

GRAINPRO® GAS-HERMETIC FUMIGATION
SELF-VERIFYING COCOON™

INSTRUCTION MANUAL

MA2021TDB1199-19



**"A GREEN, NOT ONLY FOR
PROFIT COMPANY"**



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1. INTRODUCTION

The GrainPro® Gas-Hermetic Fumigation Self Verifying Cocoon™ (G-HF SVC) is a flood protected, Ultra Hermetic™ gas-tight storage designed for insecticide-free fumigation specifically CO₂ fumigation to immediately control any infestation and safe storage of durable agricultural commodities. G-HF SVC™ are 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 (O₂), and moisture. Includes one transparent plug to monitor the relative humidity (RH) inside.

G-HF SVC able to withstand floods below zipper line and can maintain the gas resulting from the respiration of insects and commodity; 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. 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, acknowledged as organic fumigation using CO₂.

1.2. PRODUCT GUARANTEE:

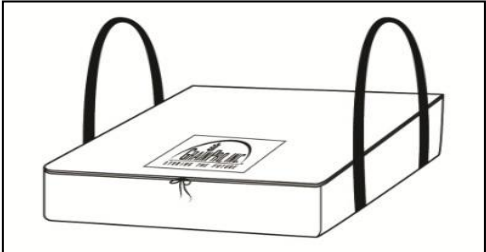
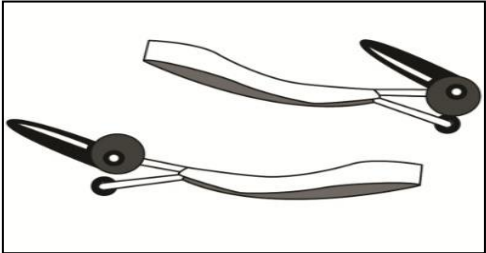
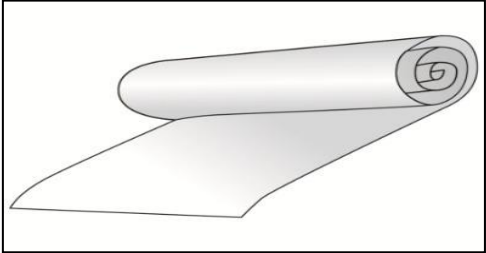
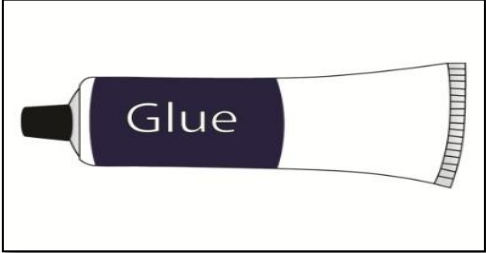

- 1.2.1. In accordance with the terms and conditions herewith, GrainPro, Inc. guarantees the quality of this product per its written warranty provided it is used according to the instructions in this manual.
- 1.2.2. Please read and understand the manual thoroughly before using the G-HF Cocoon.

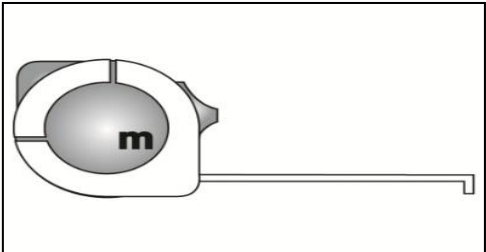
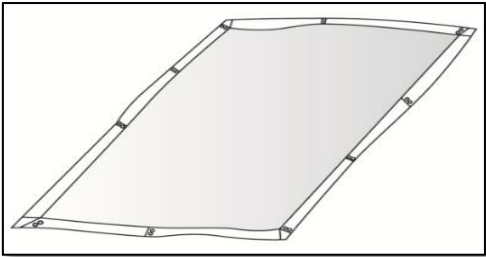
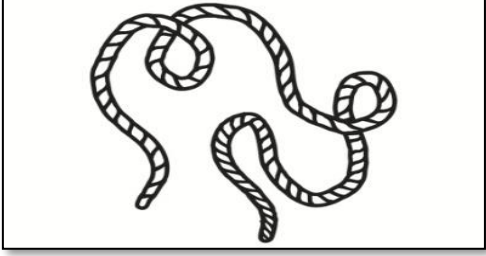
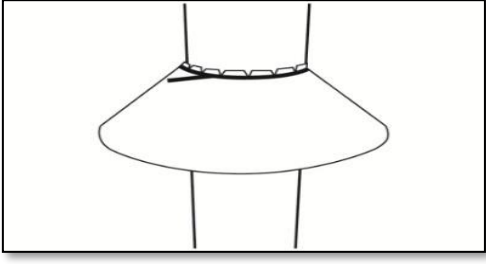
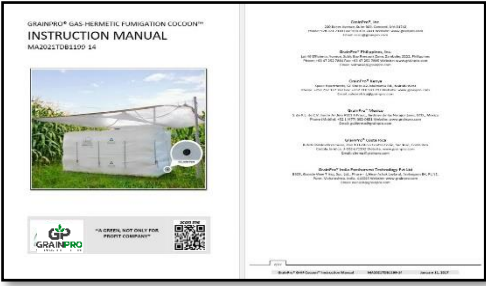
1.3. COMMENTS, COMPLAINTS, AND/OR CLARIFICATIONS:

- 1.3.1. Please contact customercare@grainpro.com.
- 1.3.2. We shall be glad to address any of your concerns.

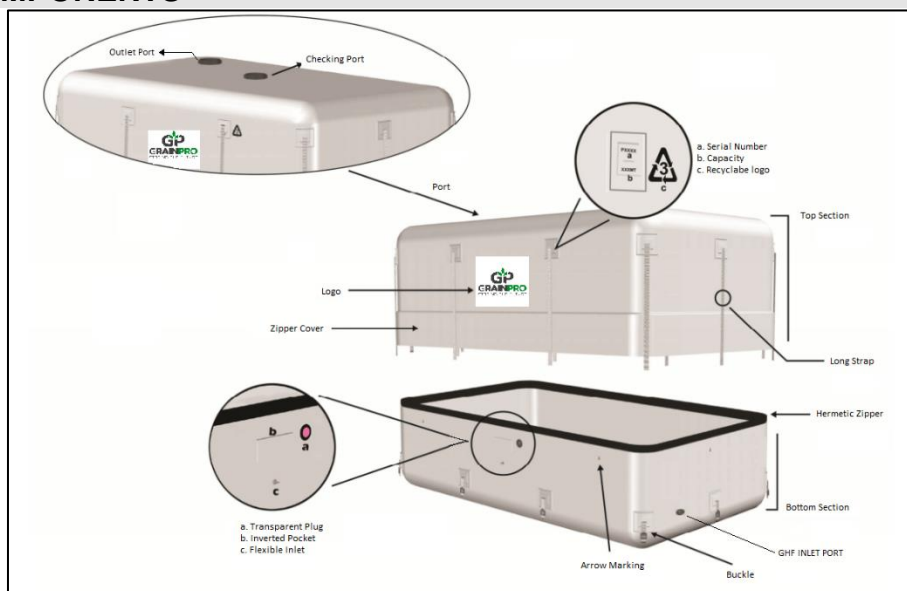
2. CHECKLIST

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	10
Warranty, years	5

4.2. PRODUCTS

G-HF COCOON	CAPACITY (MT)*	LENGTH cm (inch)	WIDTH cm (inch)	HEIGHT cm (inch)	VOLUME m ³
GP G-HF Cocoon-005	5	297.5 (117.13)	165.0 (64.96)	150.0 (59.06)	7.36
GP G-HF Cocoon-010	10	330.0 (129.92)	297.5 (117.13)	150.0 (59.06)	14.73
GP G-HF Cocoon-020	20	398.0 (156.69)	380.0 (149.61)	200.0 (78.74)	30.25
GP G-HF Cocoon-2-050	50	890.0 (350.39)	440.0 (173.23)	200.0 (78.74)	78.32
GP G-HF Cocoon-3-050	50	595.0 (234.25)	435.0 (171.26)	300.0 (118.11)	77.65
GP G-HF Cocoon-100	100	860.0 (338.58)	580.0 (228.35)	300.0 (118.11)	149.64
GP G-HF Cocoon-3-150	150	890.0 (350.39)	850.0 (334.65)	300.0 (118.11)	226.95
GPG-HF Cocoon-4.5-150	150	750.0 (295.28)	680.0 (267.72)	450.0 (177.17)	229.50
GP G-HF Cocoon-300	300	926.0 (364.57)	745.0 (293.31)	597.5 (235.24)	413.92

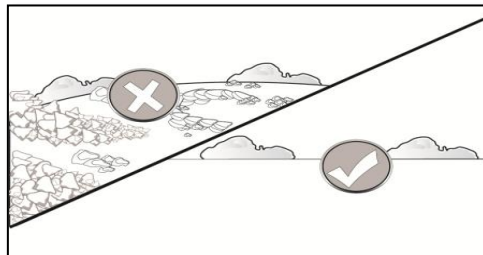
*Based on bulk density of wheat

5. INSTALLATION

5.1. SITE SELECTION

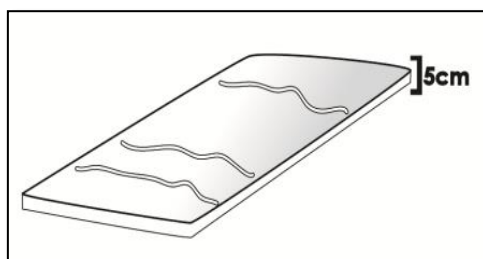
5.1.1. In selecting a site, look for:

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



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

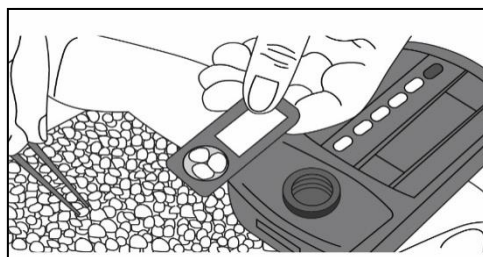
5.1.3. If ground will be used as flooring, put a layer (5cm) of fine sand (or any equivalent) on top of the soil as ground foundation.



5.1.4. 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.

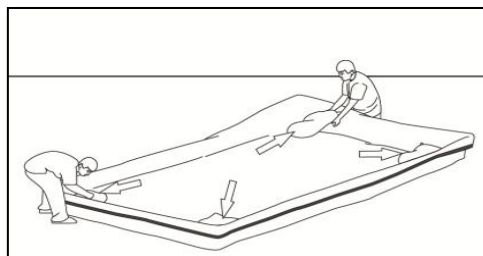
5.2. LOADING

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



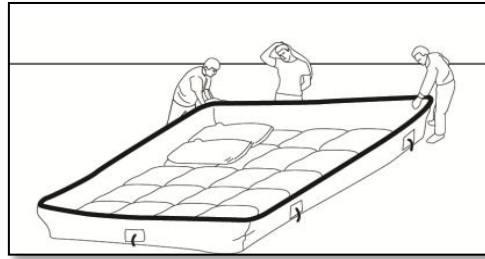
5.2.2. Loading the bottom section:

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



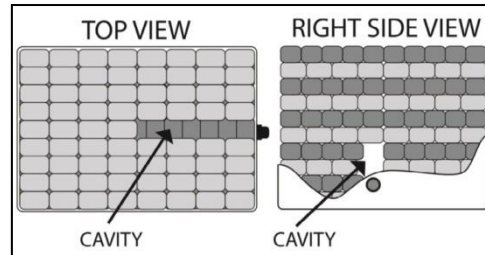
5.2.3. Required stack height:

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



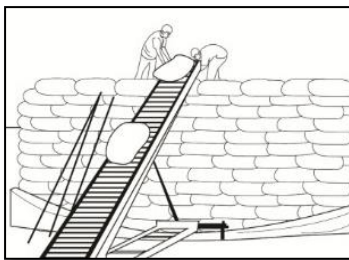
5.2.4. Providing a cavity/canal for CO₂ flushing:

- Create a cavity/canal about 1-2 layers (20cm wide-up) aligned with the inlet port to the center of the stack.
- This will help facilitate CO₂ flushing and avoid dry ice build-up that may cause the G-HF Cocoon liner becomes brittle that will eventually crack/explode.

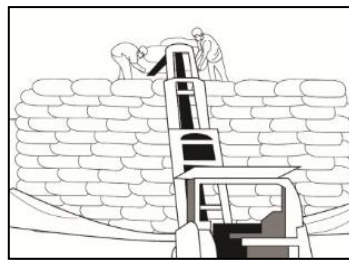


5.2.5. Mechanical loading of bagged commodity (optional for larger G-HF Cocoon):

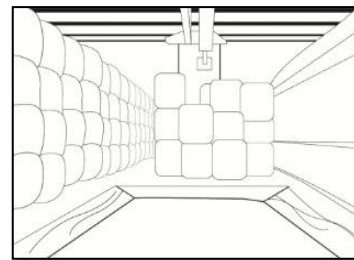
- Stacking of grains involves diverse equipment such as conveyor, forklift or crane.
- Operations provide continuous stacking without delays especially for outdoor installation.



Conveyor



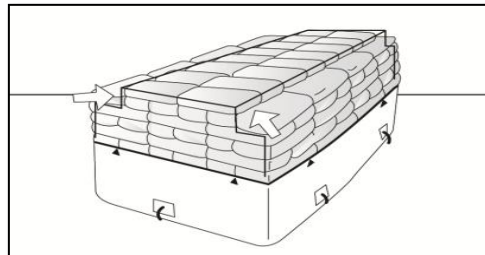
Forklift



Crane

5.2.6. The top layer:

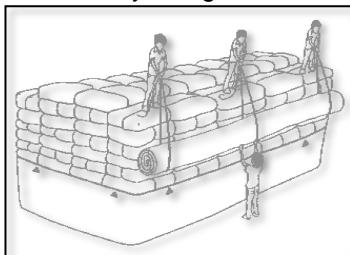
- Continue piling the sacks until the desired G-HF Cocoon height is reached.
- Once you have reached the required stacking height, provide one line of sacks in the middle along the longitude of the stack.
- This creates a crest that will keep rainwater from accumulating on the top of the G-HF Cocoon.



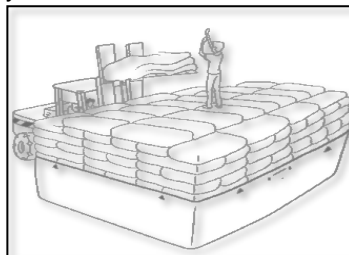
5.3. POSITIONING THE TOP SECTION

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

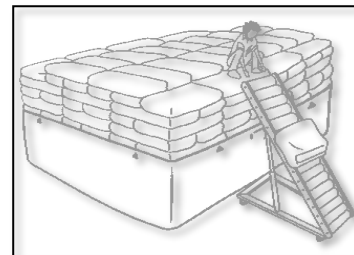
- By rolling.
- By using forklift or conveyor.



Rolling method



Use of forklift



Use of conveyor

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

- 5.3.3. One pair of arrows is painted green. Match these arrows for correct front and back orientation of the Cocoon.
- 5.3.4. Pull the sides all the way down over the stack.
- 5.3.5. Do not use tensions straps to pull or carry the top section.

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

5.4.1. Required dosage of Calcium Chloride, CaCl_2 .

G-HF COCOON	CAPACITY	Desiccant Require (CaCl_2) for 1month of Storage	Desiccant Required (CaCl_2) for 6months 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

- 5.4.2. Place the packed desiccant (Calcium Chloride, CaCl_2), at the middle-top portion of the bags inside the SVC G-HF before Zipping.
- 5.4.3. 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 SVC G-HF before Zipping.

5.5. ZIPPING

5.5.1. Preparing to zip:

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

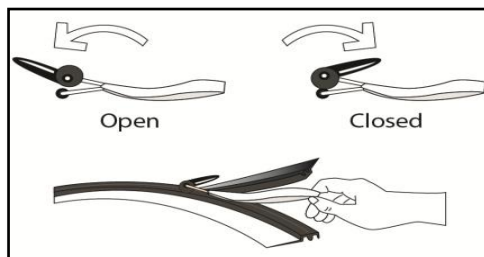


NOTE:

- 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 with which you are most comfortable.

5.5.2. Engaging the zipper pull:

- 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



5.5.3. 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:

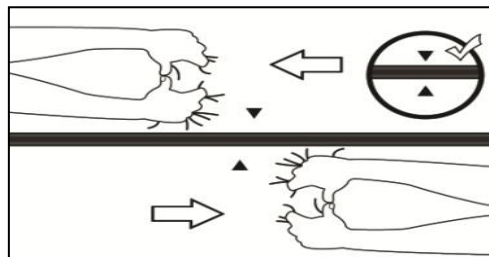
- To make zipping easier, a second person should pull the top and bottom liners' zipper tracks close to each other as the zipper pull advance.
- Apply the silicon spray to the zipper track to ensure ease of pulling the zipper pull

5.5.4. Completing the zipping process:

- a. As you go around the G-HF Cocoon, take note of the marks ("arrows") printed on both 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 to elongation of the zipper exposed to higher temperature.
- Wait until both sections are at the same temperature, and repeat this step.

5.5.5. 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.

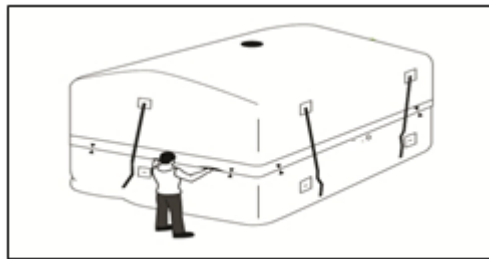


5.5.6. Ensuring a complete hermetic closure:

- 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:

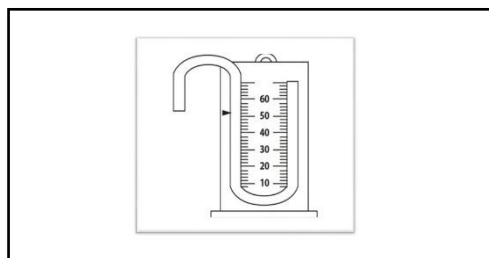
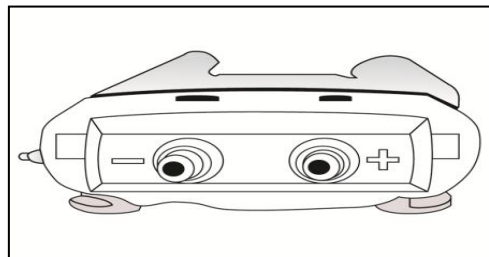
- Dirt or other objects on the zipper track can prevent it from closing completely



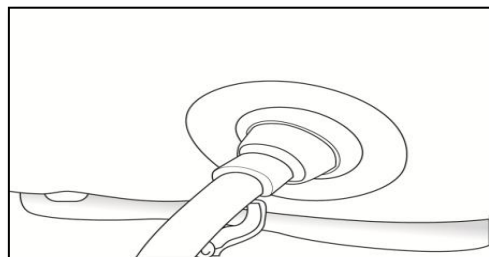
5.6. PRESSURE DECAY TEST (PDT)

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

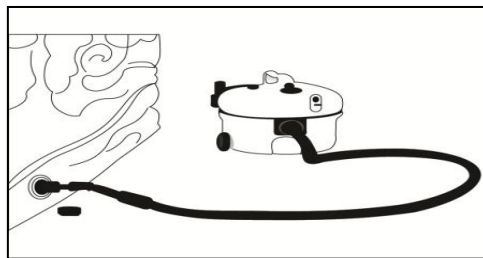


5.6.2. Connect the manometer hose into the flexible inlet of the G-HF Cocoon.



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

- Connect the vacuum pump hose to the inlet port of the G-HF Cocoon.
- Create at least -250 Pascals (Pa) or -25 millimeters' water (mm H₂O) vacuum. Doing this can also help engage the zipper tracks properly as there may be imperfections during zipping.
- For it to be considered sufficiently airtight, the final pressure should not be greater than one-half ($\frac{1}{2}$) of the initial pressure (created by the vacuum pump) within five (5) minutes.
- If the PDT test failed, check for holes/tears and poorly sealed zippers then repeat the PDT procedure.



5.7. USE OF SECURITY TAPE - (OPTIONAL)

Note: Security Tape is not included in the package.

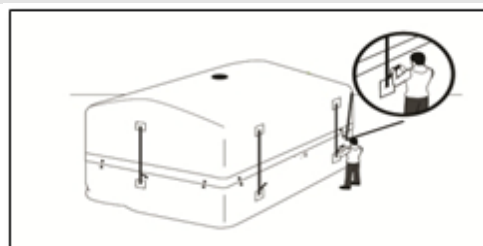
Security tapes are recommended to help us or our customers to identify if the Cocoon zipper has been deliberately opened, either because of improper closing, high forces.

- After Pressure Decay Testing (PDT), properly place security tape around the G-HF Cocoon's hermetic zipper.
- If the G-HF Cocoon has been deliberately opened, prints in the tape will remain in the zipper area.



5.8. TENSIONING OF STRAPS

- 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.



- 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.



5.9. PROCEDURE FOR PURGING CARBON DIOXIDE (CO₂)

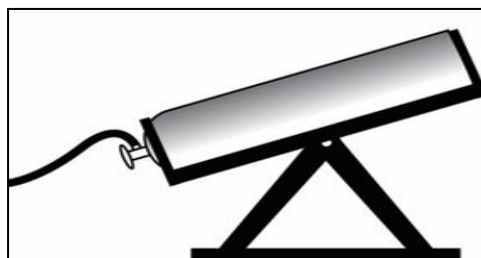
5.9.1. Calculation:

- Total Volume – Volume Occupied by the Commodity.
- For every 2.0kg of CO₂ replaces 1 cubic meter of air.
- Additional 15% will be added to the total capacity.
- Formula: (1-Bulk Density) x Volume x 2 x 1.15.

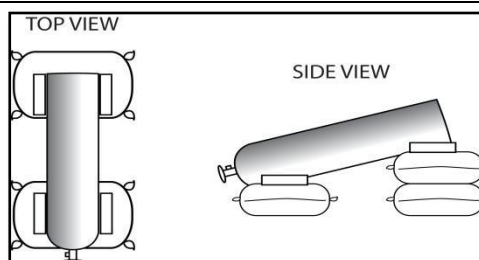
COMMODITY	BULK DENSITY MT/m ³	AMOUNT OF CARBON DIOXIDE (CO ₂) FOR PURGING, kg							
		5MT 7.50	10MT 15.0	20MT 30.0	50MT 78.32	100MT 150.0	150MT 227.0	300MT 414.0	320MT 856.0
Barley	0.62	7	13	23	68	131	198	362	750
Cashew nuts	0.50	9	17	30	90	173	261	476	987
Chia seeds	0.68	6	11	19	57	110	167	304	630
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

5.9.2. CO₂ application:

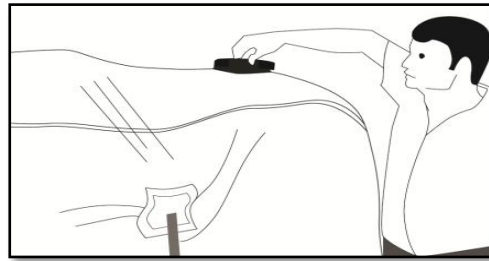
- Make sure that enough CO₂ is available on-site. The weight of the CO₂ in the cylinder is supplied by the industrial companies (i.e. 22 kg standard capacities which may be used to calculate the number of cylinders required). CO₂ cylinders are available with or without siphon (dip tube). For rapid flushing, the cylinder without siphon should be inverted.
- For rapid flushing, the cylinder should be inverted using mechanical inverter. However, the cylinders with siphon should be in upright position during flushing.



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



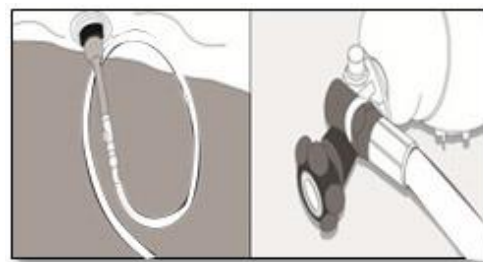
- d. Open the outlet port located at the back (top) of the G-HF Cocoon to relieve excess pressure and to release air from inside.



- 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/cm²). Ensure that all connections are made properly and gaskets are in place where they are required. The high-pressure hose should have a length of about 2-meter to facilitate easy connection to the inlet valve.

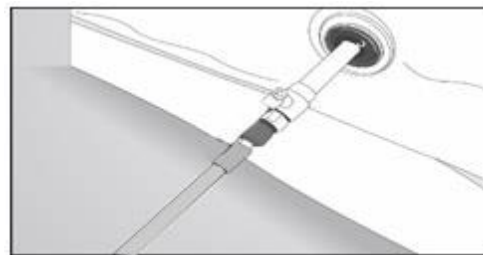


- f. Open the gas inlet port of the G-HF Cocoon and then open the cylinder tap. The cylinder tap should only be turned to a point where you can hear the liquid pass through the hose into the G-HF Cocoon. The liquid CO₂ flushes into the G-HF Cocoon and evaporates inside through the expansion pipe and will push the air upward starting from the bottom core, following the piston effect, until the air is totally replaced.



5.9.3. Ice formation along the pressurized hose and the pipe connector during CO₂ 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!

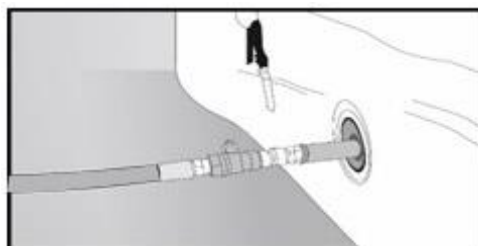


- c. Flushing (emptying of the cylinder) depends on the amount of CO₂ to be applied. Emptying one 22kg cylinder should only take about 20 to 30 minutes. If the pressure hose or the inlet valve gets blocked with ice, this is an indication that the CO₂ is being released too quickly. If this happens the 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 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 CO₂ entering the G-HF Cocoon.
e. If necessary, for small scale applications and 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.

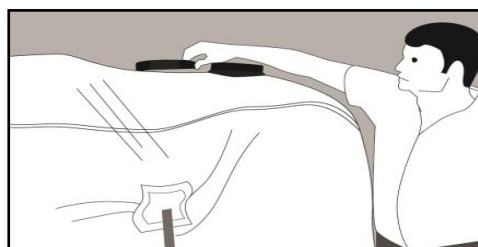
5.9.4. Since CO₂ is heavier than air, the air inside the G-HF Cocoon will be pushed upwards and out of the container through the outlet port. Complete displacement of oxygen is not possible as there is always some mixing at the interface between the air and the CO₂. However, if the final CO₂ concentration reaches 80% then the O₂ concentration in the remaining air amounts to 4%. This mixing of the CO₂ with the remaining air, and absorption of CO₂ by the commodity, will take 12-24 hours depending on temperature. This will also be the time to determine the initial concentration of CO₂.

5.9.5. After the required weight of CO₂ has been applied, immediately:

a. Close the CO₂ cylinder tap and the inlet port of the G-HF Cocoon.



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



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

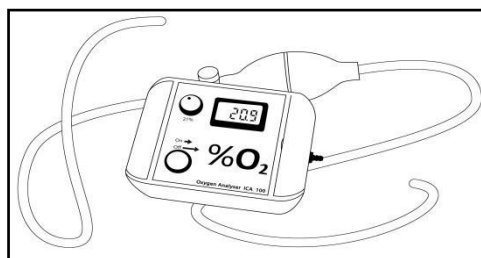
5.10.1. Recommended pest reduction timeline:

a. Leave the G-HF Cocoon closed for two weeks at a minimum of 35% CO₂ (13% O₂) concentration to eliminate all stages of insects and achieve best result.

b. When storing commodities, leave the G-HF Cocoon sealed until it is unloaded completely.

5.10.2. Use of an oxygen analyzer:

a. During the first 15 days of installation, oxygen level 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.



5.10.3. When carrying-out a CO₂ treatment, the approximate CO₂ concentrations can be determined by measuring O₂ concentrations using below conversion table:

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

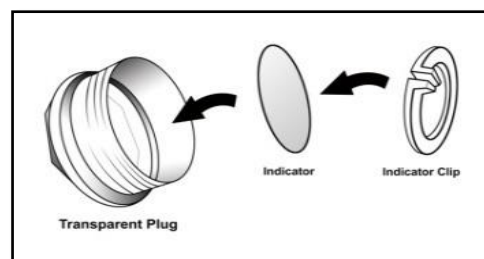
1.6	92.3	4.6	78.0	7.6	63.6	10.6	49.3	13.6	34.9	16.6	20.6	19.6	6.2
1.8	91.4	4.8	77.0	7.8	62.7	10.8	48.3	13.8	34.0	16.8	19.6	19.8	5.3
2.0	90.4	5.0	76.1	8.0	61.7	11.0	47.4	14.0	33.0	17.0	18.7	20.0	4.3
2.2	89.5	5.2	75.1	8.2	60.8	11.2	46.4	14.2	32.1	17.2	17.7	20.2	3.4
2.4	88.5	5.4	74.2	8.4	59.8	11.4	45.5	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

5.10.4. Use of humidity indicator:

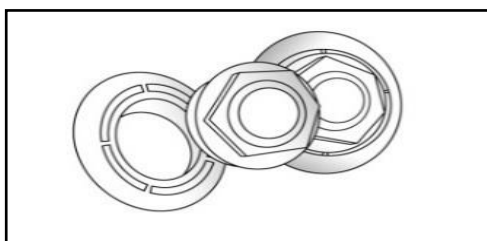
- The humidity indicator is a special circular paper with moisture-sensitive chemical. Its color changes from blue to pink when relative humidity exceeds 65%, and vice versa.
- The humidity indicator provides an affordable and quick reference to relative humidity inside the G-HF Cocoon.
- It is easy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



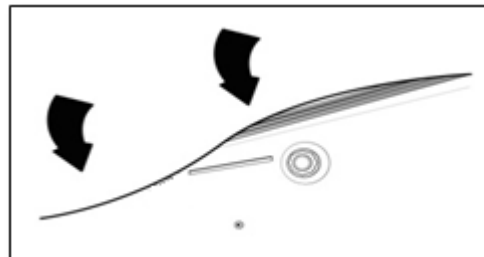
Get a humidity indicator from the pack



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

5.10.5. Instruction when Indicator turned Pink:

- 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).
- Monitor the indicator for 4-8 hours.
- If the indicator turned pink within 4-8 hours, use other devices to check for the humidity inside or consult GrainPro.
- If the indicator did not turn pink, continue to monitor. Repeat 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 (1 unit) of desiccant for 4-8 hours or oven dry for 10-20minutes, set the oven to 50°C (122°F).

5.11. DISMANTLING

5.11.1. Although CO₂ is not toxic, it is an asphyxiant gas and is advisable to unzip the G-HF Cocoon and wait until most of the CO₂ has dispersed.

5.11.2. 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 commodity brought in from the new harvest. This is because when the new commodity is tapped from top, the old commodity from the previous harvest is left at the bottom.

- 5.11.3. This commodity will only be unloaded at the end of storage:
- Unfastening the tension straps.
 - Using a coin, insert and twist the zipper (sharp objects should not be used for opening the zipper).
 - Gently pull the two sections apart, taking the top section completely off.
 - Remove the sacks of stored commodities (again, a stairway of sacks might make the job easier)

6. PREVENTING CONDENSATION

6.1. WHY DOES CONDENSATION OCCUR?

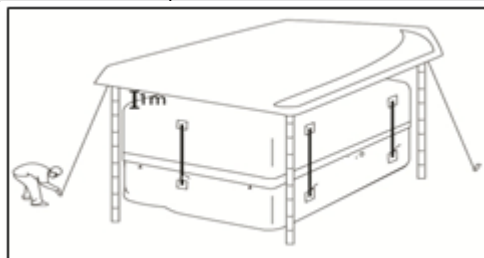
- 6.1.1. Condensation is caused by temperature difference i.e. hot weather by day and cool at night or sudden rains in a hot sunny day. When air collides with a cool surface at dew point temperature the water in the air condense on the surface. Air movement inside the G-HF Cocoon follow the natural forces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

6.2. MOISTURE CONTENT (MC) REQUIREMENT FOR SAFE STORAGE

- 6.2.1. 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.
- 6.2.2. 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.
- 6.2.3. 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.

6.3. SETTING-UP THE GRAINSHADE (OUTDOOR INSTALLATION)

- 6.3.1. Ensure that the poles are rigid and stable:
- Use poles (pipe, lumber, or bamboo) at least 1.5-meter away from each corner and 1-meter higher than the G-HF Cocoon.
 - Connect the corners of the GrainShade to apex of the poles, maintaining at least 1-meter clearance between the top surface of the G-HF Cocoon and the GrainShade.
 - Additional wires might be used to reinforce the pole by tying at the top with the other end pegged to the ground away from the pole.
- 6.3.2. If poles are not feasible, tie the GrainShade to nearby posts, walls, tree branches, or pegs for support.
- 6.3.3. To prevent from sagging and flapping during rain and strong wind, install a wire or rope beneath and above the GrainShade.

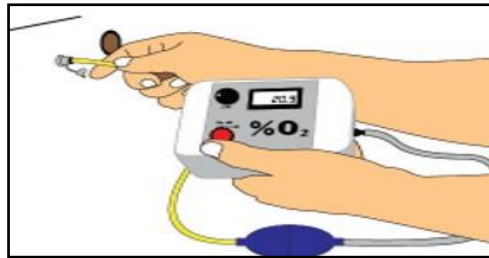


7. MAINTENANCE AND CARE

7.1. REGULAR EXAMINATION

7.1.1. Measure oxygen concentration using Oxygen analyzer (GrainPro HH or ICA model).

- a. First-two weeks- Daily.
- b. Succeeding days- Twice a week.



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



7.2. PHYSICAL INSPECTION

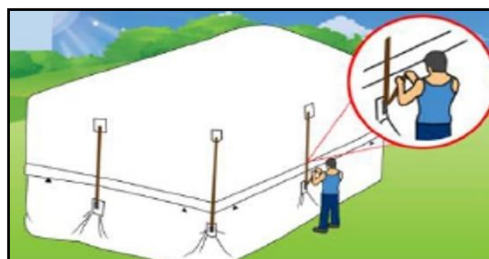
7.2.1. Check the zipper track for any small opening/s and push the opened track section by hand.



7.2.2. No slack material should be developed near the ground.



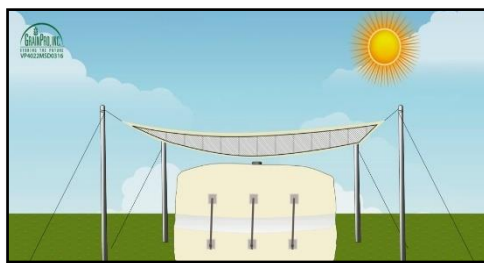
7.2.3. If slacks are observed, re-adjust the tension straps to pull up any slack sidewall away from the ground.



7.2.4. During rainy season, 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.



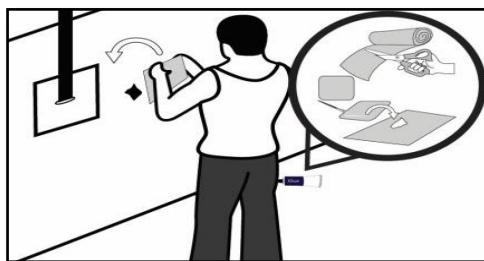
- 7.2.5. Re-tensioning of wires to prevent from sagging and flapping during rain and strong wind.



7.3. REPAIRING PUNCTURES AND OTHER DAMAGES

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

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



- 7.3.2. Protective maintenance:

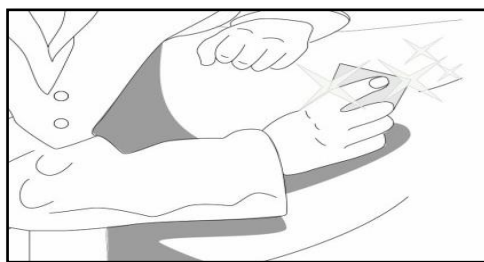
- Check the patched PVC occasionally and replace or re-patch if necessary.

7.4. PROHIBITED ITEMS NOT ALLOWED TO SHIP

- 7.4.1. The Silicone spray (for zipper lubrication) and Glue (for patching PVC materials) are prohibited item and not allow to be shipped in air cargo.
- 7.4.2. These items will be removed from the package.
- 7.4.3. The client is advised for purchase of local equivalent.

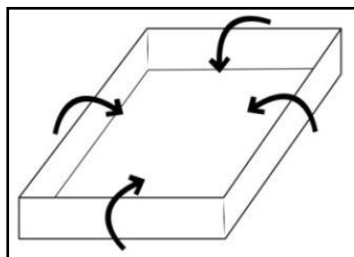
7.5. CLEANING TOP AND BOTTOM SECTIONS

- 7.5.1. If necessary with soap and water.
- 7.5.2. Dry under the sun.

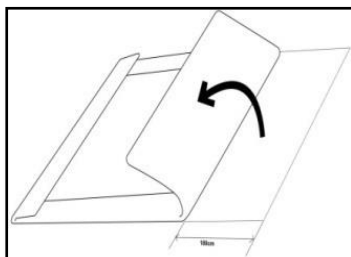


7.6. FOLDING

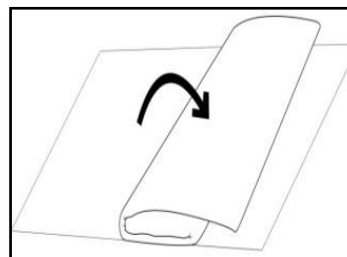
- 7.6.1. Measure 180cm from the end and fold inside.
- 7.6.2. Fold any extra material and finally fold in half.
- 7.6.3. Fold the material lengthwise until it fits in the carrying bag.
- 7.6.4. Folding procedures and repacking of the G-HF Cocoon:



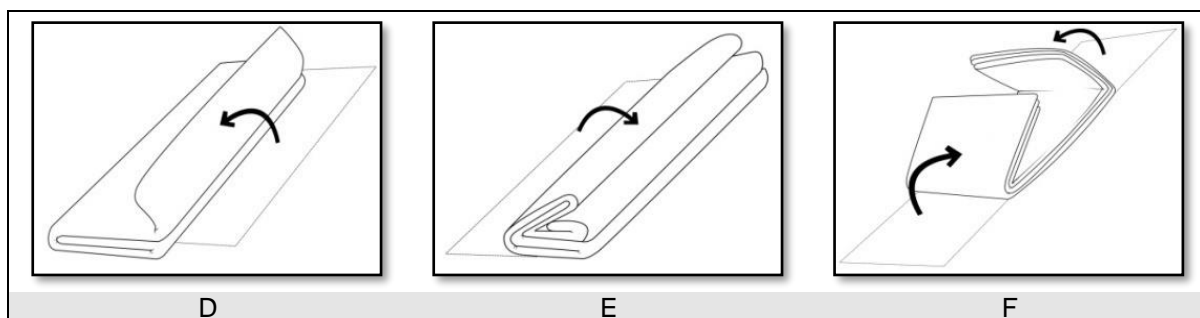
A



B



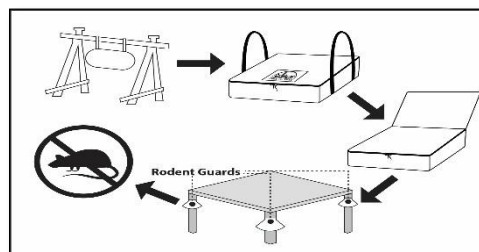
C



7.7. SAFEKEEPING

7.7.1. The empty G-HF Cocoon should be stored away from heat or direct sunlight and away from rodent.

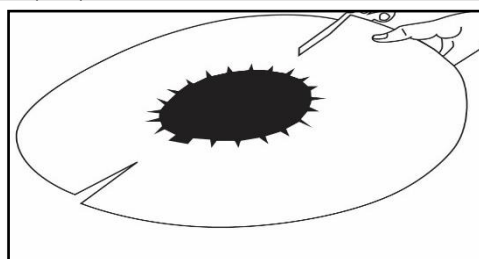
7.7.2. Do not place heavy object on top of the stored liner as it may damage or deform it.



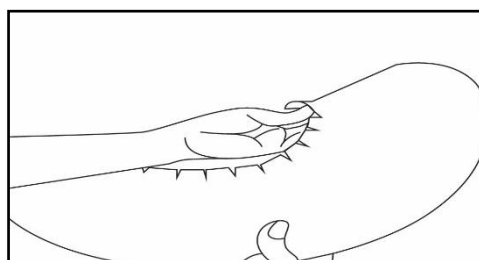
7.8. PLATFORM INSTALLATION OF RODENT GUARD (RG)

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

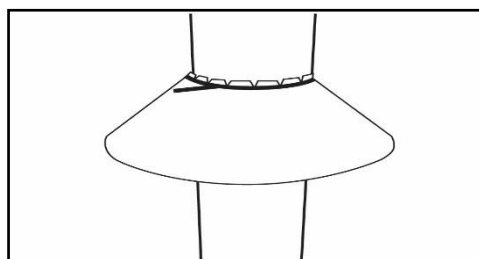
- One set can be installed on any platform legs with leg perimeter (round or square) of 22 cm (9") to 44 cm (17").
- If the leg area is smaller, can be optionally cut in half to fit. Cut along the lines at the back of the rodent guard.



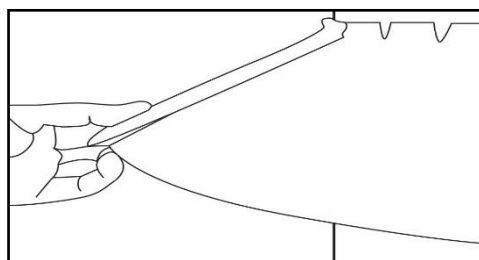
7.8.2. Fold the rodent guard's teeth upwards against the sides of the leg to keep it from slipping.



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



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



7.9. TERMITE CONTROL

7.9.1. Overview of Termite:

- a. The two most common types of termites are "dry wood" and "ground," or subterranean termites.
- b. 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.



- c. High moisture areas like basements and crawl spaces are very attractive to termites and can serve as starting points for an infestation.

7.9.2. Description (Subterranean Termite).

- a. Food and moisture:
 - Need a great deal of moisture such as from soil, and damp wood, Cellulose (from wood) is their diet
- b. Habitat:
 - Usually they live in the soil, but can be above ground if enough moisture is present. They have large colonies.
- c. Evidence of activity:
 - Protective mud tubes ascending from the ground to the structure or protruding from walls, etc.
- d. 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.
- e. Control Measures:
 - With current activity use a baiting program or a termite barrier treatment

7.9.3. Termite Treatments:

- a. The traditional method of controlling subterranean termites was 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 designed to block all possible routes of termite entry. Any termites attempting to penetrate through the treated soil were either killed or repelled.
- b. 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.
- c. Effective termite treatments require a great volume of termiticide.

7.10. RECYCLING

GrainPro GH-F Cocoon is made of PVC.

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

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

8. FREQUENTLY ASKED QUESTIONS AND ANSWERS

8.1. 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 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 (CO₂). Atmospheres modified with CO₂ will preserve the quality of stored product and eliminate the chances of insect survival.

- 8.1 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 lack of oxygen.
- 8.2 IS THERE ANY USE NOT RECOMMENDED FOR G-HF COCOON?
- Yes, the G-HF Cocoon is not recommended for storing fresh fruits, vegetables, medicine, or insufficiently dried commodities.
- 8.3 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.
- 8.4 DO I NEED TO FILL G-HF COCOON ENTIRELY FOR IT TO BE HERMETIC?
- No. However, at least a three-quarter load is recommended to ensure a good hermetic effect and full protection from insect infestations and rodents.
- 8.5 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.
- 8.6 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.
- 8.7 WHAT IS THE SAFE PRODUCT MC FOR STORAGE IN 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. Equilibrium moisture content is affected by temperature and relative humidity.
- 8.8 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 penetrate the smooth, slippery surface of a 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 G-HF Cocoon when they are empty and left unprotected.
- 8.9 CAN 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.
- 8.10 HOW FAST WILL OXYGEN LEVEL DROP AFTER SEALING?
- When used as 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 infestation level, moisture content of the product, and other factors. If the oxygen level does not drop in a span of 7 days, check for open zipper track; inspect the top and bottom sections for holes and cuts. Contact GrainPro for assistance immediately.
- 8.11 WHAT SHOULD BE DONE WHEN IT IS DIFFICULT TO TAKE AN OXYGEN READING?
- First, check the flexible inlet valve and 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.
- 8.12 IS IT SAFE FOR THE HUMIDITY INDICATORS TO COME IN CONTACT WITH FOOD?
- The humidity indicators is non-toxic.

8.13 SHOULD I REPLACE THE HUMIDITY INDICATOR IF THEY CHANGE COLOR?

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

8.14 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.

9. WARRANTY CLAUSE

GrainPro® hereby warrants that Products sold by it to 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 replacement of defective Products the warranty period at GrainPro's plant in accordance with the provisions specifically and expressly set forth herein.

The Buyer will pay for Products which need to be replaced under warranty, a percentage of the full list price according to the ratio between the period, which 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 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 to.

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.

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