a mechanical inverter. However, the cylinders with a siphon should be in an upright position during flushing.



c. If a mechanical inverter is not available, a makeshift inverter can be made using sandbags or other improvised techniques. The cylinder should be inverted with its top resting on one sandbag and the bottom end resting on a pile of two or three sandbags high.

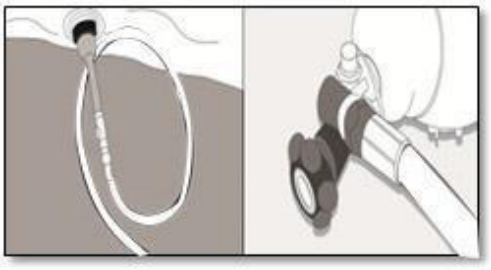


d. Open the outlet port located at the back (top) of the G-HF Cocoon™ to relieve excess pressure and to release air from inside.



e. A snap-on standard high-pressure hose (not supplied/separate item) should be connected between the cylinder and the gas inlet port. This hose should be guaranteed to withstand a pressure of 88 atmospheres (1,300 psi, or 92 kg/cm^2). Ensure that all connections are made properly, and the gaskets are placed where they are required. The high-pressure hose should have a length of about 2 meters to facilitate easy connection to the inlet valve.

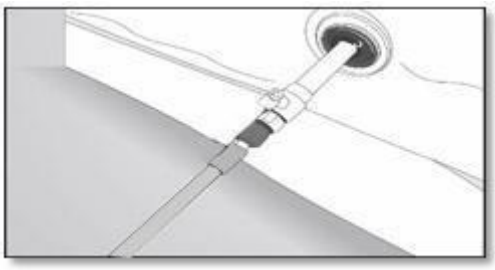
f. Open the gas inlet port of the G-HF Cocoon™ and then open the cylinder tap. The cylinder tap should only be turned to a point where you can hear the liquid pass through the hose into the G-HF Cocoon™. The liquid CO_2 flushes into the G-HF Cocoon™ and evaporates inside through the expansion pipe and will push the air upward starting from the bottom core, following the piston effect, until the air is totally replaced.



10.8.3. Ice formation along with the pressurized hose and the pipe connector during CO_2 flushing:

a. During this procedure, some ice may form around the gas inlet port and high-pressure hose.

b. If this happens, do not touch the PVC liner at this point because it becomes brittle, loses flexibility, and may crack.



c. Flushing (emptying of the cylinder) depends on the amount of CO_2 to be applied. Emptying one 22kg cylinder should only take about 20 to 30 minutes. If the pressure hose or the inlet valve gets blocked with ice, this is an indication that the CO_2 is being released too quickly. If this happens the cylinder should be closed until the ice melts, and then the cylinder tap should be re-opened and adjusted to reduce the flow.

d. An additional indication that the gas is being released too quickly is when the G-HF Cocoon™ begins to balloon out because the pressure begins to build-up inside. If this happens, the gas flow should be decreased at the cylinder tap until the rate of air being expelled through the outlet port is about the same as the rate of CO_2 entering the G-HF Cocoon™.

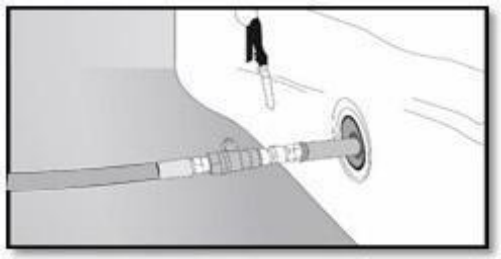
e. If necessary, for small-scale applications where the cylinder is not inverted, weighing scales may be used to control the weight of the gas delivered. In this case, the gas is released slowly, through a pressure gauge adjusted to control the flow rate.

10.8.4. Since CO_2 is heavier than air, the air inside the G-HF Cocoon will be pushed upwards and out of the container through the outlet port. Complete displacement of oxygen is not possible as there is always some mixing at the interface between the air and the CO_2. However, if the final CO_2 concentration reaches 80% then the O_2 concentration in the remaining air amounts to 4%. This mixing of the CO_2 with the remaining air, and absorption of CO_2 by the commodity,

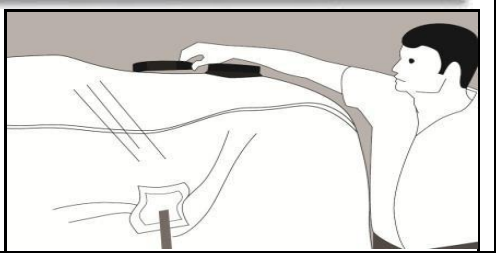
will take 12-24 hours depending on temperature. This will also be the time to determine the initial concentration of CO_2.

10.8.5. After the required weight of CO_2 has been applied, immediately:

a. Close the CO_2 cylinder tap and the inlet port of the G-HF Cocoon.



b. Close the outlet port of the G-HF Cocoon™.



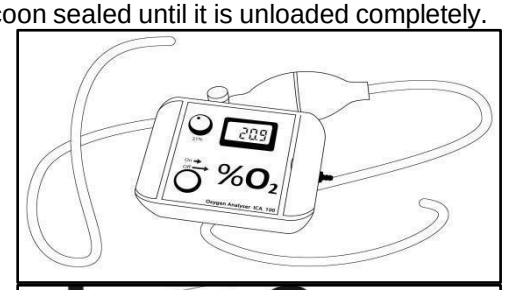
10.9. MONITORING THE OXYGEN LEVEL AND RELATIVE HUMIDITY (RH%)

10.9.1. Recommended pest reduction timeline:

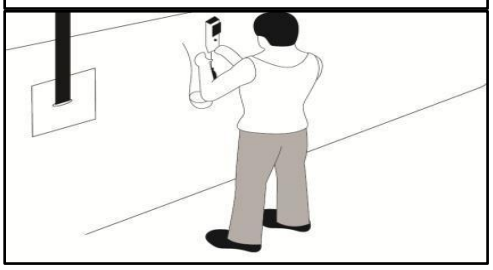
a. Leave the G-HF Cocoon™ closed for two weeks at a minimum of 35% CO_2 (13% O_2) concentration to eliminate all stages of insects and achieve the best results.
b. When storing commodities, leave the G-HF Cocoon sealed until it is unloaded completely.

10.9.2. Use of an oxygen analyzer:

a. During the first 15 days of installation, oxygen levels should be checked daily using the oxygen analyzer.



b. Succeeding monitoring should be done twice a week. Normally, oxygen levels should drop 1-2% per day to a level less than 3% (though lower levels have been observed as well). Oxygen levels go up by a few percent but must not exceed 7%, sealing is probably compromised, and the commodity may not be adequately protected.



10.9.3. When carrying out a CO_2 treatment, the approximate CO_2 concentrations can be determined by measuring O_2 concentrations using the conversion table below:

Note:

- Carbon dioxide flushing must be also recommended for commodities that are fumigated or processed (i.e., milled rice, yellow split peas).
- When planning to store for 2 months or less, carbon dioxide flushing is recommended to ensure control of insect infestation.

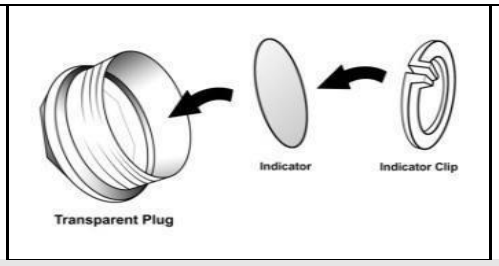
O_2	CO_2	O_2	CO_2	O_2	CO_2	O_2	CO_2	O_2	CO_2	O_2	CO_2	O_2	CO_2
0.0	100	3.0	85.7	6.0	71.3	9.0	56.9	12.0	42.6	15.0	28.3	18.0	13.9
0.2	99.0	3.2	84.7	6.2	70.3	9.2	56.0	12.2	41.6	15.2	27.3	18.2	12.9
0.4	98.1	3.4	83.7	6.4	69.4	9.4	55.0	12.4	40.7	15.4	26.3	18.4	12.0
0.6	97.1	3.6	82.8	6.6	68.4	9.6	54.1	12.6	39.7	15.6	25.4	18.6	11.0
0.8	96.2	3.8	81.8	6.8	67.5	9.8	53.1	12.8	38.8	15.8	24.4	18.8	10.1
1.0	95.2	4.0	80.9	7.0	66.5	10.0	52.2	13.0	37.8	16.0	23.4	19.0	9.1
1.2	94.3	4.2	79.9	7.2	65.6	10.2	51.2	13.2	36.8	16.2	22.5	19.2	8.1

1.4	93.3	4.4	79.0	7.4	64.6	10.4	50.2	13.4	35.9	16.4	21.5	19.4	7.2
1.6	92.3	4.6	78.0	7.6	63.6	10.6	49.3	13.6	34.9	16.6	20.6	19.6	6.2
1.8	91.4	4.8	77.0	7.8	62.7	10.8	48.3	13.8	34.0	16.8	19.6	19.8	5.3
2.0	90.4	5.0	76.1	8.0	61.7	11.0	47.4	14.0	33.0	17.0	18.7	20.0	4.3
2.2	89.5	5.2	75.1	8.2	60.8	11.2	46.4	14.2	32.1	17.2	17.7	20.2	3.4
2.4	88.5	5.4	74.2	8.4	59.8	11.4	45.5	14.4	31.1	17.4	16.8	20.4	2.4
2.6	87.6	5.6	73.2	8.6	58.9	11.6	44.5	14.6	30.1	17.6	15.8	20.6	1.4
2.8	86.6	5.8	72.3	8.8	57.9	11.8	43.5	14.8	29.2	17.8	14.8	20.8	0.5

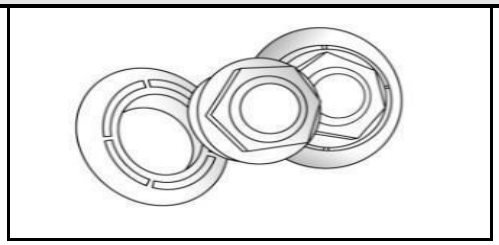
10.9.4. Use of humidity indicator:

a. The humidity indicator is a special circular paper with moisture a sensitive chemical. Its color changes from blue to pink when relative humidity exceeds 65%, and vice versa.
b. The humidity indicator provides an affordable and quick reference to relative humidity inside the G-HF Cocoon™.
c. It is easy to use and does not require meticulous preparation for installation.
d. The material is non-toxic, and disposal doesn't need any special treatment.
e. Procedures on how to use the humidity indicator:

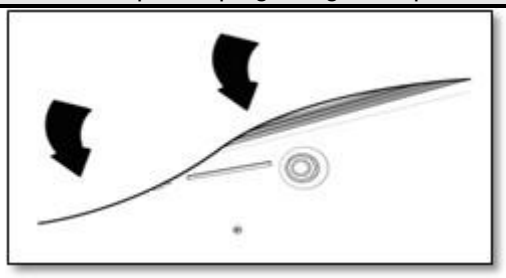
Get a humidity indicator from the pack



Put the humidity indicator inside the transparent plug using the clip



Attach the transparent plug to the threaded flange tightly



Hide the humidity indicator with the zipper cover

10.9.5. Instructions for when the indicator turns pink:

a. Replace the pink indicator with an unused (blue) indicator. Make sure the plug is dry and the replacement is done quickly (Cover threaded flange to not let in too much air inside).
b. Monitor the indicator for 4-8 hours.
c. If the indicator turns pink within 4-8 hours, use other devices to check for the humidity inside or consult GrainPro.
d. If the indicator did not turn pink, continue to monitor. Repeat the procedure if the indicator changes.

Note:

- Place unused humidity indicators on a sealed container with the included desiccant. Humidity indicator cards with pink or lavender spots can be turned to a blue color by placing indicators in a sealed container with 33grams (I unit) of desiccant for 4-8 hours or oven-dry for 10-20 minutes, set the oven to 50°C (122°F).

10.10. DISMANTLING

10.10.1. Although CO_2 is not toxic, it is an asphyxiant gas, and is advisable to unzip the G-HF Cocoon™ and wait until most of the CO_2 has dispersed.

10.10.2. Although the G-HF Cocoon™ may be progressively filled over several days as the commodity is harvested and provided, they have the same moisture content, it is not recommended to top up a G-HF Cocoon™ that is still partially filled from a previous harvest, with the commodity brought in from the new harvest. This is because when the new commodity is tapped from the top, the old commodity from the previous harvest is left at the bottom.

10.10.3. This commodity will only be unloaded at the end of storage:

a. Unfastening the tension straps.
b. Using a coin, insert and twist the zipper (sharp objects should not be used for opening the zipper).
c. Gently pull the two sections apart, taking the top section completely off.
d. Remove the sacks of stored commodities (again, a stairway of sacks might make the job easier).

11. PREVENTING CONDENSATION

11. WHY DOES CONDENSATION OCCUR?

11.1.1. Condensation is caused by temperature difference i.e., hot weather during the day and cool at night or sudden rains on a hot sunny day. When air collides with a cool surface at dew point temperature the water in the air condenses on the surface. Air movement inside the G-HF Cocoon™ follows the natural forces i.e., in convection currents hot air rises and cool air sinks (except for the phenomenon called inversion). Hence, when warm air inside the G-HF Cocoon rises and hits the cool G-HF Cocoon™ top cover at dew point temperature, a condensation reaction occurs, and water condenses.

11.1.2. Therefore, avoiding trapped warm air inside the G-HF Cocoon™ can prevent condensation at the top layer. This is the role of the GrainShade i.e., prevents heating the air inside the G-HF Cocoon by repelling solar radiation. Condensation can be checked manually through the center outlet port. Close the checking port properly after checking. Refer to 5.4 to prevent condensation).

11.2. RECOMMENDATION TO PREVENT CONDENSATION

For outdoor installation of the GHF-Cocoon™, a garden net with at least 80% ultraviolet (UV) sun-shading rate could be used in addition to the GrainShade to cover unshaded parts or parts from being exposed to direct sunlight to prevent condensation.

11.3. MOISTURE CONTENT (MC) REQUIREMENT FOR SAFE STORAGE

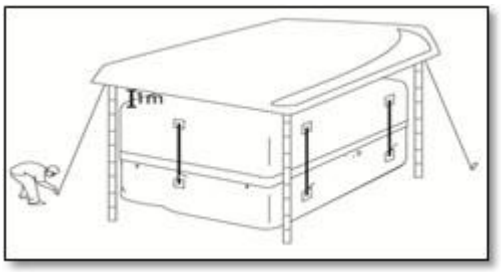
11.3.1. Commodities should be dried before storage to at least 12% MC for sorghum, 9-10% millet, 12-14% for paddy, and maize, and 13% for wheat.

11.3.2. When the commodity is properly dried, there is virtually no “free water” that the microorganisms can use to process the nutrients in the stored product for their growth and development.

11.3.3. This condition can be maintained by avoiding ambient air (with variable moisture content) to be in contact with the dried product using the hermetic storage technology.

11.4. SETTING-UP THE GRAINSHADE (OUTDOOR INSTALLATION)

11.4.1. Ensure that the poles are rigid and stable:



a. Use poles (pipe, lumber, or bamboo) at least 1.5 meters away from each corner and 1 meter higher than the G-HF Cocoon.
b. Connect the corners of the GrainShade to the apex of the poles, maintaining at least a 1-meter clearance between the top surface of the G-HF Cocoon and the GrainShade.
c. Additional wires can be used to reinforce the pole by tying at the top with the other end pegged to the ground away from the pole.

11.4.2. If poles are not available, tie the GrainShade to nearby posts, walls, tree branches, or pegs for support.

11.4.3. To prevent sagging and flapping during rain and strong winds, install a wire or rope beneath and above the GrainShade.

12. MAINTENANCE AND CARE

12.1. REGULAR EXAMINATION

12.1.1. Measure oxygen concentration using the oxygen Analyzer (GrainPro HH or ICA model).
a. First two weeks - Daily.
b. Succeeding days- Twice a week.

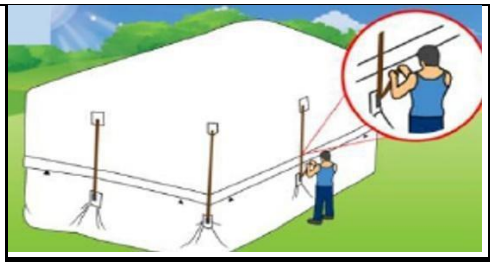
12.1.2. Check (at least weekly) for possible condensation by opening (and re-closing) the checking port.

12.2. PHYSICAL INSPECTION

12.2.1. Check the zipper track for any small opening/s and push the opened track section by hand.

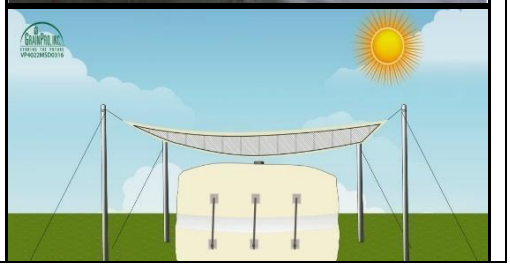
12.2.2. Do not allow any material near the ground to become slack.

12.2.3. If slacks are observed, re-adjust the tension straps to pull up any slack sidewall away from the ground.



12.2.4. During rainy seasons, the upper surface of the G-HF Cocoon™ should be regularly inspected for water accumulation and damages that would permit water to sip into the G-HF Cocoon™. The stored commodity is not adequately protected if the G-HF Cocoon™ is not completely sealed.

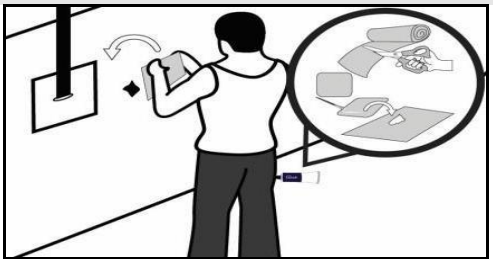
12.2.5. Re-tension wires to prevent sagging and flapping during rain and strong winds.



12.3. REPAIRING PUNCTURES AND OTHER DAMAGES

12.3.1. Use the patching material and adhesive found in the repair kit:

a. Clean the area to be patched with a damp cloth or organic solvent.
b. Apply glue (150-200g) on both surfaces with a brush or equivalent.
c. Let it dry for 5-10 minutes and stick and apply sufficient pressure.



12.3.2. Protective maintenance:

a. Check the patched PVC occasionally and replace or re-patch if necessary.

12.4 CLEANING, INSPECTION, AND REPAIR

12.4.1 Clean the GHF Cocoon™ after use, dilute the liquid detergent/or dishwashing liquid to a water bottle using the 1-part liquid detergent to 20 - 30 parts of water (1:20 to 30 parts).

12.4.2 Using clean rags, wipe the entire GHF Cocoon™ to remove dirt from the liner and the residual smell from the commodity. This will ensure that no pests will be attracted during safekeeping.

12.4.3 Dry under the sun after cleaning.

12.4.4 After drying visually check or inspect the liner of the GHF Cocoon™ after cleaning and mark the visible damages.

12.5. PROHIBITED ITEMS NOT ALLOWED TO BE SHIPPED

12.5.1. The silicone spray (for zipper lubrication) and glue (for patching PVC materials) are prohibited items and are not allowed to be shipped in air cargo.

12.5.2. These items will be removed from the package.

12.5.3. The client is advised to purchase any local equivalent.

12.4.5 To ensure the airtightness of the GHF Cocoon™ for the next use, pinholes should also be repaired. To detect pinholes, expose the liner directly to the sun, pinholes will be marked with a marker in preparation for repair.

12.4.6 Repair the damage using the patching materials see 12.3. Repair procedure.

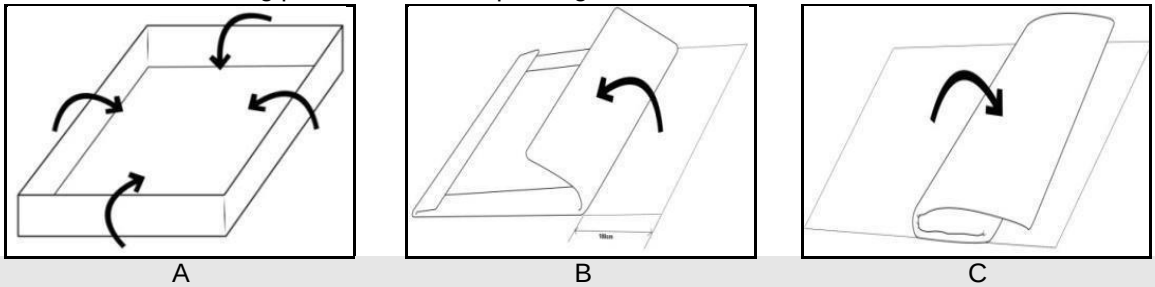
12.6. FOLDING

12.6.1. Measure 180 cm from the end and fold inside.

12.6.2. Fold any extra material and finally fold in half.

12.6.3. Fold the material lengthwise until it fits in the carrying bag.

12.6.4. Folding procedures and repacking of the G-HF Cocoon:



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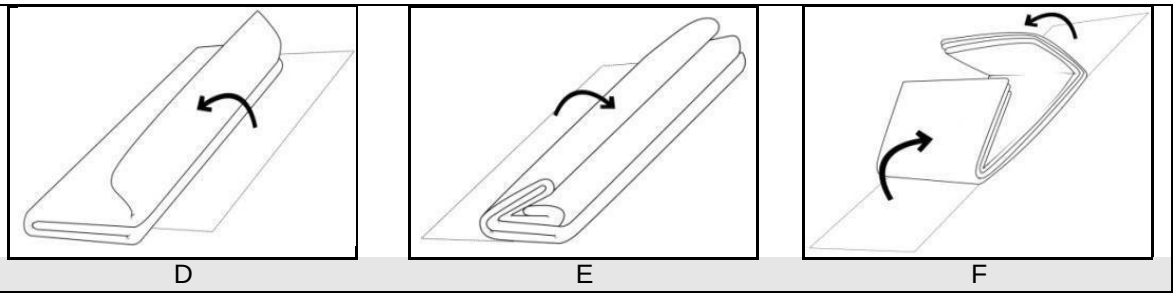
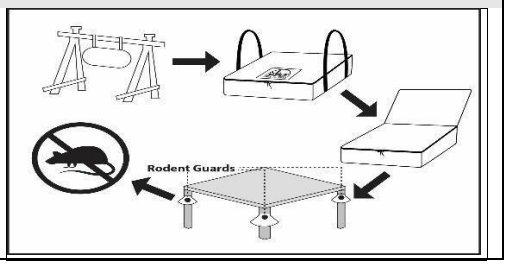


12.7. SAFEKEEPING

12.7.1. The empty G-HF Cocoon™ should be stored away from heat or direct sunlight and away from rodents.

12.7.2. Do not place heavy objects on top of the stored liner as it may damage or deform it.

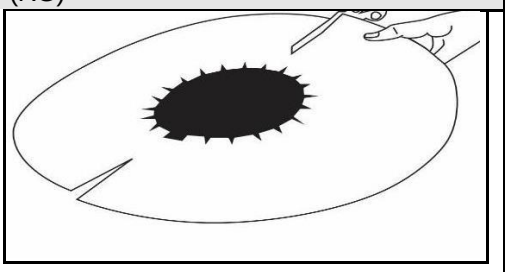


12.8. PLATFORM INSTALLATION OF RODENT GUARD (RG)

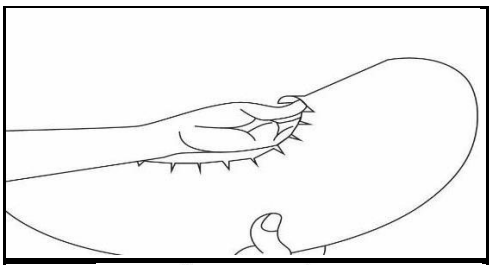
12.8.1. For protection against rodent attacks (one set contains 4 pieces):

a. One set can be installed on any platform legs with a leg perimeter (round or square) of 22 cm (9") to 44 cm (17").

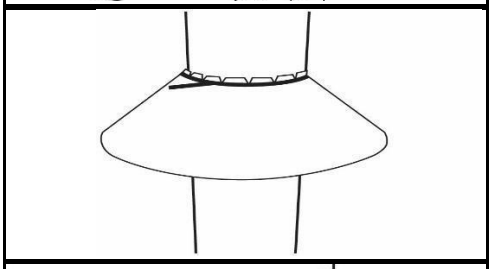
b. If the leg area is smaller, it can be optionally cut in half to fit. Cut along the lines at the back of the rodent guard.



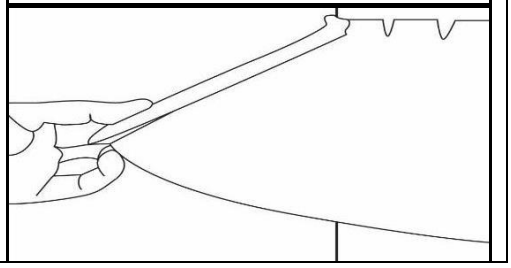
12.8.2. Fold the rodent guard's teeth upwards against the sides of the leg to keep it from slipping.



12.8.3. Make sure to overlap the sides at least one inch.



12.8.4. Lock the overlap using a staple wire, cable wire, or any fastener.



12.9. RECYCLING

GrainPro GH-F Cocoon is made of PVC.

12.9.1. The products can be delivered to the nearest recycling facilities in the area.

12.9.2. Plastic #3 – PVC (Vinyl) can be recycled into paneling, flooring, speed bumps, decks, or roadway gutters.

13. FREQUENTLY ASKED QUESTIONS AND ANSWERS

13.1. SHOULD I PUMP THE AIR OUT OF THE G-HF COCOON OR MODIFY THE AIR INSIDE IT, FOR EXAMPLE, WITH CARBON DIOXIDE?

- If used as a simple Cocoon (S-VC), do not pump out or modify the air inside. The insects' own natural activity will use up the available oxygen and convert them to carbon dioxide (CO_2). Atmospheres modified with CO_2 will preserve the quality of stored commodities and eliminate the chances of insect survival.

13.2. SHOULD I FUMIGATE INFESTED GRAIN BEFORE STORAGE?

- No, you do not need to fumigate to get rid of the infestation. The insects will die in a matter of days due to a lack of oxygen.

13.3. IS THERE ANY USE NOT RECOMMENDED FOR G-HF COCOONS?

- Yes, the G-HF Cocoon is not recommended for storing fresh fruits, vegetables, medicine, or insufficiently dried commodities.

13.4. CAN YOU ADD OR TAKE OUT ITEMS ONCE THE G-HF COCOON IS FILLED AND CLOSED?

- Yes, you can take out or add items. If the added items are infested, the insects will naturally die when oxygen is used up. However, it is not recommended to frequently open the G-HF Cocoon. The GrainSafe™ Bag 1.0-GHF with a 1-ton capacity can be used instead.

13.5. DO I NEED TO FILL G-HF COCOON ENTIRELY FOR IT TO BE HERMETIC?

- No. However, at least 90% of the capacity is recommended to ensure a good hermetic effect and full protection from insect infestations and rodents.

13.6. SHOULD THE G-HF COCOON BE INSTALLED ONLY INDOORS?

- No. The G-HF Cocoon is designed for indoor and outdoor use also under all climatic conditions.

13.7. WILL A PUNCTURE NEGATE THE BENEFITS OF HERMETIC STORAGE IN THE G-HF COCOON?

- Not completely, although a puncture allows oxygen to maintain an infestation in the immediate area of the punctured hole. Tight bag stacking of the stored product tends to prevent widespread infestation. Immediate repair of all punctures or cuts is highly recommended.

13.8. WHAT IS THE SAFE PRODUCT MC FOR STORAGE IN THE G-HF COCOON?

- The G-HF Cocoon works best with grains at or below the equilibrium moisture content which varies with locations and weather conditions. The equilibrium moisture content is affected by temperature and relative humidity.

13.9. CAN RODENTS BITE THROUGH THE PVC MATERIAL OF AN INSTALLED G-HF COCOON?

- Yes, but only if the sides are sagging (not stretched firmly). Rodents can penetrate the smooth, slippery surface of the G-HF Cocoon if the sides have too little tension. Rodents can also damage the top cover by jumping down from an overhang such as a low-hanging branch of a tree. In areas with heavy soils and high rodent activity, it is recommended that the G-HF Cocoon be placed on a 5-centimeter-thick layer of sand. But concrete or paved flooring is best. WARNING: Be sure to protect the empty G-HF Cocoon in its carry bag during storage. Rodents can damage the G-HF Cocoons even when they are empty, especially when left unprotected.

13.10. CAN THE G-HF COCOON BE USED TO STORE COMMODITIES OTHER THAN GRAINS?

- Yes, most dry agricultural commodities such as seeds, pulses, beans, coffee, cocoa, some dried fruits, and even dried chilies can be safely stored. When in doubt, ask GrainPro.

13.11. HOW FAST WILL THE OXYGEN LEVEL DROP AFTER SEALING?

- When used as a simple Cocoon (S-VC), normally, if the stored commodity is sufficiently dried and heavily infested, except for coffee, oxygen can drop down to 1-2% in 14 days. The drop depends on the infestation level, moisture content of the commodity, and other factors. If the oxygen level does not drop in a span of 7 days, check for an open zipper track and inspect the top and bottom sections for holes and cuts, or contact GrainPro immediately for assistance.

13.12. WHAT SHOULD BE DONE WHEN TAKING AN OXYGEN READING IS DIFFICULT?

- First, check the flexible inlet valve to see if it is clogged or dirty. Clean the inlet to remove dirt and other impurities. Slightly flex the end of the flexible inlet valve to create an opening for air to pass through. When inserting the oxygen analyzer tube, slightly pinch the flexible inlet to get a proper reading. Refer to the Oxygen Analyzer Manual for further information.

13.13. IS IT SAFE FOR THE HUMIDITY INDICATORS TO COME IN CONTACT WITH FOOD?

- The humidity indicator is non-toxic.

13.14. SHOULD I REPLACE THE HUMIDITY INDICATOR IF THEY CHANGE COLOR?

- Yes. If the humidity indicator turns pink, replace it with an unused (blue) indicator. Please refer to 5.10.5. (Instruction when the indicator turns pink) for step-by-step instructions.

13.15. HOW LONG WILL IT TAKE FOR THE HUMIDITY INDICATOR TO CHANGE COLOR?

- Normally, the indicators will change color within minutes of exposure to the ambient conditions. However, the time it takes for the humidity indicator to turn from one color to another depends on the amount of humidity the indicator is exposed to and the temperature.

14. WARRANTY CLAUSE

GrainPro® hereby warrants that Products sold by it to the Buyer shall be free of defects in workmanship, including maintaining gas tightness for a period as follows - starting from the date of shipment (B/L): Five years for the Gas-Hermetic Fumigation Cocoon™ liner and zipper.

The warranty liability is limited to the replacement of defective Products within the warranty period at GrainPro's plant in accordance with the provisions specifically and expressly set forth herein.

The Buyer will pay for Products that need to be replaced under warranty, a percentage of the full list price according to the ratio between the period, that has passed until replacement, and the full warranty period.

The Buyer shall bear shipping costs for shipment of defective Products to GrainPro, and GrainPro shall bear shipping costs of returning good Products to the Buyer.

The Warranty does not cover the cost of any services, work, or materials required for the replacement of defective Products with good Products at the site of installation.

GrainPro shall have no obligation under the warranty to replace defective Products or parts thereof if the defect is a result of any of the following: normal wear and tear; damages occurring after delivery, accidents, acts of God, or catastrophes, fault or negligence, or improper storage installation, maintenance of the Products.

Replacement costs and shipping charges for Products found not to be under warranty as specified above would be paid in full by the Buyer before new/refurbished Products are shipped.

Notwithstanding the above, if the Products include main parts or sub-assemblies purchased by GrainPro from other vendors ("Additional Equipment"), then the period and terms of warranty for Additional Equipment are limited to the period and terms offered by the vendors of such equipment.

The Buyer agrees that the warranty liabilities of GrainPro shall be and are limited to the express foregoing terms: THE EXPRESS WARRANTIES AND OBLIGATIONS SET FORTH ABOVE, ARE AND SHALL BE IN LIEU OF ALL OTHER WARRANTIES AND OBLIGATIONS OF GRAINPRO, EXPRESSED OR IMPLIED. EXCEPT TO THE EXTENT HEREIN PROVIDED, GRAINPRO DOES NOT MAKE AND SHALL NOT BE DEEMED TO MAKE ANY WARRANTY WHATSOEVER TO THE, TO ANY END-USER OR TO ANY OTHER PERSON OR PARTY, INCLUDING, WITHOUT LIMITATION, ANY WARRANTY OF MERCHANTABILITY OR OF FITNESS FOR ANY PARTICULAR USE OR PURPOSE. GRAINPRO SHALL NOT BE LIABLE FOR ANY LOSS OF USE, SALES, OR PROFIT OR FOR ANY INDIRECT, CONSEQUENTIAL, OR INCIDENTAL DAMAGES CAUSED BY OR SUFFERED AS A RESULT OF THE SALE OR USE OF THE PRODUCTS.

For further information and clarifications, visit our website at www.grainpro.com; email our Customer Support team: customercare@grainpro.com, or call: +63 47 252 7884.