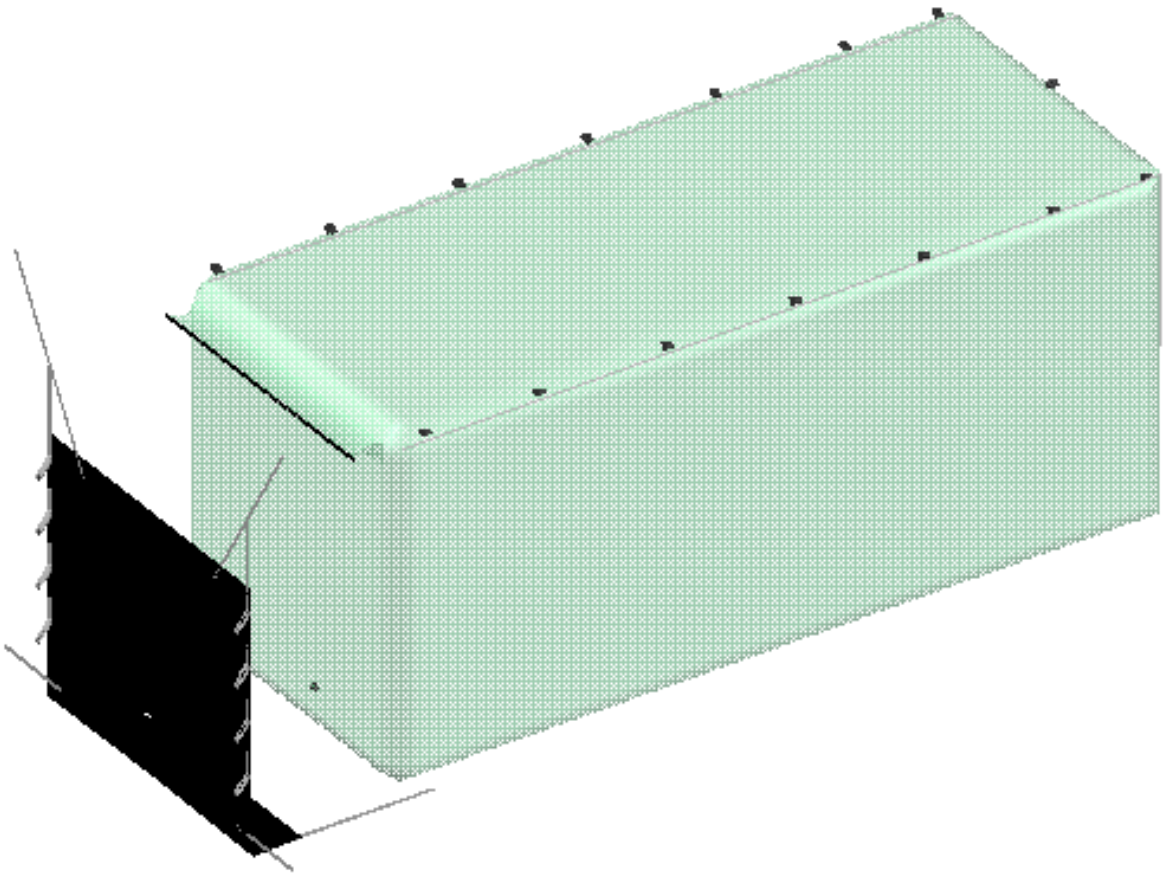
GRAINPRO® TRANSAFELINER™ BULK

INSTRUCTION MANUAL

MA4045RAD1114-6



GRAINPRO
STORING THE FUTURE

scan me

GrainPro® Inc.
5520 Connecticut Avenue. NW Washington, DC 20015
Tel : +1 202-921-6700
Email : sales@grainpro.com

GrainPro® Philippines, Inc.
Lot 46 Efficiency Avenue, Subic Bay Gateway Park I, Subic Bay Freeport Zone 2222 Philippines
Phone: +63 47 252 7884 Fax: +63 47 252 7885 Website: www.grainpro.com
Email: salesasia@grainpro.com

GrainPro® (Inc) Kenya Ltd.
Space Apartments, GF Shop A1 & A2 Maimahui Rd. Nairobi West, Kenya
Tel: +254 796 904 144
Tel.: +254 791 222 169
Email: africa@grainpro.com

GrainPro® Nigeria Ltd
6, Adu Street, Aguda-Ogba, Ikeja, Lagos
Email: africa@grainpro.com
Tel: +234 806 564 3156

GrainPro® Mexico, S de RL de CV
Cto. Garona No. 903, Sección Tres, Col. Amberes, 37237,
León, Gto. Mexico
Mobile: +52 (477) 392 0851
Email: guillermo@grainpro.com

GrainPro® Costa Rica S.R.L.
Residencial Valle del Sol, Calle Lajas, Casa #27 Alto de las Palomas,
Santa Ana, San José, Costa Rica
Tel: +506 2282 9129
Email: infogpcr@grainpro.com

GrainPro® India Post-Harvest Technology Pvt. Ltd.
Office Number 18A109, WeWork Berger Tower 18th Floor,
C-001/A2, Sector 16-B, Noida, INDIA – 201301
Landline: +91 120 515 0017
Customer Service: +91 960 292 0202
Email: praveen.gupta@grainpro.com

GrainPro® Inc., 1401 K Street NW, Suite 502, Washington D.C. 20005 USA

TABLE OF CONTENTS

1. INTRODUCTION

The GrainPro® TranSafeliner™ Bulk (TSL Bulk) is designed to protect dry agricultural commodities shipped in bulk inside an ISO shipping container. It is made of Ultra Hermetic PE with a barrier layer. It has superior gas and moisture resistant properties to restrict the entry of moist ambient which reduces risks due to condensation, mold growth, and insect infestation. As a result, the TSL Bulk preserves the quality of dried agricultural commodities and prevents postharvest losses while in transit. It also has a GHF inlet port for fumigation. The TSL Bulk consists of "Ultra-Hermetic" liner and bulkhead. Using nylon rope and pre-installed tape, the liner can be easily hung inside the container. To support the commodity's lateral force, a strong woven polyethylene bulkhead is fitted into the container's doorway using straps and 1.5" steel tubes positioned horizontally and anchored into the groove of the container's wall. Loading the single trip TSL Bulk can be done using grain augers or screw conveyors (with TSL blower) which can be fitted in the liner's resealable loading port. Unloading of the TSL Bulk is best done by self-discharging or by tilt-trailer where unloading can be done by slitting the bottom portion of the TSL Bulk and tilting the shipping container.

1.1. FEATURES:

1.1.1. "Green" fumigation technology is acknowledged as organic fumigation using CO_2.
1.1.2. Preserves quality and minimizes damage to dry agricultural commodities in transit.
1.1.3. A "green" technology for the transport and organic preservation of dry agricultural commodities (certified safe for organic grain storage)
1.1.4. Minimizes condensation, inhibits/controls mold growth and infestation.
1.1.5. Easy to install in a container van using nylon ropes.
1.1.6. Two options in installing the bulkhead (straps or rigid bars)
1.1.7. Maximizes the volumetric capacity of the shipping container.
1.1.8. Reduces packaging cost vs. bagged commodities.
1.1.9. Reduces labor cost.
1.1.10. Prevents grain contamination.

1.2. PRODUCT GUARANTEE:

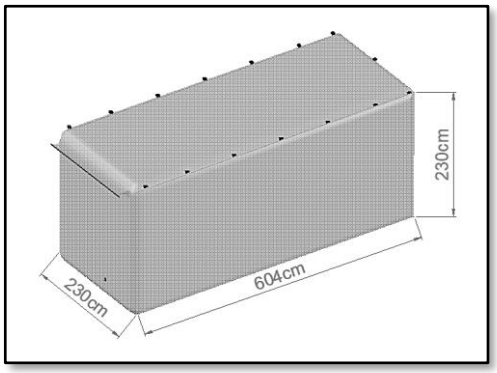
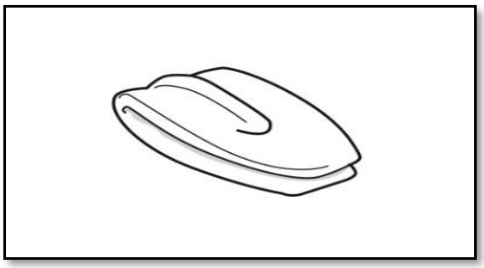
1.2.1. In accordance with the terms and conditions herewith, GrainPro®, Inc. fully guarantees the quality of this product if the product is used according to the instructions in this operator's manual.
1.2.2. Please read and understand the manual thoroughly before using the TSL Bulk.

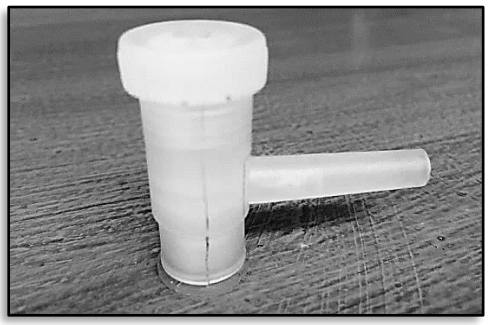
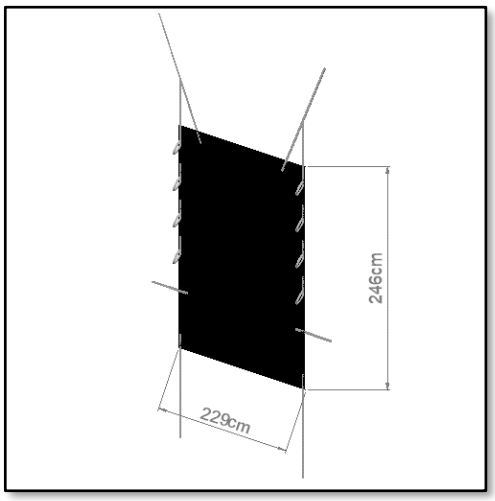
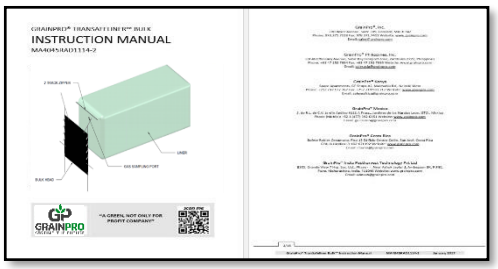
1.3. COMMENTS, COMPLAINTS, AND/OR CLARIFICATIONS:

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

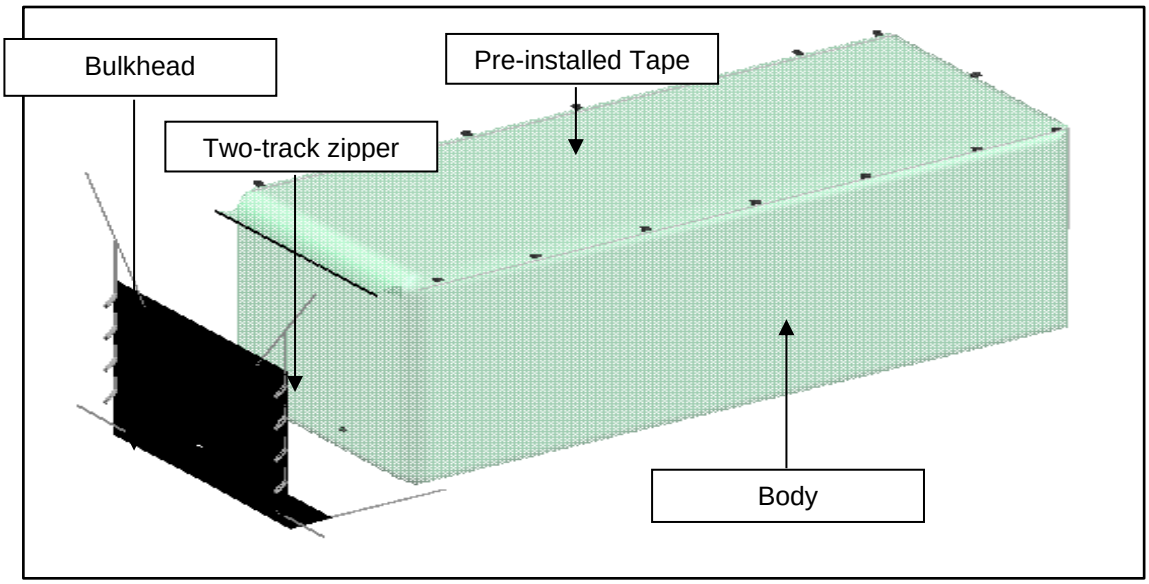
2. CHECKLIST

Please inspect your GrainPro® TranSafeliner™ Bulk package to ensure it includes the following items:

PART NAME	DESCRIPTION	IMAGE
2.1. TSL™ BULK BODY	2.1.1. Ultra-Hermetic Polyethylene with a barrier layer	
2.2. ZIPPER SLIDER	2.2.1. For zipper closing. Two (2) pieces	
2.3. Rope Braces (Woven OPP Tape)	2.3.1. TSL™ BULK 15pcs	
2.4. NYLON ROPE	2.4.1. For container mounting installation (Pulling rope) TSL Bulk 17 m x 1 rope	

2.5. PLASTIC VALVE	2.5.1. For PDT (Pressure Decay Test) or CO_2 or O_2 reading 1 piece	
2.6. DESICCANTS	2.6.1. TSL™ Bulk 2 packs x 3pcs/pack	
2.7. BULKHEAD	2.7.1. Woven Polyethylene (WPE) Dimension: 229cm x 246cm	
2.8. INSTRUCTION MANUAL	2.8.1. Installation instructions. 2.8.2. Maintenance instructions. 2.8.3. Frequently asked questions and answers. 2.8.4. Warranty clause.	

3. COMPONENTS



4. SPECIFICATIONS

4.1 LINER	
PARAMETERS	TSL™ BULK
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	<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, kg (lbs) based on wheat	21,600 (47620)
Dimension (AxBxC), cm (inch)	230x230x604 (91x91x238)
Product Weight (per piece), kg (lbs)	14 (31)
Packed Dimension, cm (inch)	100x50x20 (39x20x8)
Packed Volume, m^3 (ft^3)	0.05 (1.8)
Packed Weight for Liner and Bulkhead (without pallet), kg (lbs)	15 (33)

4.2 BULKHEAD	
PARAMETERS	BULKHEAD
Material	Woven Coated Polyethylene
Thickness, microns	508±10%
Color	Black
Material Weight, g/m^2	320
Product Life, years	2
Warranty, year	1
Dimension (DxE), cm (inch)	229X246 (90x97)

5. WARNING!

5.1.1. Do not load fresh produce or commodities with high moisture inside TSL™ Bulk.
5.1.2. Do not wear shoes with spikes as this might damage the TSL™ Bulk.
5.1.3. Do not directly install TSL™ Bulk without clearing the container van of debris and other foreign materials.
5.1.4. Do not smoke while installing, cigarette butts might burn and damage the TSL™ Bulk.
5.1.5. Do not directly insert or hook nylon rope to the TSL™ Bulk.
5.1.6. Do not put TSL™ Bulk on top of a wooden pallet or equivalent to prevent puncture by sharp edges and nails.
5.1.7. Do not allow loading vehicles (e.g., forklift/pallet trucks) to run over the TSL™ Bulk as this will cause damage to the P.E. material.

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.

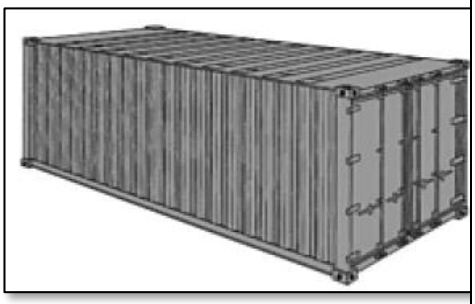
7. SMALL PARTS

7.1. Liner	1 piece
7.2. 2 Track zipper slider, blue	2 pieces
7.3. Nylon string	17m x 1 piece
7.4. Desiccant (Calcium Chloride) $CaCl_2$	6 pieces (1,200 grams)
7.5. Plastic Valve	1 piece
7.6. Packaging Box	1-piece TSL Bulk per box
7.7. Woven OPP tape	15 pieces

8. INSTALLATION

8.1 PREPARATION

8.1.1. The TSL™ Bulk is designed for a standard 20-foot container van.



8.1.2. Check the moisture content of the commodity using the Moisture Meter to ensure the MC is at a safe level for storage. Refer to Recommended Moisture Content for safe storage.

8.1.3. Ensure that the container floor and wall are free of any sharp objects that may damage the liner.

8.1.4. Place a mat or thick cardboard on the floor as additional protection for the TSL™ Bulk.

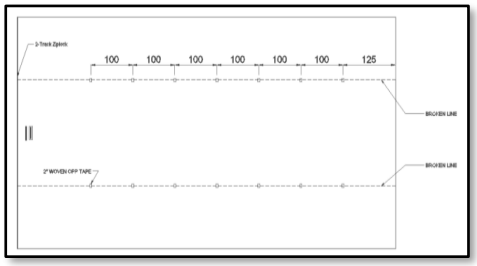
8.1.5. Carefully unfold the TSL™ Bulk. Lay TSL™ Bulk with the broken line markings facing upward.

8.1.6. Pull the top portion to unfold.

8.2. ATTACHMENT OF ROPE BRACES (TAPE)

8.2.1. On the laid TSL find the broken line markings from the back end of the TSL measure 125cm along the broken line and attach the supplied Woven OPP Tapes.

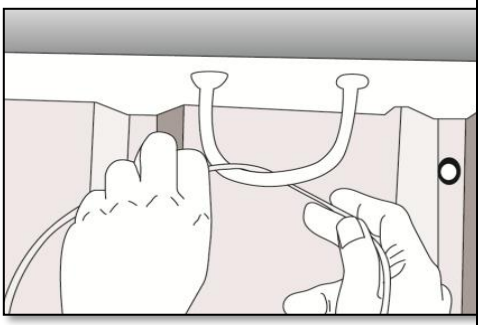
8.2.2. Stick another set of Woven OPP Tape along the broken line with a 100cm distance in between them. In total there will be 14 pieces of rope braces (Woven OPP Tape).



8.3. STALLATION PROCESS

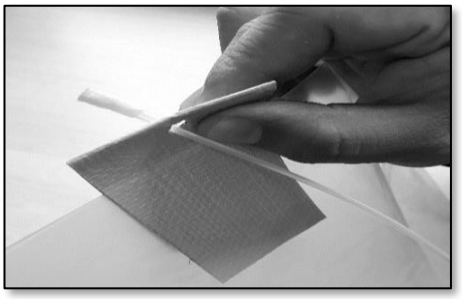
8.3.1. Secure one end of the nylon rope (flexible nylon cord) into the hook located on the side wall of the container van.

8.3.2. Pull and insert the rope to the next hook.



8.3.3. Insert the free end of the nylon rope into the first woven OPP tape. The woven OPP tape in the TSL™ Bulk should be positioned in-between the hooks (except for the first woven OPP tape near the TSL zipper)

Note: Do not insert nylon rope into the woven OPP tapes aligned with the container's hooks.



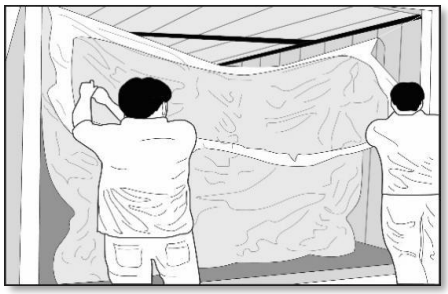
8.3.4. Secure the bottom of the liner and add additional woven OPP tape aligned in container hooks. Insert the nylon rope into the woven OPP tape and tie it to the hooks.

8.3.5. Hanging of the liner should be done by completing one side of the container first starting from the door, then going around the ceiling of the container.

8.3.6. One person should hold and pull the rope while the other person continues to hang the liner and complete the setup.

8.3.7. Insert the rope into the woven OPP tapes and hooks in a uniform direction to easily retrieve the rope after loading.

8.3.8. Apply proper tension and secure the nylon rope to minimize the sagging of liner for ease of loading.

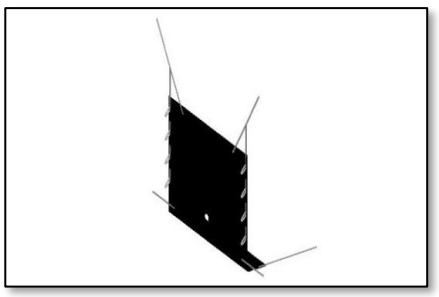


8.4 BULKHEAD INSTALLATION

8.4.1. Install the top and outside portion of the Bulkhead using the straps into the container door. Secure the straps into the first hooks of the container ceiling.

8.4.2. Insert the excess portion of the WPE bulkhead under the TSL™ Bulk liner.

8.4.3. Position 1.5” GI pipes of approximately 235 cm length horizontally into the container’s door starting from bottom to top. Insert the pipes in the installed loops of the WPE bulkhead. Anchor pipes to the groove of the container’s wall.



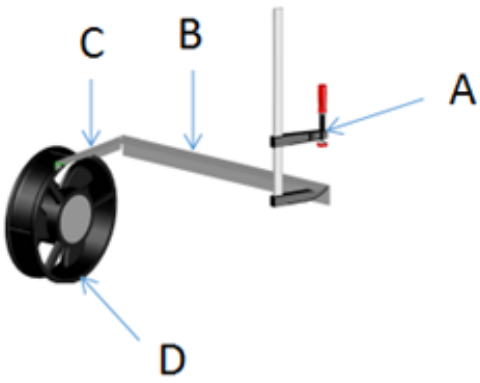
8.4.4 Install four (4) GI pipes (NOT INCLUDED in the TSL™ Bulk Package) for support, 0.4 m apart.

Material – 1 1/2" G.I. Pipe Schedule 40
Size (Diameter) = 38 mm (1 ½ in.)
Wall Thickness = 3.68 mm (0.145 in.)
Length – Approximately 235 cm (92.52 inch)
Quantity – 4 pieces

8.5. TSL BLOWER INSTALLATION

8.5.1. The blower is utilized for ease in loading operations when using an auger or conveyor. It is installed at the top portion of the container door using bracket or holder prior to loading. The following specifications are required for blower fabrication:

A-Clamp
B- Angle Bar (1 1/2” x 1 1/2” x 1/16”)
C- Angle Bar (1” x 1” x 1/16”)
D-Blower



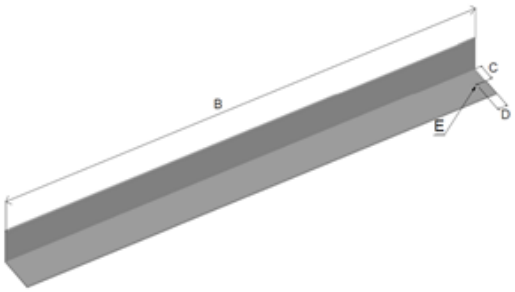
8.6. TSL BLOWER (NOT INCLUDED) COMPONENTS AND SPECIFICATIONS

8.6.1. Bracket for Blower

Material-Steel

Bar/F Clamp,
A-30 cm (12 inch)

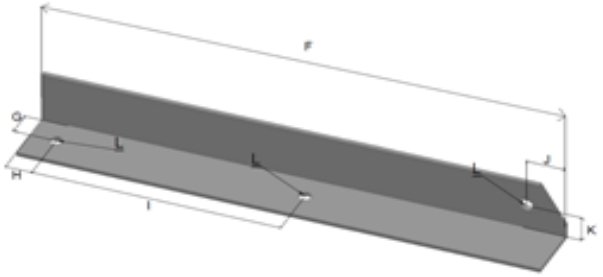
8.6.2. Angle Bar (1 1/2” x 1 1/2” x 1/16”) – cm (inch)



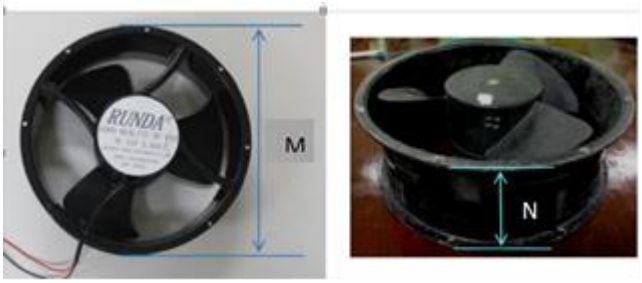
B-50 (20)
C-1.9 (0.8)
D-1.2 (0.5)
E-0.5 (0.2)

8.6.3. Angle Bar (1” x 1” x 1/16”) – cm (inch)

F-20 (7.9)
G-1.2 (0.5)
H-1.2 (0.5)
I- 9.5 (3.7)
J-1.2 (0.5)
K-1.2 (0.5)
L-0.5 (0.2)



8.6.4. Blower

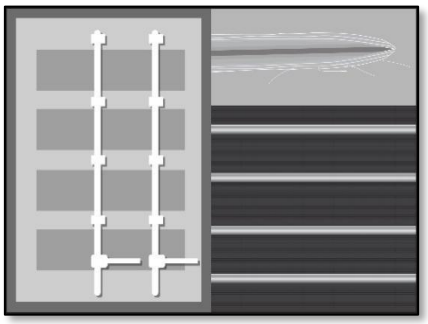


M - 25.4 cm (10 in.)
N - 8.9 (3.5 in.)

Type- Axial Flow Fan
Rated Speed, rpm-2200/2100 ± 10%
Maximum Air Flow-1165 m^3/hour
(686 ft^3/min)
Rated Voltage, Voltage Rating for AC-
110-120/220-240

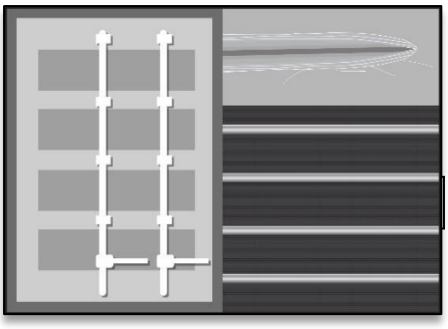
8.7. HORIZONTAL LOADING

8.7.1. Secure the bulkhead by closing one side of the container door during loading.

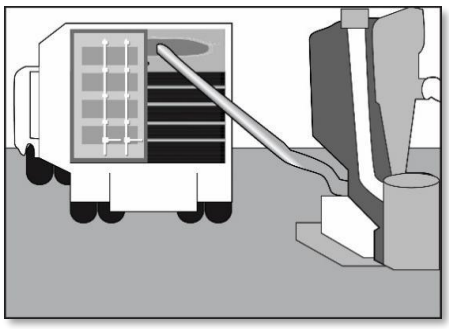


8.7.2. Install the blower clamp into the container ceiling.

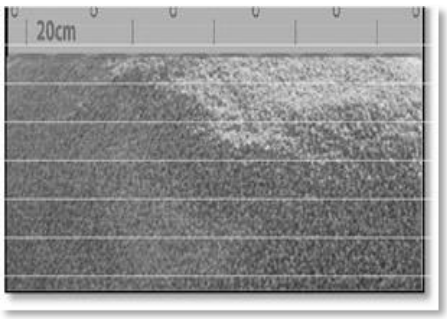
8.7.3. Load the commodity into the TSL™ Bulk loading port.



8.7.4. Use a screw conveyor or grain auger that can be inserted through the loading port of the TSL™ Bulk positioned at the upper end of the liner. Use of the blower is recommended for easy loading.

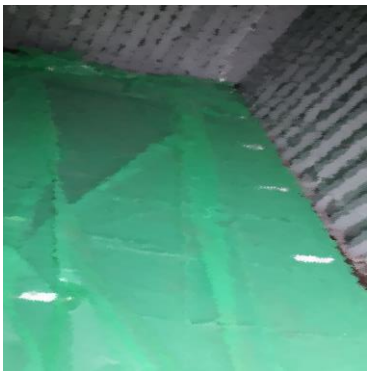


8.7.5. Make sure to leave at least 20 cm. of space between the roof of the container and the top of the commodity to prevent condensation.



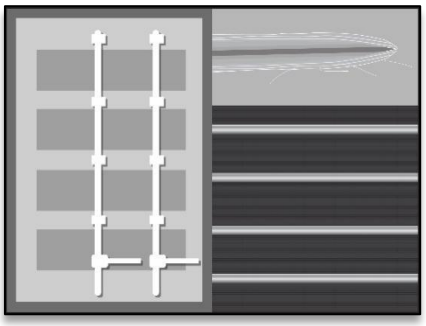
8.8. VERTICAL LOADING

8.8.1. Double check the bottom part of the TSL™ Bulk, make sure that it is securely plastered on the mat or thick cardboard to prevent it from tearing due to tension during vertical loading and unloading. Fixed the container doors fully open to expose the bulkhead and the TSL™ Bulk loading port. Refer to Installation 8.1.10.

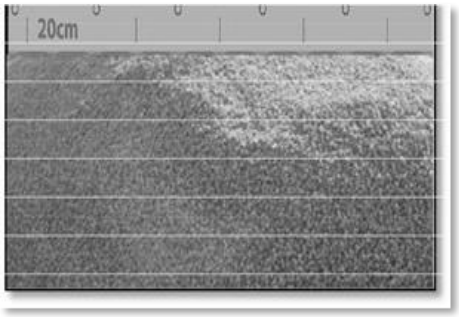


8.8.2. Position the container at a loading angle and the conveyor outlet into the inner center of the TSL™ Bulk loading port.

8.8.3. Load the commodity into the TSL™ Bulk loading port. Make sure to load only based on the capacity of the TSL™ Bulk.



8.8.4. Make sure that there is a space of at least 20 cm. between the roof of the container and the top of the commodity to prevent condensation.



8.8.5. To unload the commodity, slash the TSL™ Bulkhead and the liner at the bottom part to partially discharge the commodity.

8.8.6. The size of slash should be enough to the amount of commodity being discharged to avoid clogging.

8.8.7. Slowly tilt the container until the commodity is fully discharged.

8.9. USE OF DESICCANTS/DRY BAGS (REQUIRED)

Hygroscopic commodities, such as cocoa, coffee, and various nuts and grains, are particularly susceptible to mold and rot when exposed to condensation and humidity. But desiccant bags inside the TSL™ Bulk will protect the goods against condensation and moisture damage.

8.9.1. Usage requirement:

a. One-thousand two hundred (1200) grams of GrainPro® Dry Bags per 20-footer.

Note: 1 GrainPro® Dry Bag contains 200 grams of calcium chloride.

8.9.2. Place the GrainPro® Dry Bags in perforated bags or sacks to prevent direct contact with the commodity. Position the Dry Bags on top of the loaded commodity.

8.10. PLASTIC VALVE INSTALLATION FOR PRESSURE DECAY TEST (PDT) AND CO_2 OR O_2 READING USING AN ANALYZER

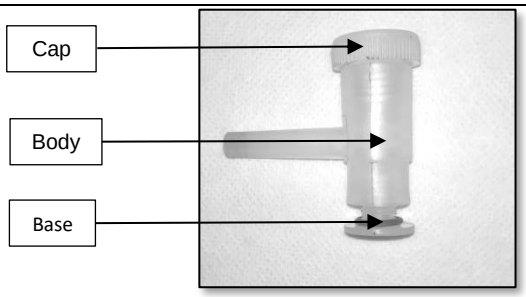
Install plastic valve before sealing or zipping the liner. Conduct PDT after sealing. CO_2 or O_2 reading (optional) is taken upon arrival of the container to verify the integrity of the TSL's hermeticity. After use, close the plastic valve.

8.10.1. Plastic valve components:

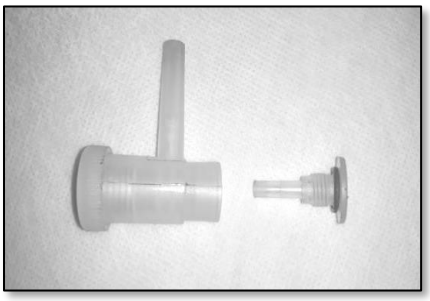
Cap – To open and close the valve

Body – Where tube or hose is inserted for PDT and CO_2 or O_2 reading

Base – Use for piercing the liner

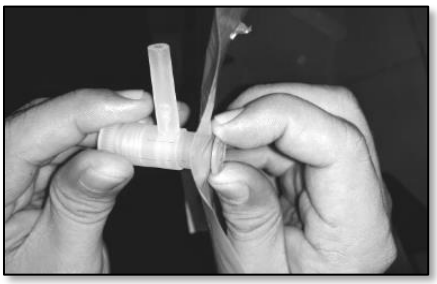


8.10.2. Disassemble the plastic valve by unscrewing the base.



8.10.3. Pierce the TSL™ Bulk using the plastic valve base. Piercing is done from the inner side of the TSL (approximately 20 cm from the zipper).

8.10.4. Screw the plastic valve body. The cap of the plastic valve should be positioned outside the loaded TSL™ Bulk.



8.11. SEALING

8.11.1. Untie the nylon rope from the side wall of the container van.

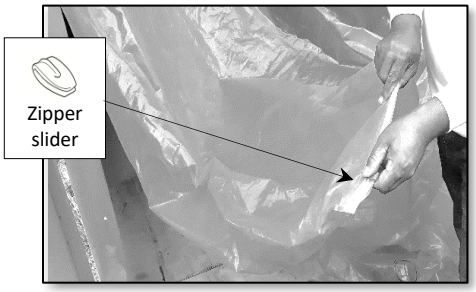
8.11.2. Pull the rope out of the container to provide space between the roof and liner for air circulation.

8.11.3. Pull the ends of the TSL™ Bulk zipper for sealing.

8.11.4. Positioning of zipper slider:

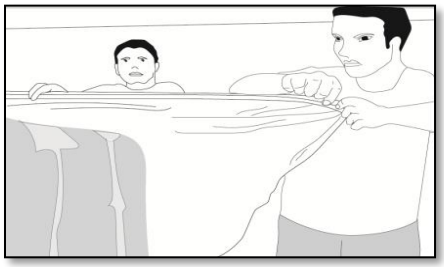
a) Manually zip a few centimeters enough to initially engage the slider.

b) Position the slider on the manually zipped portion of the zip lock.

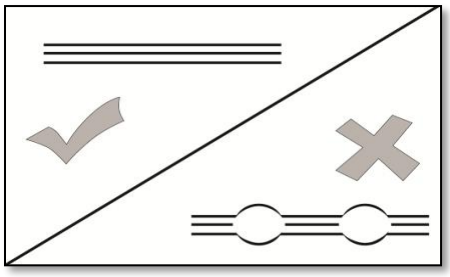


8.11.5. Two persons are required for ease in zipping the TSL™ Bulk.

a) One person will do the zipping and the other person holds the other end steadily making both sections of the zipper in a straight line to avoid the zipper length being misaligned.
b) Moving the slider while the zipper or slider is not straight forces 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.

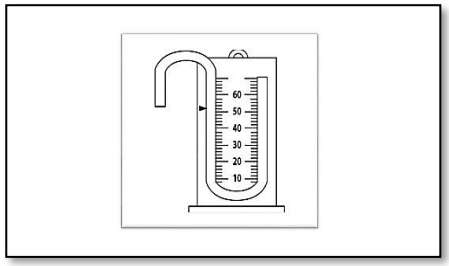


8.12.1. PRESSURE (VACUUM) DECAY TEST

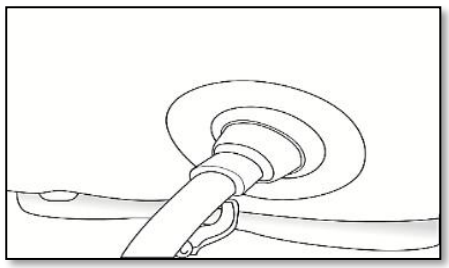
8.12.2. After zipping, perform a pressure (vacuum) decay test (PDT) to ensure gas-tightness:

a. Use a digital manometer.

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



8.12.3. Connect the manometer hose to the flexible adapter hose previously installed in the TSL.



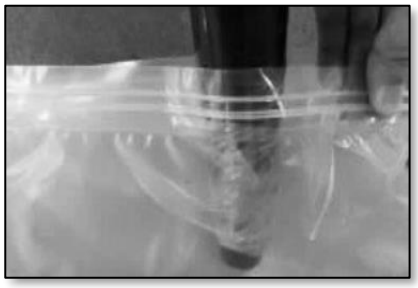
8.12.4. Twist the plastic valve cap to open.

8.12.5. Use a vacuum pump (at least 2.3-cubic meters per minute):

a) Create at least -250 Pascals (Pa) or -25 millimeters water (mm H_2O) vacuum. Partially open a portion of the zipper and insert the vacuum pump.

b) For it to be considered sufficiently airtight, the initial vacuum should not be decreased by more than one-half (½) of the final vacuum (created by the vacuum pump) within five (5) minutes.

c) If the PDT test failed, check for holes/tears and poorly sealed zippers then repeat the PDT procedures. Failed PDT test indicates a non-gastight installation.



8.12.6. After conducting the PDT, twist the plastic valve to close.

8.13. INSTALLING THE FLEXIBLE ADAPTER HOSE FOR CO_2 OR O_2 READING

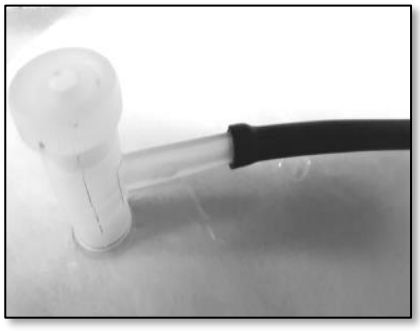
To ensure gas-tightness, the container with TSL can be checked using the CO_2 analyzer or O_2 analyzer.

8.13.1. The flexible adapter hose is included in the GrainPro® Carbon Dioxide Analyzer, or the user can find equivalent flexible hose from local hardware using the specifications as shown:

Inner Diameter	4 mm (0.16 in.)
Length	>5 cm (2 in.)

8.13.2. This mixing of the CO_2 with the remaining air, and the absorption of CO_2 by the commodity, takes 12-24 hours depending on the temperature. Measure O_2 or CO_2 at least 24 hours after sealing.

8.13.3. When taking the carbon dioxide or oxygen reading, install the flexible adapter hose into the plastic valve.



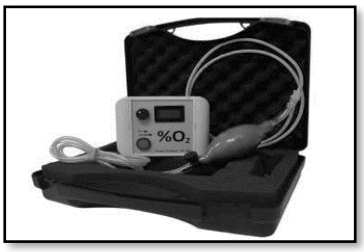
8.13.4. Twist the plastic valve cap to open. Connect the O_2 or CO_2 analyzer to the flexible adapter hose and the reading.

8.13.5. After taking the oxygen or carbon dioxide reading, twist the plastic valve cap to close.

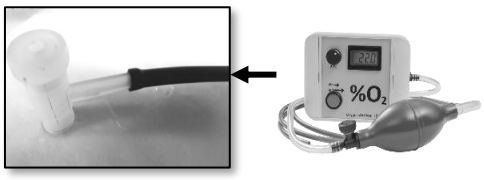
8.14. USING OXYGEN ANALYZER FOR MONITORING (WITHOUT CO_2 FLUSHING) - OPTIONAL

8.14.1. Use of an oxygen analyzer:

a. The oxygen level can be checked upon arrival of the container with TSL™ Bulk.



b. Using the analyzer, the oxygen level can be checked through the plastic valve with a flexible adapter hose before unloading. Decreased oxygen level indicates the absence of any source of leaks from punctures, holes, or damages. The oxygen level of ambient air is 20.9%.



c. Close plastic valve after testing.

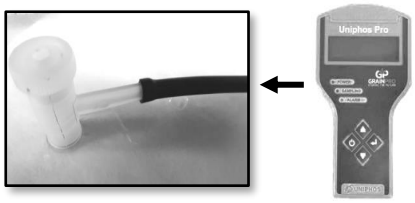
8.15. USING CARBON DIOXIDE ANALYZER FOR MONITORING (WITHOUT CO_2 FLUSHING) - OPTIONAL

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, a voltage signal is generated in proportion to the gas concentration. This voltage signal is amplified, digitized, and displayed on the instrument's OLED display.

8.15.1. Using the carbon dioxide analyzer:

a. Upon arrival, the container with TSL™ can be checked using the CO_2 analyzer.

b. Using the analyzer, carbon dioxide levels can be checked through the plastic valve with a flexible adapter hose before unloading. Increased carbon dioxide level indicates the absence of any source of leaks from punctures, holes, or damages. The CO_2 level of ambient air is 0.04%.



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

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.

8.16. CARBON DIOXIDE (CO_2) SAFETY

8.16.1. Carbon dioxide does not support life. It can act as a simple asphyxiant by diluting the concentration of oxygen in air below the levels necessary to support life. As it is heavier than air it will tend to concentrate at lower levels.

8.16.2. Avoid breathing in CO_2. Do not get in the eyes, on the skin, or on clothing. Wear leather safety gloves and safety shoes when handling cylinders.

8.16.3. Protect cylinders from physical damage. Do not drag, roll, slide or drop. While moving the cylinder, always keep the removable valve cover in place. Never attempt to lift a cylinder by its cap; the cap is intended solely to protect the valve. When moving cylinders, even for short distances, use a cart (trolley, hand truck, etc.) designed to transport cylinders.

8.16.4. Never insert an object (e.g., wrench, screwdriver, and pry bar) into cap openings; doing so may damage the valve and cause a leak. Use an adjustable strap wrench to remove over-tight or rusted caps. Slowly open the valve. If the valve is hard to open, discontinue use and contact your supplier.

8.16.5. Close the container valve after each use; keep closed even when empty.

8.16.6. Never apply flame or localized heat directly to any part of the container. High temperatures may damage the container and could cause the pressure relief device to fail.

8.17. PROCEDURE FOR PURGING WITH CARBON DIOXIDE (CO_2)

8.17.1. Calculation:

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

Recommendations:

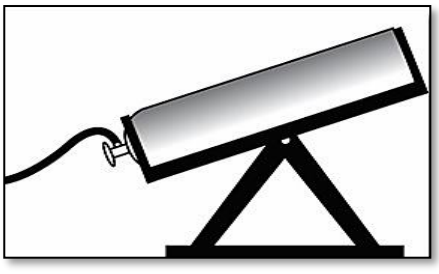
- If commodity temperature is at 15 deg Celsius or below, there is no need for TSL™ Bulk.
- If commodity temperature is 15-20 deg Celsius, use TSL™ Bulk without carbon dioxide flushing but fumigation should be conducted upon arrival.
- If commodity temperature is above 20 deg Celsius, use TSL™ with carbon dioxide flushing.

COMMODITY	BULK DENSITY MT/m^3	AMOUNT OF CARBON DIOXIDE (CO_2) FOR PURGING, kg TSL Bulk
Barley	0.62	25.1
Cashew nuts	0.50	33.0
Chia seeds	0.68	21.1
Chickpeas	0.74	17.2
Cocoa beans	0.56	29.0
Coffee beans	0.59	27.1
Cotton seed	0.40	39.6
Cowpea	0.75	16.5
Maize	0.72	18.5
Millet	0.63	24.4
Mung bean	0.75	16.5
Oats	0.43	37.6
Paddy	0.60	26.4
Paddy, rice bran	0.55	29.7
Peanuts, shelled	0.64	23.8
Rice, milled	0.80	13.2
Rye	0.72	18.5
Sesame	0.59	27.1
Sorghum	0.72	18.5
Soybean	0.75	16.5
Sunflower	0.41	38.9
Wheat	0.77	15.2

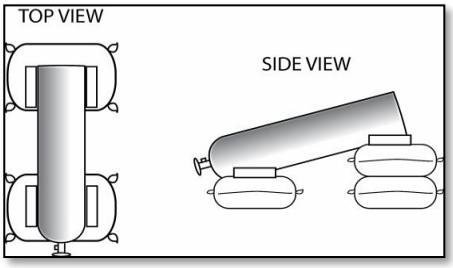
8.17.2. CO_2 application:

a) Make sure that enough CO_2 is available on site and proper pressure hose with matching TSL™, and CO_2 cylinder threaded ends are on hand. The weight of the CO_2 in the cylinder is supplied by the industrial companies (i.e., 22 kg is the standard capacity 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 a siphon should be inverted.

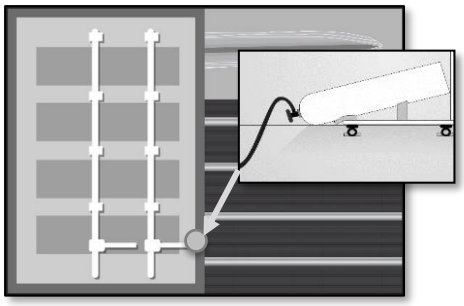
b) For rapid flushing, the cylinder should be inverted using a mechanical inverter. However, the cylinders with a siphon should be in an upright position during flushing.



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) 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 placed where they are required. The high-pressure hose should have a length of about 2-meter.



e) Open the cylinder valve. Adjust the opening of the valve until the sound of liquid passing through the hose is observed. The liquid CO_2 flushes into the TSL Bulk and will push the air upward starting from the bottom, creating a piston effect, until the air is totally replaced. The opening through the zipper will serve as an outlet for the displaced air.

f) Open a section of the zipper to serve as an outlet to discharge O_2 when flushing.

g) Flushing (emptying of the cylinder) depends on the amount of CO_2 to be applied. Emptying one 22 kg cylinder without using a pressure regulator 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.

h) An additional indication that the gas is being released too quickly is when the TSL™ Bulk 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 CO_2 entering the liner.

i) 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 flowrate.

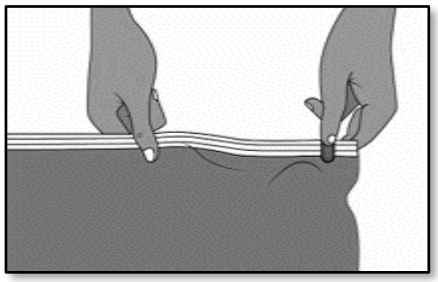
8.17.3. Since CO_2 is heavier than air, the air in the TSL™ Bulk will be displaced upwards and will be lifted out of the container through the outlet port. Complete displacement is not possible as there

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 the temperature. This will also be the time to determine the initial concentration of CO_2.

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

a) Close the CO_2 cylinder valve.

b) Close the zipper thoroughly using the slider.



8.17.5. For controlling stored-product 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 can be achieved at 25° Celsius or higher temperatures.

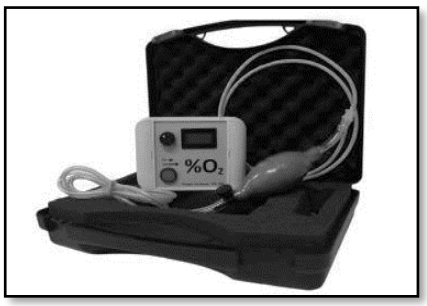
8.17.6. Although CO_2 is not toxic, it is an asphyxiant. During unloading, it is advisable to unzip the TSL™ Bulk and wait until most of the CO_2 has dispersed.

8.18. USING OXYGEN ANALYZER FOR MONITORING (WITH CO_2 FLUSHING) – OPTIONAL

8.18.1. Recommended pest reduction timeline:

a. Leave the TSL™ closed for 15 days at a minimum of 13% O_2 level to eliminate all stages of insects and achieve the best result.

b. Use of an oxygen analyzer:
Oxygen levels should be checked using the oxygen analyzer after CO_2 flushing and upon arrival.



c. Using the analyzer, the oxygen level can be checked through the TSL's plastic valve with a flexible adapter hose.

d. Close plastic valve after testing.

8.18.2. When flushing with CO_2, the approximate CO_2 concentrations can be determined by using the conversion table below when measuring the O_2 level:

$\%O_2$	$\%CO_2$	$\%O_2$	$\%CO_2$	$\%O_2$	$\%CO_2$	$\%O_2$	$\%CO_2$	$\%O_2$	$\%CO_2$	$\%O_2$	$\%CO_2$	$\%O_2$	$\%CO_2$
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

8.19. USING CARBON DIOXIDE ANALYZER FOR MONITORING (WITH CO_2 FLUSHING) – OPTIONAL

8.19.1. Recommended pest reduction timeline:

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

8.19.2. Using the carbon dioxide analyzer:

a. Carbon dioxide levels should be checked using the carbon dioxide analyzer after CO_2 flushing and upon arrival.

b. 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.

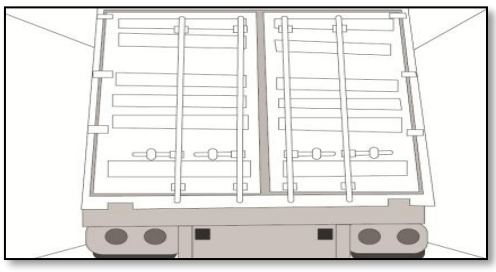
c. Close plastic valve after testing.

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

8.20. CLOSING AND OPENING THE CONTAINER VAN

8.20.1. Close the container van carefully and be sure not to pinch or squeeze the excess liner material between the container doors.

8.20.2. Care should be taken when opening the container van considering shifting of loads while on transit. It is advised to open one side of the door first to check the loads.



8.20.3. Unloading of the TSL™ Bulk is best done by tilt-trailer where unloading can be done by slitting the bottom portion of the TSL Bulk and tilting the shipping container.

9. MAINTENANCE AND CARE

9.1. REPAIRING PUNCTURES AND OTHER DAMAGES

9.1.1. Use an ordinary 2” wide plastic tape:

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

9.1.2. Protective maintenance:

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

9.2. RECYCLING

GrainPro® TSL™ Bulk is made of polyethylene with a barrier layer.

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

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

10. FREQUENTLY ASKED QUESTIONS

10.1. WHAT IS TSL™ BULK?

- The TSL™ Bulk is a specially designed Ultra Hermetic™ liner to handle bulk loads in shipping containers while in transit.

10.2. WHAT FEATURES DIFFERENTIATE IT FROM THE ORIGINAL TSL™?

- Unlike the TSL™, the TSL Bulk is designed to easily and conveniently load bulk commodities using a conveyor belt or blower. It has an opening at the front to fit the blower or conveyor for loading.

10.3. WHAT COMMODITIES CAN I STORE IN IT?

- The TSL™ Bulk can be used to store a wide variety of dried grains in bulk such as paddy, maize, nuts, beans, coffee, cacao, and soybean.

10.4. WHEN SHOULD I USE IT?

- The TSL™ Bulk is used primarily when shipping commodities in bulk.

10.5. WHAT IS ITS CAPACITY?

- TSL™ Bulk has the same capacity when used as a standard 20-ft shipping container which is 30,000 kg of commodity on average.

10.6. HOW LONG CAN I KEEP COMMODITIES INSIDE THE TSL™ BULK?

- It is recommended to use TSL™ Bulk during the duration of the trip. Upon arrival, the commodities should be unloaded and stored properly in a warehouse.

10.7. CAN I USE THE TSL™ BULK AS A STAND-ALONE STORAGE UNIT?

- No. The TSL™- Bulk will collapse as a stand-alone bulk storage unit.

10.8. HOW MANY PEOPLE ARE NEEDED TO SET UP THE TSL™ BULK?

- At least two people are needed to set up the TSL™ Bulk.

10.9. IS IT REUSABLE?

- TSL Bulk is not reusable since the TSL Bulk needs to be sliced/cut to unload bulk commodities.

11. WARRANTY CLAUSE

GrainPro® hereby warrants that product 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® TranSafeliner™ Bulk (TSL™ Bulk).

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 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.