Recommended Practice and Inspection

Multi-Purpose Offshore Bulk Lifter, IBC-1

BILLY PUGH CO., INC.

INTEGRITY MANAGEMENT SYSTEM (IMS)

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1.0 INTRODUCTION

The purpose of this document is to provide a written guide or Recommended Practice ("RP") for the recommended safe lifting techniques associated with the functionality and inspection of Billy Pugh's Multi-Purpose Offshore Bulk Lifter, IBC-1.

The Multi-purpose Offshore Bulk Lifter is generally capable of operating in three different modes (e.g., depending on the configuration of the system). The three different modes include:

1.5 Intermediate Bulk Container (IBC) or "tote mode"
1.6 Flexible Intermediate Bulk Containers (FIBC) and
1.7 Palleted Loads.

2.0 ACRONYMS, DEFINITIONS & REFERENCES

2.1 Acronyms

ABS	-	American Bureau of Shipping
BPC	-	Billy Pugh Company
DNV	-	Det Norske Veritas
FIBC	-	Flexible Intermediate Bulk Container
IBC	-	Intermediate Bulk Container
MGW	-	Maximum Gross Weight
NDT	-	Non-Destructive Testing
OEM	-	Original Equipment Manufacturer
OOP	-	Out of Plane
POU	-	Portable Offshore Unit
RP	-	Recommended Practice

2.2 Definitions

Composite IBC ("IBC") (From Chapter 6.5 of the UN Recommendation on the Transport of Dangerous Goods)

Intermediate Bulk Containers are closed shipping vessels with a liquid capacity ranging from 450 up to 3,000 L (119 to 793 gallons). They consist of structural equipment in the form of a rigid outer casing enclosing a plastic inner receptacle together with any service or other structural equipment. They are so constructed that the inner receptacle and outer casing once assembled, form and are used as, an integrated single unit to be filled, stored, transported, or emptied as such.

Image of Typical Composite IBC

Flexible IBC ("FIBC")(From Chapter 6.5 of the UN Recommendation on the Transport of Dangerous Goods)

Consist of a body constituted of film, woven fabric or any other flexible material or combinations thereof, and if necessary, an inner coating or liner, together with any appropriate service equipment and handling devices.

Image of Typical Flexible IBC

2.3 Design Standards

The Multi-Purpose Lifter has been designed, manufactured, inspected, and tested in accordance with ASME BTH-1-2020 "Design of Below-The-Hook Lifting Devices" as a Service Class "1", Category "B" lifter.

2.4 References

General Arrangement Drawing (Document # 22-099-SD-72-003)

3.0 BACKGROUND & DESIGN FEATURES

3.1 Background

BPC recognizes a need in the offshore upstream oil and gas business for more robust and certified designs for lifting IBCs and Pallets. The types of IBCs targeted by the design are:

- IBC, Composite at 275-gallon (1,000 L) and 330-gallon (1,200 L) sizes
- FIBC, Flexible with footprint range of 30” x 30” to 48” x 48” (height only relevant in determining overall mass)
- Pallets of standard 40”x 48” and 48”x 48”

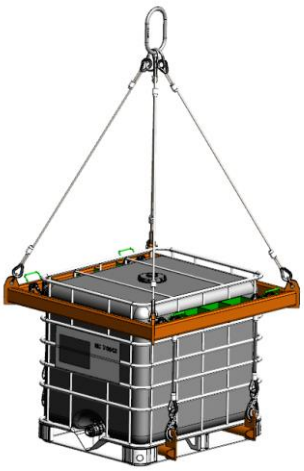
The targeted maximum payload is 2.5MT.

The IBCs can be lifted shipboard as well as ship-to-ship. The lifer will consist of an upper lifting frame from which the IBC is suspended as payload. FIBCs will be hung via their owns straps from hooks fix-welded to the upper frame. Composite IBCs will be elevated by lower lifting bars which pass through the pallet bottom of the IBC. The lower bars are suspended by wire rope slings from the hooks on the upper frame. Alternatively, IBCs can be lifted with use of Soft Slings of appropriate capacity. BPC recommends use of Polyester Slings, with a 3” width and 3-ply thickness with a Cordura Cover for chafing protection.

The following is the design operational temperature range:

- Low 0°C / 32°F (Southern North Sea)
- High 50°C / 122°F (Middle East)

The lifter and payload are lifted from a sling set attached at the corners of the upper frame. The lifter will appear as follows:



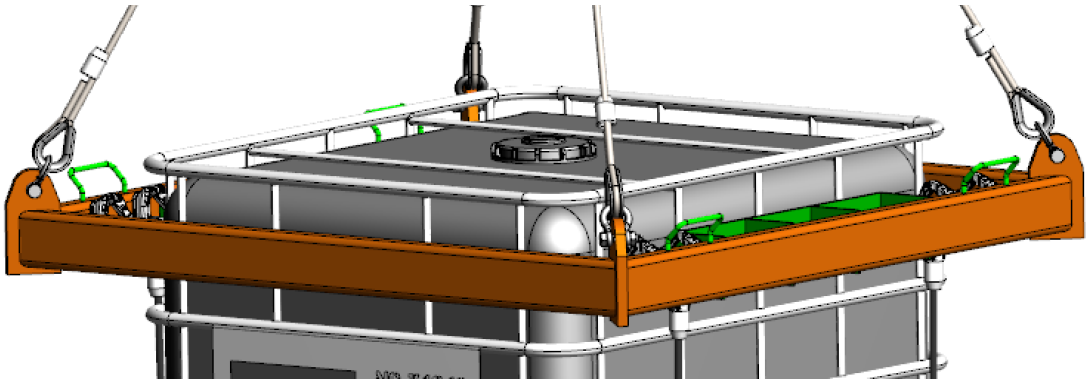
Lifter in “Tote” Mode

Lifter in FIBC Mode

3.2 Design Features – IBC Lifting Mode

3.2.1 IBC Lifting Mode

In IBC lifting mode, the offshore lifting system prevents lateral loads from causing overturning of the IBC (e.g., which is not uncommon when transporting sloshing fluids) by ensuring that a lifting frame of the offshore lifting system fully encapsulates the IBC tote. The lift frame should encapsulate the IBC tote as highlighted below.

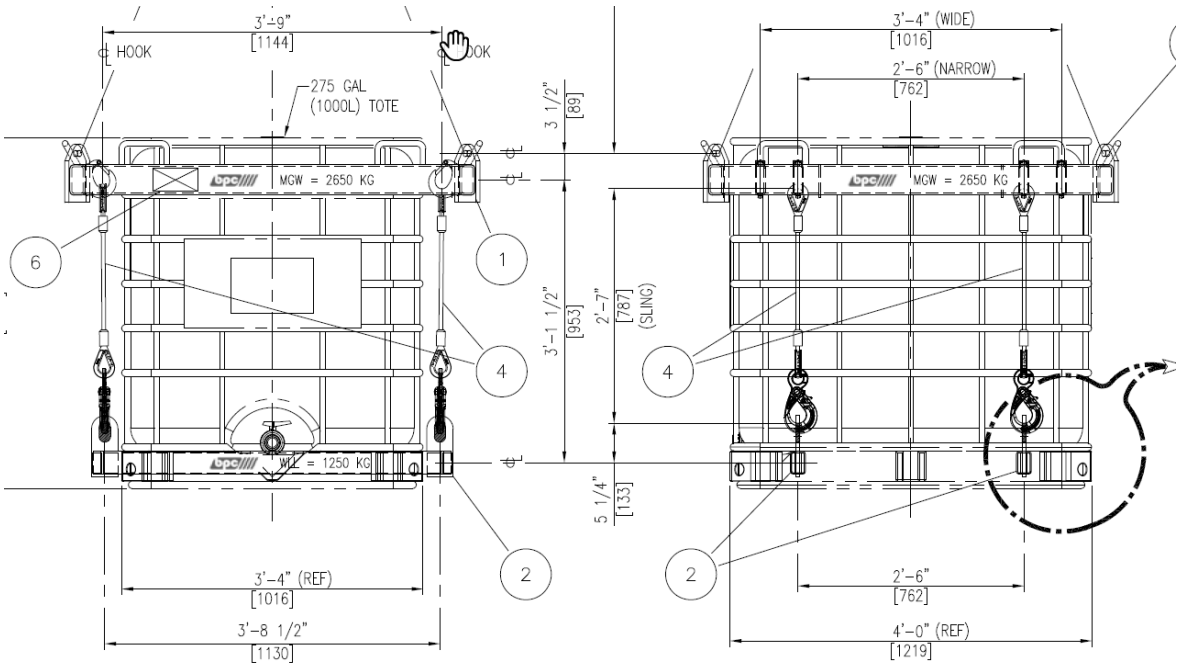


Upper Frame Encapsulating IBC Tote

3.2.2 IBC Lifting with Pallet Bars

When lifting an IBC, the IBC-1 Lifter is designed to have pallet bars inserted in the forklift pockets in the base of the IBC tote. Then four vertical slings are suspended from the weld-on excavator hooks integrated into the upper lift frame. A single set of vertical slings, of specific length, will properly encapsulate both 275 gal and 330 gal IBC totes.

Please refer to the General Arrangement Drawing (Ref. # 22-099-SD-72-003) for more detail on tote lifting configuration.



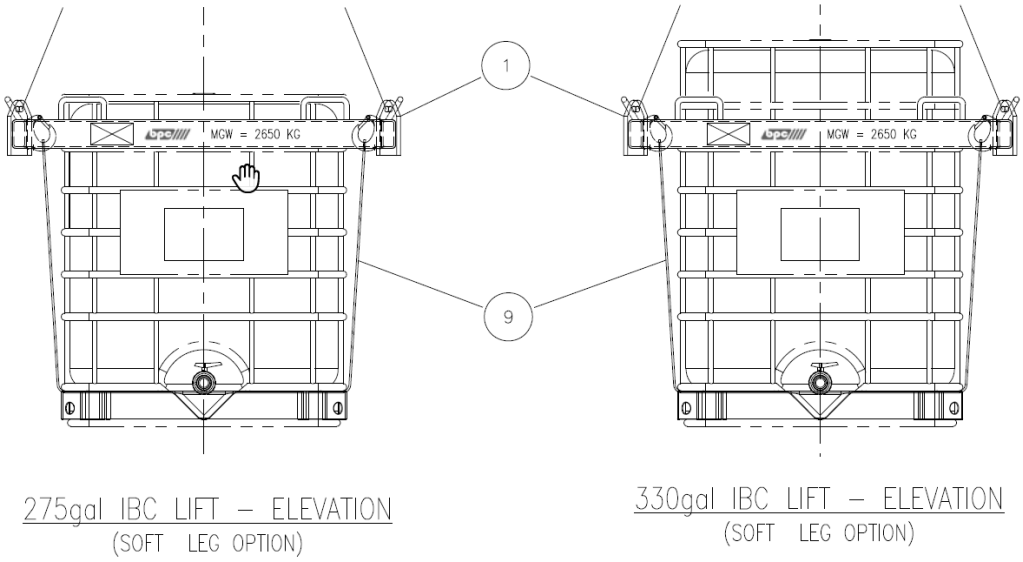
Lifting IBC Tote with Lifting Bars

Lifting IBC Tote with Lifting Bars

3.2.3 IBC Lifting with Soft Slings

An alternative configuration of IBC lifting is available for the IBC-1 Lifter. This lifting configuration involves use of two polyester soft slings in a basket configuration. In this instance, the eyes of the polyester slings are suspended from the weld-on excavator hooks and run underneath the tote though the forklift pockets.

Note: This mode of lifting is very useful when the frames of IBC totes are damaged and pallet bars will not fit into the forklift pockets. This is frequently encountered in an offshore environment. Additionally, IBC totes are often positioned in containers or tight spaces where access to use a pallet bar is not possible.



Lifting IBC Tote with Soft Straps

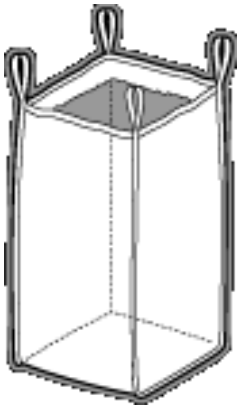
Please refer to the General Arrangement Drawing (Ref. # 22-099-SD-72-003) for more detail on tote lifting configuration.

3", 3-Ply Polyester Sling with a 12,300 lbs Capacity in Basket Configuration

Lifting IBC Tote with Soft Straps

3.3 Design Features – FIBC Lifting Mode

3.3.1 FIBC Lifting Mode



FIBCs should be thoroughly examined for surface abrasions, cuts, tears or any other damage to the bag. Particular attention should be paid to the straps / lift loops and their connections to the bag.

In FIBC lifting mode, the lifting frame is configured to allow for attachment of a cargo net that surrounds and contains an FIBC bag during transport, thereby providing dropped object protection in the event that handles of the FIBC bag were to fail. If the handle of an FIBC breaks during transport, the FIBC will slough into the cargo net, thereby mitigating the risk of the FIBC being dropped from a height.

When lifting FIBCs, the IBC-1 Lifter can accommodate the bags to be lifted by affixing the bag handles directly to the weld-on excavator hooks (depicted above) or also using the IBC vertical slings/hooks as "spacer" slings (depicted below). The advantage of using the IBC slings is that it raises the lift frame above the load and can accommodate odd shaped bag sizes and minimize outward pulling forces on the bag handles.

FIBC Lifted with IBC "Spacer" Slings

FIBC Lifted with IBC "Spacer" Slings

To ensure safe bag handling the angle of "outward" pull on the FIBC straps should be minimized. "Inward" pull is not typically of concern in FIBC handling. Two (2) sets of hanging hooks are provided in the upper frame, one (1) wide set and one (1) narrow set. The narrowly spaced hooks should be used for smaller bags, and the wider hooks can be used for larger bags.

The length of each lifting leg, which is the combined length of the FIBC handle and the IBC slings, should always be greater than the minimum recommended length as detailed on drawing 22-009-SD-72-003. This will ensure that "outward" pull loading angles do not exceed 10°.

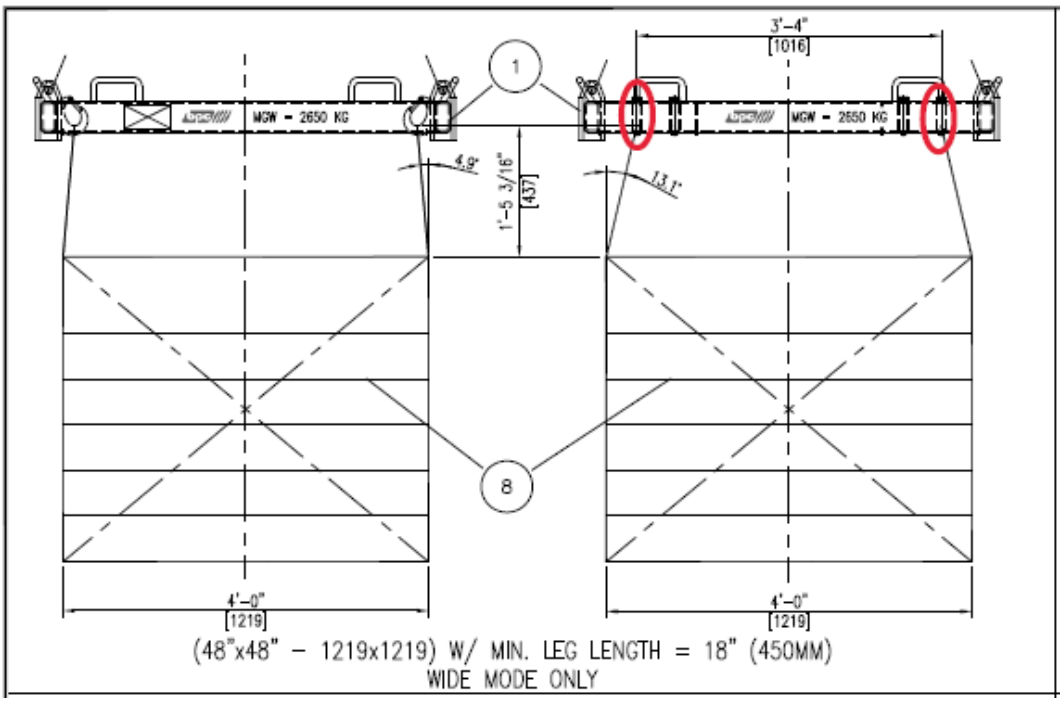
LIFT LEG LOADING FOR FIBC

FIBC SIZE (4)	HOOK SPACING	MIN LEG LENGTH	UPPER HOOK LOAD ANGLE		FIBC LEG			SUPPLEMENTAL SLING LENGTH	MIN LOOP LENGTH
			θx	θy	DROP	ANGLE (2)	LOAD AMPLIFICATION (3)		
		(IN / MM)	(DEG)	(DEG)	(MM)	(DEG)	x:1	(IN / MM)	(IN / MM)
48"x48"	WIDE	18 / 450	13.1	−4.9	437	76	1.03	31 / 768	N/A
45"x45"	WIDE	12 / 300	12.2	0.1	293	78	1.02	31 / 768	N/A
42"x42'	WIDE	10 / 250	5.9	8.9	246	79	1.02	31 / 768	N/A
39"x39"	WIDE	18 / 450	1.6	9.8	443	80	1.02	31 / 768	N/A
36"x36"	WIDE	28 / 700	4.2	9.5	689	80	1.02	31 / 768	N/A
36"x36"	NARROW	28 / 700	6.3	9.5	686	79	1.02	31 / 768	N/A
33"x33"	NARROW	36 / 900	2.5	9.8	886	80	1.02	31 / 768	5 / 127
30"x30"	NARROW	44 / 1100	0.0	10.0	1083	80	1.02	31 / 768	13 / 330

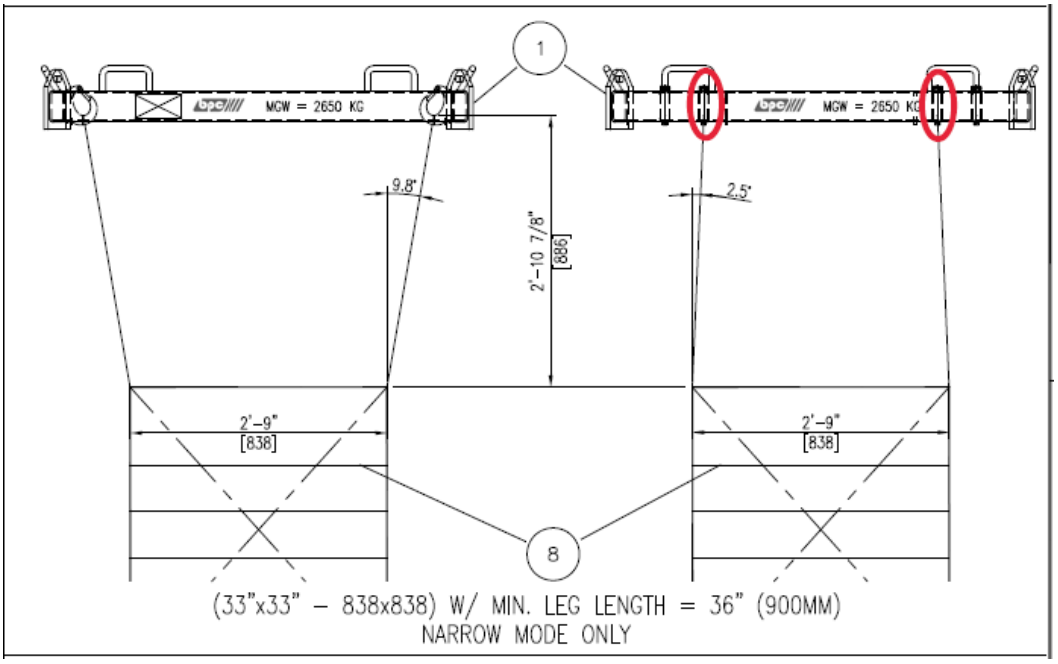
NOTE:
LIFT LEG LENGTH = FIBC LOOP LENGTH + LENGTH OF SUPPLEMENTAL SLING.

1. MINIMUM LIFT LEG LENGTH SELECTED TO ENSURE:
   - LEG ANGLE IS AT LEAST 60 DEG FROM HORIZONTAL
   - ANY LOADING ANGLES (θx OR θx) WHICH TEND TO PULL THE BAG OPEN ARE NO MORE THAN 10 DEG FROM VERTICAL.
   - −15 DEG < θx < 15 DEG LOAD ON HOOK
   - −20 DEG < θy < 30 DEG LOAD ON HOOK
2. LIFT LEG ANGLE IS GIVEN FROM THE HORIZONTAL.
3. LOAD AMPLIFICATION IS STATIC INCREASE IN TENSION FROM A VERTICAL HANG.
4. FOR ALL FIBCS GREATER THAN 36"x36" USE "WIDE MODE" HOOKS. FOR ALL FIBCS LESS THAN 36"x36" USE "NARROW MODE" HOOKS.
5. SUPPLEMENT FIBC LOOPS WITH SLINGS, AS REQUIRED, TO ENSURE THAT MINIMUM LEG LENGTHS ARE MAINTAINED. REFER TO SHEET 6 FOR DEPLOYING SUPPLEMENTAL SLINGS.

FIBC Required Lifting Leg Details (ref. 22-009-SD-72-003)



48" FIBC Lifted From "Wide Mode" Hooks



33" FIBC Lifted From "Narrow Mode" Hooks
Note the use of "spacer slings" to minimize outward pull angles

3.4 Design Features – Pallet Lifting Mode

3.4.1 Pallet Lifting

When lifting Pallets, the IBC-1 Lifter can accommodate 40” x 48” pallets using the IBC vertical slings/hooks (depicted below). To accommodate a larger 48” x 48” Drum Pallet there are longer vertical slings and pallet bars available for purchase. This is outlined in the General Arrangement Drawing (Ref. # 22-099-SD-72-003).

Pallet Lifting with Safety Net

Due to the longer length of the pallet lifting bars, the WLL of the system is slightly reduced to 2,270kg.

3.5 Design Features – Safety Features

3.5.1 Safe “Green” Handles

Billy Pugh Company recommends employing a policy of **‘No Hands-on Loads’**. Push/Pull Poles and/or Tag Lines are to be used to control and position loads. We, however, recognize that final positioning of some loads, especially when rigging up, may require personnel having to physically touch the lifter to maneuver it into place. This must always be a last resort and must only be done when the load is in the lowest position possible and must never result in people being placed in a compromising position. Recognizing the occasional need to manually maneuver a load, Billy Pugh has integrated “green” handles as a safe place to grab the load for final manipulation and positioning.

In all modes (e.g., IBC mode, FIBC mode, and pallet mode), the upper lifting frame includes eight (8) green handles on the top surface of the frame. These handles have been "green" colored for quick identification and safe hand positioning. Stated another way, the handles provide a safe place for a person to touch, grasp, or otherwise manipulate the lifter without risk of a pinching injury.

3.5.2 Internal Tote Bumper

The upper frame is equipped, internally, with a bumper that tightly centers the tote in the lifting frame. The bumper is made of pipe providing for radiused surface to ease the frame on and off the tote frames. The bumper also provides a safe place for personnel to place their hands for installation of the lifting slings or straps into the excavator hooks.

Radiused Internal Bumper and Hook "Pocket"

4.0 recommended practices

4.1 Safe Lifting Recommendations

When the IBC-1 Lifting Device is utilized to perform tasks, it is recommended that the lifting operation be performed under strict controls. At minimum, it is recommended that a Job Safety Analysis (JSA) be performed prior to the task taking place.

It is recommended that communication be established prior to and maintained throughout the operation. This communication whether radio or hand signals should be between the crane operator and the banksman/signalman.

It is recommended that all lifting equipment in service must have current certification or have been successfully load tested within the last year. All lifting equipment must be suitable for the lift and visually inspected for condition prior to each use.

Before lifting any FIBC:

- It shall be inspected for any damage
- The lifting loops or other lifting devices shall be positioned according to the manufacturer's instructions.

Particular attention should be paid to the lifting loops and their attachments. The examiner should look for signs of:

- Abrasion
- Cuts
- Ultraviolet degradation and / or chemical attack

When damage affecting the strength of the FIBC is discovered, the FIBC should be taken out of service immediately.

General FIBC Lift Considerations:

- Select the right FIBC for the job in consultation with the manufacturer or supplier
- Read the instruction label on the FIBC work within the stated SWL
- Inspect re-usable FIBC's before refilling
- Check that the discharge spout (if equipped) is closed off before filling
- Consider the possibility of static electricity hazards
- Protect the FIBC's from rain and / or prolonged sunlight
- Only use single-trip FIBC's once
- Repair heavy duty re-usable FIBC's only as per the manufacturer's instructions
- Never allow personnel under a suspended FIBC
- Prior to transferring FIBCs, the route of travel must be inspected for any objects or obstructions which would tear or puncture the bags as they are lifted.

Pallets

Prior to lifting, all pallets should be inspected to ensure:

- No unsecured material is lifted with the pallet
- The integrity of the pallet is adequate to accommodate the weight of the material to be lifted
- Goods on the pallet are secured

4.2 Inspection and Maintenance

4.2.1 Inspection Frequency

The following recommendations are in compliance with ASME B30.20 "Safety Standard for Below-The-Hook Lifting Devices". The end-user is recommended to adopt procedures that meet or exceed these recommendations.

	Frequency			
Type of Inspection	**Before Each Use**	**6 months**	**12 months**	**48 months**
Routine	x			
Detailed Sling Visual by 3rd Party		x		
Detailed Lifting Device Visual			x	
Load Test and NDT				x

***Remember: When inspecting any safety equipment, always err on the side of caution. The cost of a new lifter (or any safety equipment) is very small compared to the potential consequences of putting an unsafe or damaged device into service.

4.2.2 Routine Inspection

Perform a visual inspection of the following elements. Disassembly is not required unless the visual inspection identifies a potential issue.

- Confirm that all placards and labels are intact.
- Check the entire frame for bends, damage, corrosion or any deformity that would affect the strength or performance of the lifter.
- Check the green safe handles are secure and without deformation.
- Confirm that the nuts and cotter pins are in place on all lifting shackles
- Inspect lifting sling set for kinked wire or deformed components.
- Inspect the weld-on excavator hooks for damage and ensure all spring-loaded latches are in good working order.
- Check the vertical sling/hook assembles to ensure they are in good shape and hooks positively latch.
- Inspect the lifting pallet bars to ensure they are in good condition with no visible deformation, bending or distortion.

4.2.3 Detailed Sling Inspection

To inspect the sling set, remove it from the lifter and follow procedures according to accepted industry practice for sling inspection. This would include the hardware such as the master links, master link assemblies, and shackles. Look for excessive wear, damage or corrosion. Replace the sling and/or hardware if any of these conditions are present.

4.2.4 Detailed Lifter Visual

In general, review the overall appearance of the Lifting Device and the amount of usage that the unit has had over its service life. If the Upper Lift Frame or Pallet Bars do not look as though it should go back into service of has a general worn appearance, take it out. The detailed inspector should be qualified with knowledge of accepted industry practices of welding and fabrication. All welds should be in good condition with no cracks, excessive corrosion or damage.
The entire Lifting Device should be inspected in its entirety to identify any presence of deformation, cracks, or corrosion. In particular, the following welds should be examined after thoroughly cleaning the painted surface. Any sign of cracked paint at a weld seam should be investigated further with the removal of the paint.

- Inspect the welds on the lifting pad eyes.
- Inspect the welds of the lugs on the lower pallet bars.
- Inspect the welds of the weld-on excavator hooks.

4.2.5 Load Test and NDT

The Lifting Device should be load tested with 125% of the working load limit (e.g. 3,125kg for a WLL of 2,500kg) using the normal operating slings. The welds securing the lifting lugs to the frame should be inspected visually and also with magnetic particle (MPI) or die penetration (PT).

For more information and an up-to-date manual, please visit our website at www.billypugh.com

4.2.6 Inspection for Cargo Nets

Cargo nets should be inspected every 6 months. A qualified inspector (API definition below) should conduct these inspections.

Much of the lifespan of this product will depend on how it was stored (out of the sun), maintained and how much it is used. If the cargo net is not often used and kept in a dry place out of the sun, it should have an excellent lifespan (several years).

Procedure:

1. Inspect each rope for excessive wear. Inspect each rope looking for damage, degradation from the sun, cuts or any other excessive wear that could affect the performance of the ropes.
2. Visually inspect the hardware if applicable for damage
3. All splices on the net should have a minimum of 3 tucks

4. If the net fails any of these inspection criteria, take it out of service immediately. Note: Look at the overall appearance of the net. Much of any inspection is slightly subjective.
5. Inspect for modifications or non-OEM supplied components. Non-OEM components or modifications should be removed.
6. If in doubt of the worthiness of the cargo net, do not use it until another qualified inspector who is versed on lifting equipment can take a look at it for a second opinion.