GRAINPRO®COCOON™ INDOOR

INSTRUCTION MANUAL

MA4044RAD1114-8

GRAINPRO
STORING THE FUTURE

"A GREEN, NOT ONLY FOR PROFIT COMPANY"

scan me

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1. INTRODUCTION

The **GrainPro® Cocoon™ Indoor** is an effective, low-cost version of the GrainPro Cocoon. It is made of Ultra-Hermetic and light weight Polyethylene materials designed to preserve and protect dry agricultural commodities stored indoor. It comes in various sizes and can be customized to effectively store different capacities of commodities in bags or in boxes. This gas-tight Cocoon Indoor is also ideal for CO_2 fumigation to immediately exterminate any insect in the commodity. The CO_2 can be flushed through the inlet port at the base of the Cocoon and excess air can be released through the zipper at the top.

1.1. FEATURES:

1.1.1. Easy to use.
1.1.2. An ideal fumigation chamber for infested crops.
1.1.3. Preserves the quality (aroma, freshness, color, etc) of the stored products.
1.1.4. Ideal for organic fumigation using CO_2.
1.1.5. Ensure safe storage of goods inside warehouse.
1.1.6. Applicable for commodities in Big Bags, but also for smaller bags with or without pallets.
1.1.7. Minimizes condensation, inhibits/controls mold growth, and infestation.

1.2. PRODUCT GUARANTEE:

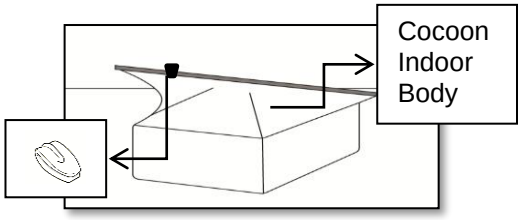
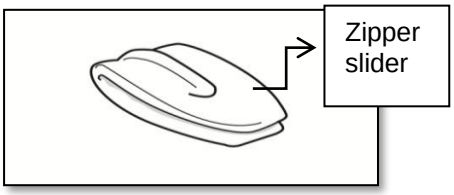
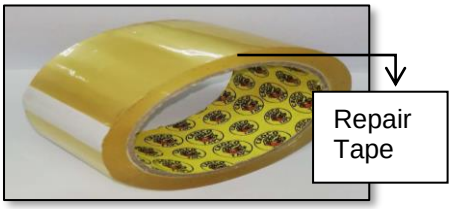
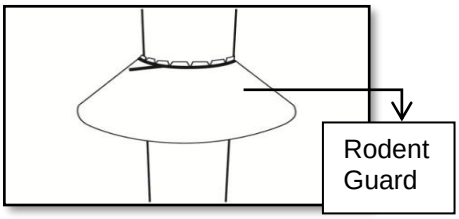
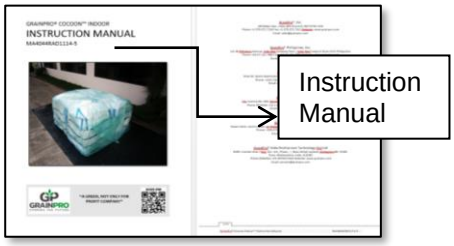
1.2.1. In accordance with the terms and conditions herewith, GrainPro®, Inc. guarantees the quality of this product per its written warranty provided it is used according to the instructions in this manual.
1.2.2. Please read and understand the manual thoroughly before using the Cocoon Indoor.

1.3. COMMENTS, COMPLAINTS, AND/OR CLARIFICATIONS:

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

2. CHECKLIST

Please inspect your GrainPro Cocoon Indoorpackage to ensure it includes the following items:

	PART NAME	DESCRIPTION	IMAGE
2.1.	COCOON INDOOR BODY	2.1.1. High strength PE with barrier layer	
2.2.	ZIPPER SLIDER	2.2.1. For zipper sealing 2.2.2. Two (2) pieces	
2.3.	CROCODILE ADHESIVE 2" TAPE	2.3.1. Repair Tape 2.3.2. One (1) piece	
2.4.	RODENT GUARD	2.4.1. For platform posts to prevent rodent access when storing the empty Cocoon™ Indoor. 2.4.2. Four (4) Pieces per pack	
2.5.	INSTRUCTION MANUAL	2.5.1. Installation instructions 2.5.2. Maintenance instructions 2.5.3. Frequently asked questions 2.5.4. Warranty clause	

3. COMPONENTS

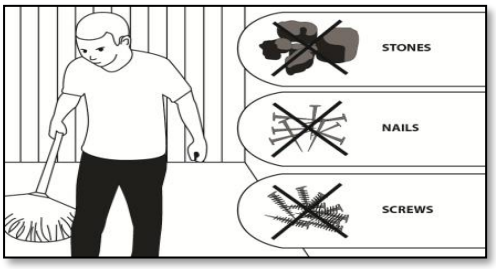
4. SPECIFICATIONS

PARAMETERS	STANDARD
Material	High strength PE with barrier layer
Thickness, microns	100±5%
Color	Green (Pantone 3385)
Material weight, g/m^2	97.5
Oxygen Transmission Rate (OTR), cc/m^2/day at 0.1 MPa	≤9
Water Vapor Transmission Rate (WVTR), g/m^2/day	≤4
Product life, years	2
Warranty, year	1
Sealing Mechanism	2-track PE zipper
Capacity	Customizable
Dimensions	Customizable

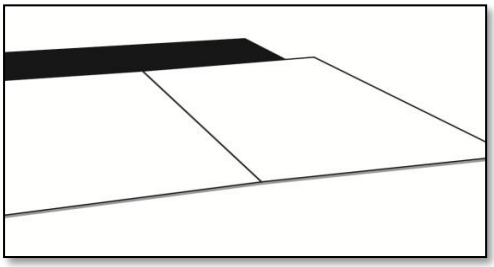
5. INSTALLATION

5.1. PREPARATION

5.1.1. Ensure that the warehouse floor is free of any sharp objects that may damage the Cocoon Indoor.



5.1.2. As additional protection. Place a mat or thick cardboard on the floor where the Cocoon Indoor will be placed.

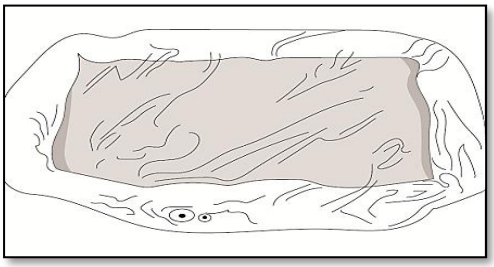


5.1.3. Carefully open the package and unfold the Cocoon Indoor on the prepared site.

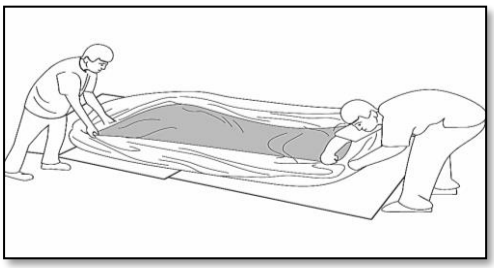
5.2. LOADING

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

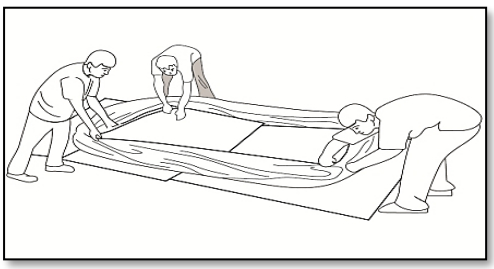
5.2.2. Roll the sides of the liner to prevent damage during loading when using the forklift.



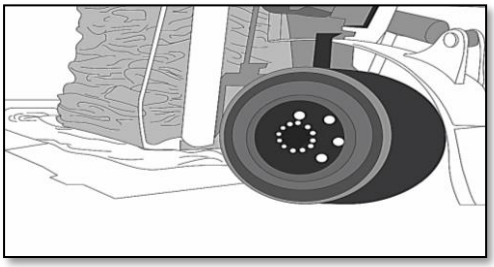
5.2.3. Make sure the bottom is stretched by pulling the corners.



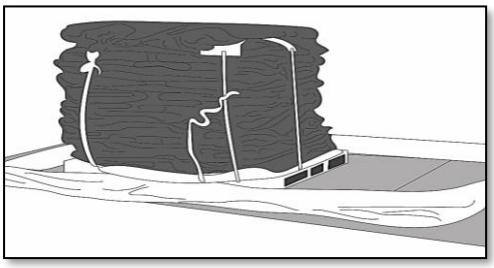
5.2.4. Place another layer of mat or cardboard inside the liner to protect the Cocoon Indoor during loading.



5.2.5. Continue the loading (mechanical or manual) by placing the load as close as possible to each other to maximize the load capacity. Stacks can be placed on a pallet.

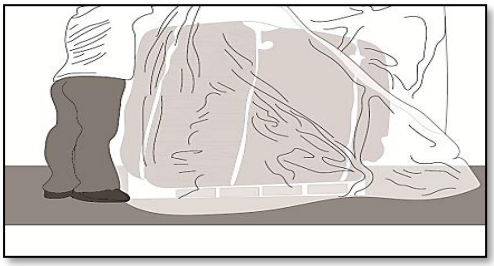


5.2.6. Make sure that the stack height is not greater than the permissible stacking height of the Cocoon Indoor.
NOTE:
- Use of pallet is optional.

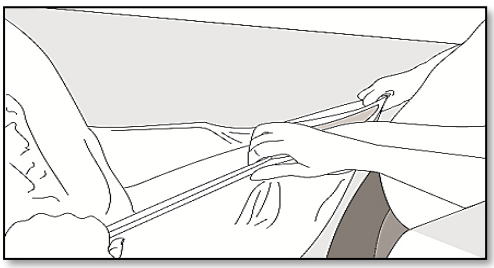


5.3. SEALING

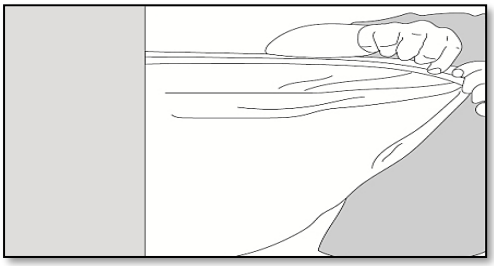
5.3.1. Unroll the sides of the Cocoon Indoor toward the top of the stack.



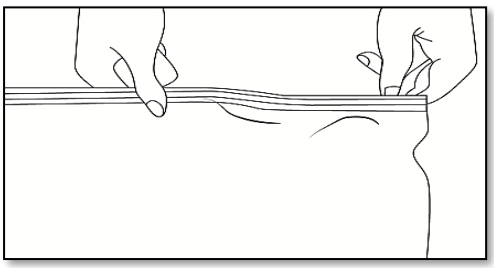
5.3.2. Pull the ends of the Cocoon Indoor together for sealing.



5.3.3. Positioning of zipper slider:
a) Manually zip a few centimeters enough to initially engage the slider.



b) Insert and position the slider on the manually zipped portion of the zip lock.

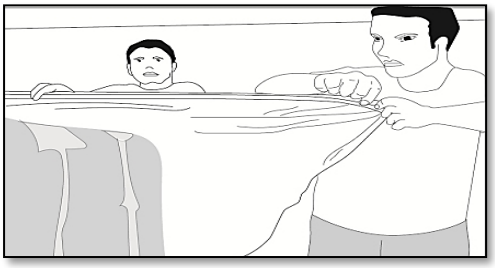


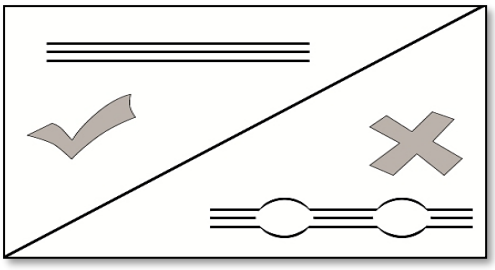
5.3.4. Two persons are required for ease when zipping the Cocoon Indoor.

a) One person will do the zipping and the other person holds the other end steadily, positioning both sections of the zipper in a straight line to avoid the zipper length misalignment.

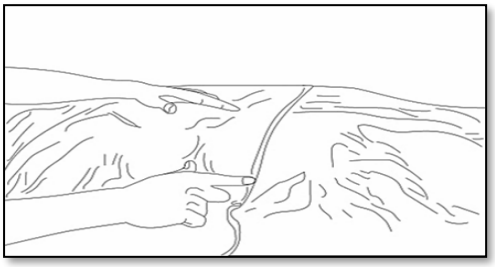
b) Moving the slider while the zipper or slider is curved will force one of the zipper sections to elongate.

c) If uneven zipper ends are observed, both ends of the zipper should be slightly stretched and do the zipping from end to end.





5.3.5. Fold extra material and secure using adhesive tape.

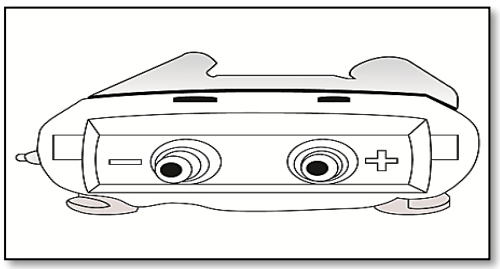


5.3.6. Make sure that there will be no folds or slacks along the Cocoon Indoor.

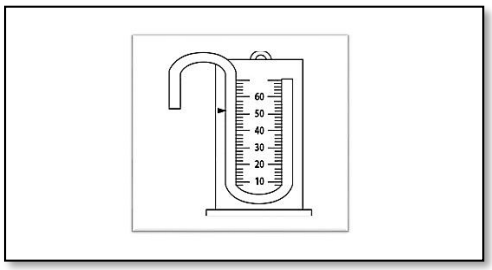
5.4. PRESSURE DECAY TEST (PDT)

5.4.1. After completely zipping and closing all the ports of the Cocoon Indoor, perform a pressure (vacuum) decay test (PDT) to ensure gas-tightness:

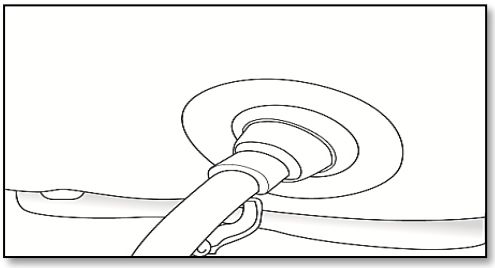
a) Use digital manometer.



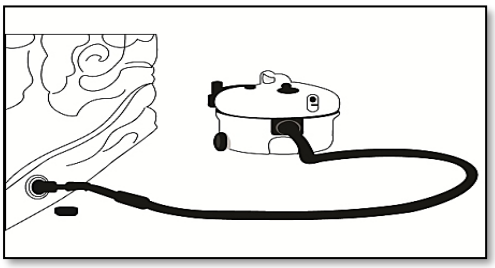
b) Use improvised U-tube manometer.



5.4.2. Connect the manometer hose into the flexible inlet of the liner.



5.4.3. 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 Cocoon Indoor.
b) Create at least -250 Pascal (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 a sufficiently airtight set-up, 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 or poorly sealed zippers then repeat the PDT procedures.

5.5. PROCEDURE FOR PURGING WITH CARBON DIOXIDE (CO_2)

5.5.1. Calculation:

a) Total Volume – Volume Occupied by the Commodity.
b) For every 2.0kg CO_2, 1 cubic meter of gas is being released.
c) Formula: (1 minus bulk density) x Volume (in m^3) x 2

COMMODITY	BULK DENSITY, MT/m^3	COMMODITY	BULK DENSITY, MT/m^3
Barley	0.62	Oats	0.43
Cashew nuts	0.50	Paddy	0.60
Chia seeds	0.68	Paddy, rice bran	0.55
Chickpeas	0.74	Peanuts, shelled	0.64
Cocoa beans	0.56	Rice, milled	0.80
Coffee beans	0.59	Rye	0.72
Cotton seed	0.40	Sesame	0.59
Cowpea	0.75	Sorghum	0.72
Maize	0.72	Soybean	0.75
Millet	0.63	Sunflower	0.41
Mung bean	0.75	Wheat	0.77

Example of calculating carbon dioxide dosage for flushing, kg:

10 MT Cocoon Indoor filled with bagged wheat which is approximately 15 m^3

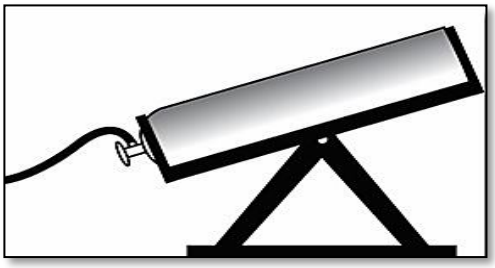
CO_2 dosage for wheat = (1-wheat bulk density) x Volume (in m^3) x 2

Carbon dioxide needed = (1-0.77) x 15 x 2 =**6.9 kg of CO_2**

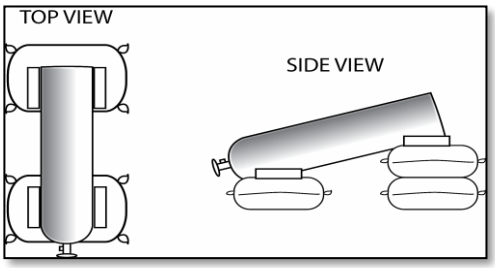
5.5.2. CO_2 application:

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

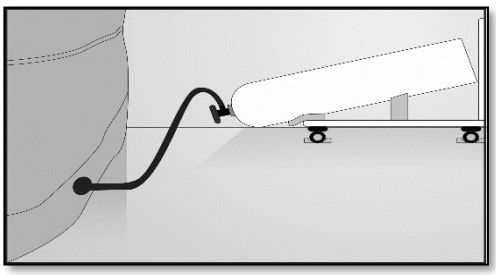
b) For rapid flushing, the cylinder should be inverted using mechanical inverter. However, the cylinders with siphon should be in upright position during flushing.



c) If a mechanical inverter is not available, a makeshift inverter can be made using sand bags or other improvised techniques. 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) A standard high-pressure hose (optional; available from GrainPro) should be connected to the cylinder. 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 gaskets are in place where they are required. The high-pressure hose should have a length of about 2-meter.



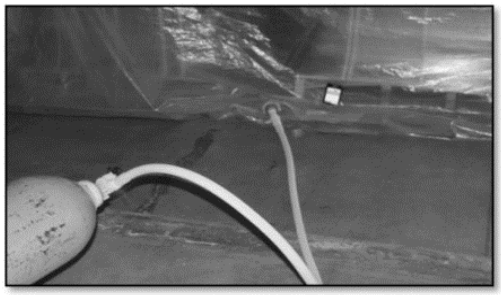
e) Open a section of the zipper (10-15 cm) to serve as an outlet when flushing the Cocoon Indoor with CO_2.

f) Open the cylinder valve. Adjust openingof the valve untilsound of liquid passing through the hose is observed. The liquid CO_2 flushes into the Cocoon Indoor and will push the air upward starting from the bottom, following the piston effect, until the air is totally replaced. The opening through the zipper will serve as an outlet for the displaced air.

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

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

Note: Do not use pressure reducer to reduce air/CO_2 mixing.



b) 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.

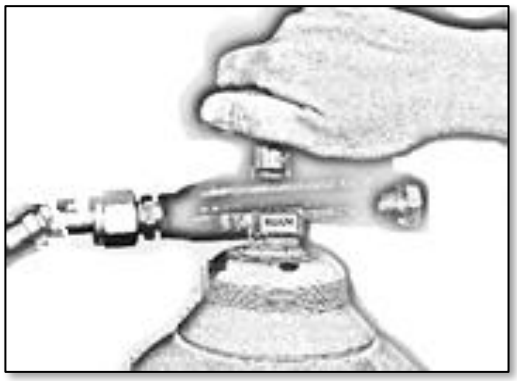
c) An additional indication that the gas is being released too quickly is when the Cocoon Indoor begins to balloon out because pressure begins to build-up inside. If this happens, the gas flow should be decreased at the cylinder tap until the rate of air being expelled through an open zipper section is about the same as the rate of CO_2 entering the liner.

d) 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 which can be adjusted to control the flow-rate.

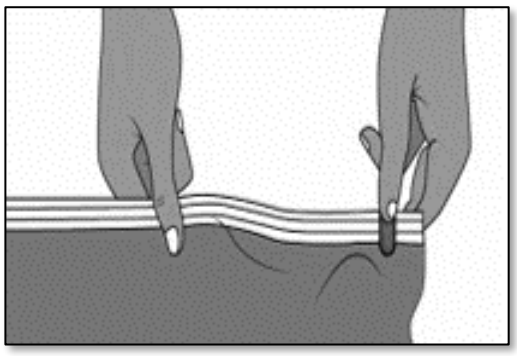
5.5.4. Since CO_2 is heavier than air, the air in the Cocoon Indoor will be displaced upwards and will be lifted out of the container through an open section of the zipper. Complete displacement is not possible as there is always some mixing at the interface between the air and the CO_2. However, if the final CO_2 concentration reaches 80% then the O_2 concentration in the remaining air amounts to 4% leaving 16% nitrogen. 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.

5.5.5. After the required weight of CO_2 has been flushed, immediately:

a) Close the CO_2 cylinder valve.



b) Close the open zipper section thoroughlyusing the slider when air has been displaced.



5.5.6. For controlling insects, maintaining CO_2 above 50% for 10 days, or CO_2 above 35% for 15 days is sufficient to provide complete control, after which the liner may be opened. In addition, temperature accelerates treatment. Effective insect control may be achieved in as little as three days at 25° and less at higher temperatures.

5.6.1. Although CO_2 is not toxic, it is an asphyxiant. It is advisable to unzip the Cocoon Indoor and wait until most of the CO_2 has dispersed.

5.6.2. Recommended pest reduction timeline:

a. Leave the Cocoon Indoor closed for two weeks at a minimum of 35% CO_2 (13% O_2) concentration at 25 deg Celsius or higher to eliminate insects in all life stages and achieve best result.

b. When storing commodities, leave the Cocoon Indoor sealed until it will be unloaded completely.

5.6.3. Succeeding monitoring should be done twice a week. Without CO_2 flushing, oxygen levels should drop 1-2% per day to a level less than 3% (though lower levels have been observed as well). Oxygen levels gradually go up by a few percent but must not exceed 7%, sealing is proba compromised and the commodity may not be adequately protected.

5.6.4 When carrying-out a CO_2 treatment, the approximate CO_2 concentrations can be determined by measuring O_2 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

5.7. USING CARBON DIOXIDE ANALYZER FOR MONITORING (WITHOUT CO_2 FLUSHING)

The GrainPro CO_2 Analyzer uses a non-dispersive infrared radiation (NDIR) sensor for the detection of carbon dioxide. When a sensor encounters a target gas, voltage signal is generated in proportion to the gas concentration. This voltage signal is amplified, digitized and displayed on the instrument's OLED display.

5.7.1. Using the carbon dioxide analyzer:

a. During the first 15 days of installation, carbon dioxide level should be checked daily using the CO_2 analyzer.

b. Succeeding monitoring should be done twice a week. Carbon dioxide levels should increase to a level greater than 10%. Carbon dioxide level may go up to 15% or more. When decrease in CO_2 level is observed, sealing is probably compromised and the commodity may not be adequately protected.

5.7.2. Monitoring of carbon dioxide level is recommended to ensure control of insect infestation. Details of using CO_2 analyzer are discussed in the analyzer's instruction manual.

5.8. USING CARBON DIOXIDE ANALYZER FOR MONITORING (WITH CO_2 FLUSHING)

5.8.1. Recommended pest reduction timeline:

a. Leave the Cocoon closed for 15 days at 35% CO_2 concentration (minimum) or 50% CO_2 for 10 days to eliminate all life stages of insects and achieve best results.

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

5.8.2. Using the carbon dioxide analyzer:

a. During the first 15 days of installation, carbon dioxide level should be checked daily using the carbon dioxide analyzer.

b. Succeeding monitoring should be done twice a week. Carbon dioxide level may go down by several percent but must not approach 0%. Check for any source of leak or damage. Sealing is probably compromised, and the commodity may not be adequately protected.

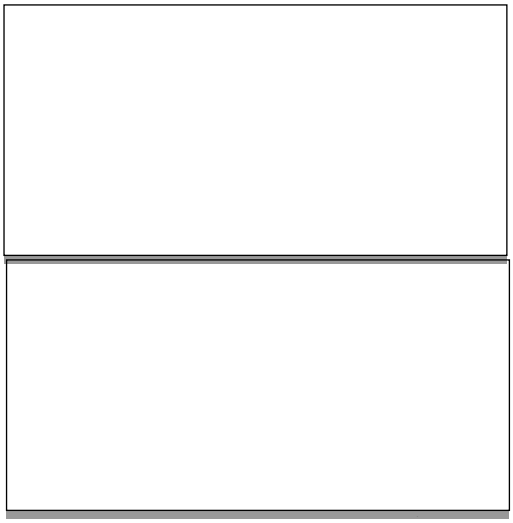
5.8.3. When carrying-out a CO_2 treatment, the approximate CO_2 concentrations can be determined by measuring CO_2 concentrations using the carbon dioxide analyzer.

5.9. USING GRAINPRO ECOWISE FOR WIRELESS MONITORING

The GrainPro® EcoWiSe™ is a wireless sensing system designed to remotely monitor the environment within a hermetic storage unit in real time. The sensor collects and sends out data such as relative humidity (%RH), temperature (°C) and CO_2 levels (%) to a receiver that is connected to a computer. The software transmits the information via the Internet to designated users who can monitor the data on their computers or smartphones.

5.9.1. EcoWiSe Standard monitors RH and temperature

5.9.2. EcoWiSe Plus provides data on RH, temperature and CO_2 levels.



5.9.3. Details of using wireless monitoring are discussed in the EcoWiSe instruction manual.

5.10. DISMANTLING

5.10.1 Although CO_2 is not toxic, it is an asphyxiant gas and it is advisable to unzip the Cocoon Indoor and wait until most of the CO_2 has dispersed.

5.10.2 Although the Cocoon Indoor 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 Cocoon Indoor 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.

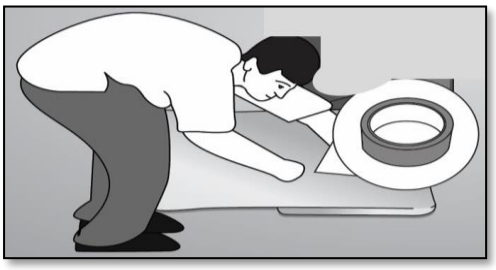
6. MAINTENANCE AND CARE

6.1. REPAIRING PUNCTURES AND OTHER DAMAGES

6.1.1. Use the 2” wide plastic tape to patch the damaged section of the Cocoon Indoor.

a. Clean the surface of the damaged area with damp cloth and allow the surface to dry before applying the plastic tape.

b. Cut out a piece of tape enough to cover the damaged area (outside surface) of the Cocoon Indoor.



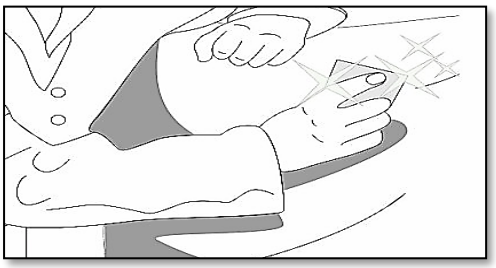
6.1.2. Protective maintenance:

a. Check the plastic tape occasionally and replace or re-patch if necessary.

6.2. CLEANING THE Cocoon Indoor

6.2.1. If necessary, use with soap and water.

6.2.2. Air-dry.



6.3. SAFEKEEPING

6.3.1. The empty Cocoon Indoor should be stored away from heat or direct sunlight and away from rodent.

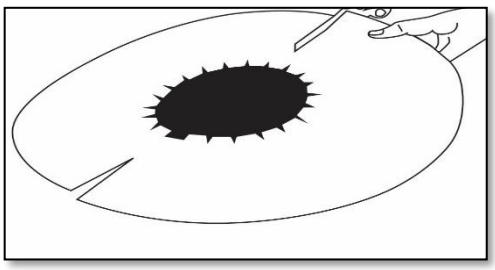
6.3.2. Do not place heavy objects on top of the liner to prevent damage.

6.4. PLATFORM INSTALLATION OF RODENT GUARD (RG)

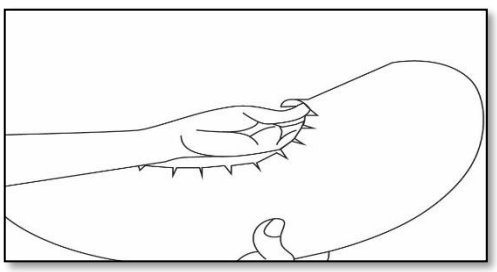
6.4.1. For protection against rodent attacks (one set contains 4 pieces of rodent guard):

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

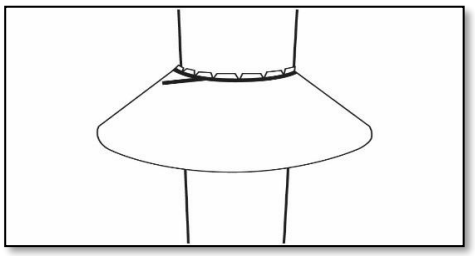
b. If the leg area is smaller, the rodent guard can be optionally cut in half to fit. Cut along the lines at the back of the rodent guard.



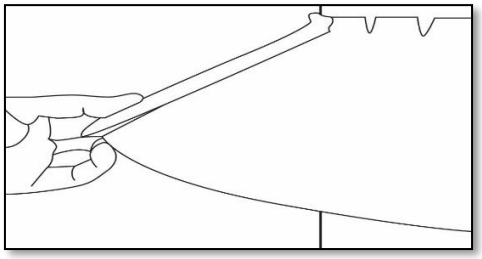
6.4.2. Fold the rodent guard's teeth upwards against the sides of the leg to keep it from slipping.



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



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



6.5.RECYCLING

GrainPro Cocoon Indoor is made of LDPE.

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

6.5.2 Plastic #4 – LDPE (Low Density Polyethylene) can be recycled into compost bins, paneling, trash can liners and cans, floor tiles, and shipping envelopes.

7. FREQUENTLY ASKED QUESTIONS

7.1. WHAT IS THE COCOON INDOOR™?
- The Cocoon Indoor is a low-cost Ultra Hermetic™ storage solution for indoor use only. With care it can be used multiple times.

7.2. WHAT COMMODITIES CAN I STORE IN IT?
- The Cocoon Indoor is used to store a wide variety of dried commodities such as maize, soybean, wheat, cassava and rice paddy in boxes or in bags. It also preserves spices, coffee, and different seeds.

7.3. HOW LONG CAN IT PRESERVE COMMODITIES?
- Typically for more than six months.

7.4. DOES IT HELP IMPROVE SEED GERMINATION?
- The Cocoon Indoor does not improve seed germination but maintains it with very little change.

7.5. CAN I STORE LOOSE COMMODITIES?
- No. The Cocoon Indoor is designed to hold commodities loaded in boxes, bags, big bags or bins.

7.6. HOW DOES THE COCOON INDOOR KILL PESTS EMBEDDED IN THE COMMODITIES?
- The Cocoon Indoor as gastight container relies on the respiration of insects, commodity and microflora which increases the level of carbon dioxide and decreases the available oxygen inside the storage. This in turn eliminates insects including eggs, larvae, pupae, and adults.

7.7. DOES IT ONLY KILL ADULT INSECTS?
- The Cocoon Indoor is designed to eliminate all insects in all development stages.

7.8. CAN I SPEED UP THE PROCESS OF DEPLETING OXYGEN?
- Yes. The Cocoon Indoor also has Gas-Hermetic Fumigation features, where users can flush in CO_2 and more rapidly create a “controlled atmosphere” which is low in O_2 and high in CO_2.

7.9. CAN I USE PHOSPHINE INSTEAD OF CO_2?
- Yes. While we do not encourage its use due to Phosphine’s adverse health effects to operators and because of growing insect resistance, we understand that many continue to use it. Gastight container is necessary for efficient phosphine application.

7.10. IS IT REUSABLE?
- Yes, as long as the plastic material of the Cocoon Indoor is undamaged.

8. WARRANTY CLAUSE

GrainPro® hereby warrants that products sold to Buyers shall be free of defects in workmanship and materials, for a period as follows, starting from the date of shipment (B/L): One year for the GrainPro®Cocoon Indoor™ (Cocoon Indoor™).

The warranty liability is limited to 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 the 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 the shipping costs for shipment of defective Products to GrainPro®, and GrainPro® shall bear the shipping costs of returning good Products to Buyer.

The Warranty does not cover the cost of any service, work, or material required for the replacement of defective 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, buyer's fault or negligence, improper storage or installation and improper maintenance.

Replacement costs and shipping charges for Products found not to be under warranty as specified above shall 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®, and EXPRESSED OR IMPLIED. EXCEPT TO THE EXTENT HEREIN PROVIDED, GRAINPRO® DOES NOT MAKE AND SHALL NOT BE DEEMED TO MAKE ANY WARRANTY WHATSOEVER, 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 Technical Support team: customercare@grainpro.com or call: (+6347) 252-7884.