IBC utilisation guide

IBC Handling Advice

Factors affecting PE liner performance

Chemical compatibility

UN Certification

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Introduction

Kingfisher Directs intermediate bulk containers include metal, plastic and composite types.

This utilisation Guide is intended to provide answers to frequently asked questions about Kingfisher Direct IBC's. What factors affect IBC performance? Will my chemical product be compatible? What does the UN marking mean?
Should you require information not contained within this Guide please contact the Kingfisher Direct sales team who will be pleased to assist.

IBC Handling Procedures

Kingfisher Direct IBC's can be handled in several ways using conventional, standard equipment. No specialised equipment is required. These guidelines are intended to assist the user with establishing procedures and should always be used in conjunction with current in house operating practice and relevant legislation such as HSE "Rider Operated Lift Trucks – Operator Training COP".

Fork Lift Truck

Conventional fork lift trucks can be used however there are several checks that should be made prior to use:

1) Is the total weight to be lifted within the lifting capacity of the truck, this should also consider the height to be lifted?
2) Do the forks pass across the base fully?
3) Is the vehicle in good working order?
4) Ensure that the forks are as wide as possible and at least 80% of the width of the load to be lifted.

When lifting always try to lift from the widest side. Avoid raised loads in congested areas or where people are working.

Approach the IBC with the forks approximately 50 mm from the floor level and parallel to the base, fully enter the base until the fork back is touching or almost touching the container.

Ensure that the brake is applied. Lift the IBC approximately 50 mm from the floor. Apply suitable tilt to the forks for the next stage of the journey, this is normally tilted back towards the truck.

Travelling should always be with the load as low as possible and the speed adjusted considering the surface to be travelled across. Acceleration, braking and cornering should always be done evenly and in control. Gradients should always be addressed with the fork lift on the down side and traversing gradients should be avoided.

When raising or lowering the load the truck should be stationary and the brake applied.

Pallet Truck

Many of the Kingfisher Direct IBC's can be handled with a pallet truck, however those fitted with anti-tilt bars or fork lift channels may not suit all types of pedestrian operated truck.

Consideration should be given to the type of truck to be used but it is not normal to attempt to move weights greater than 500 kg without assistance.

Stacking

When stacking use the lifting procedure as above with the following additional considerations:

1) Only stack containers that are designed to be stacked and ideally on containers of the same design.

2) Ensure that stacking is aligned, often the easiest way to identify this is to ensure the outlet valves are aligned.

3) Only stack containers on a smooth, even surface which is sufficiently supportive for the load. Normally containers above 2.0 m would not be stacked.

Overhead Crane

Many of Kingfisher Direct IBC's are designed to be lifted from above as standard, others have this facility as an option. It is important to check that this facility is available on the units intended to be lifted.

Lifting in congested areas or above a work area should be avoided.

It is advised to use a "spreader frame" during lifting to ensure that the load applied is even and correctly supported. It is normal that such equipment should be tested and approved for the load to be lifted.

Where chains are to be used it is vital that these are appropriately rated and in good order and that they are correctly secured before lifting. Units should be slung evenly and raised from four points ensuring a maximum angle of chain at 45 degrees.

Units should be raised just above ground level and held momentarily to ensure they are secure.

Factors Affecting PE liner Performance

There is a range of factors which can enhance or reduce the performance of polyethylene liners and these should always be considered when specifying IBC's for the carriage of hazardous chemicals.

Outdoor Weathering

Most plastics are highly resistant to weathering agents such as oxidation, extremes of temperature, humidity, wind, precipitation, chemical impurities in the atmosphere, fall-out, biological agents and light. They will however undergo some chemical transformation and consequent degradation when exposed to sunlight or fluorescent light for long periods. The result is discolouration, loss of clarity, loss of gloss, and tensile, impact strength reductions. Visibly polyethylenes will exhibit crazing, cracking and become increasingly brittle. In order to prevent this UV photo catalytic degradation the polyethylenes used in the manufacture of Kingfisher Direct IBC's are UV stabilised by adding a high strength HALS type UV stabiliser to the base polymer. Even greater protection can be provided by the incorporation of a small percentage of carbon black which effectively blocks out UV light.

Chemical Attack

Oxidisers are the only group of materials capable of chemically degrading polyethylenes. The polyethylene types chosen for Kingfisher Direct IBC's are resistant to many oxidisers but will be attacked to varying degrees by some acids.

Chemical + Physical Attack

This is encountered in two forms as environmental stress cracking (commonly referred to as ESC) and plasticisation due to absorption.

Stress Cracking

Stress cracking occurs when stress crack agents such as strong detergents are brought into contact with stressed areas of a container. If cracks are present for example as scratches or gouges the stress crack agents can cause propagation of the fracture resulting in wall failure.

The polyethylenes used in the composition of all Kingfisher Direct IBC's have very high ESCR (environmental stress crack resistance) values. UN Group II containers use polymers which match or exceed the maximum test results achievable. In addition the rotomoulding process used to produce the IBC liners is a largely stress free process. The combination results in liners with very high ESCR properties.

Plasticisation

Polyethylene will absorb certain chemicals and this will result in swelling, weight gain, softening and some loss of stiffness. These plasticising agents do not

chemically degrade the polymer and in some cases they are sufficiently volatile that their removal from contact with the polymer results in drying out and a return to the original polymer properties. The chemicals concerned are chiefly solvents and other hydrocarbon derivatives. For a variety of reasons some of these materials are not considered compatible with Kingfisher Direct IBC's and this is indicated in the chemical listing.

Filling

When filling Kingfisher IBC's ensure that filling nozzles do not damage the neck of the container the inside of the container or it's closure.

Closures should be correctly attached and tightened to the correct torque setting defined in their relevant UN certification. Where vented closures are to be used, ensure they are in good condition, all components are present and undamaged, and that once attached, containers are only stored upright.

Temperature of Contents

Chemicals are more reactive at elevated temperatures. With some acids, raising their temperature 10° to 20° C above room temperature will cause accelerated attack of the polyethylene container wall - thermal oxidative degradation. For this reason the practice of diluting acids within Kingfisher Direct IBC's is not recommended. The exothermic reaction which occurs can lead to premature embrittlement and potential impact failures.

Physical Abuse

IBC's that are physically mishandled, dropped or dragged on their sides are less likely to realise long service life.

If handling equipment is to be employed ensure that it is suitable for use with the IBC design.

IBC Dedication

The adoption of a dedicated IBC policy greatly improves service life expectancy. The use of individual IBC's for the carriage of more than one chemical substance is not recommended. Such practice can lead to liner failures as synergistic reactions between the residues of one product and new contents can occur. Laundering (rinsing out of IBC's) is not always effective in removing residues especially in the case of chemicals which permeate the polyethylene liner wall.

Container Laundering

It is recommended that IBC's are rinsed before initial filling in order to remove any possible contaminants from production finishing operations. This is particularly important prior to packing high purity solutions.

Rinsing out IBC's with clean water before each repeat filling helps remove residues and also prevents cross contamination.

Light Sensitive Chemicals

Chemicals which are subject to photo catalytic reactions such as Sodium Hypochlorite are best packed within black containers. This will prevent reactions occurring that could accelerate chemical degradation of the container.

As mentioned previously black containers will also provide longer service life since they are resistant to UV attack from sunlight.

Mixed Chemical Solutions

These should always be assessed carefully. The synergistic reactions possible in such formulations are often aggressive and can cause premature liner failure. If in doubt contact the Kingfisher Direct sales team for advice.

Chemical Compatibility & Service Life

The following table is intended as a guide to the suitability of various chemicals for storage in Kingfisher Direct IBC's. It is an amalgamation of the various standard information which normally appears on separate sheets.

Since Kingfisher Direct has no control over the conditions of service that are encountered by individual IBC's no assurances in any form are provided.

The list of chemicals shown is of course not exhaustive. Wherever solutions are to be packed for which no data exists we strongly recommend that the end user determines acceptable compatibility by conducting laboratory tests.

Mixed chemical solutions should always be assessed carefully. The synergistic reactions possible in such formulations are often aggressive and can cause premature IBC failure. If in doubt contact the Kingfisher Direct sales team for advice.

All advice contained here is based on ambient conditions of temperature and pressure.

Abbreviations used in the table

S	-	Suitable	-	Storage of these materials is not detrimental to the package
V	-	Variable	-	Seek further advice
C	-	Corrosion	-	Gradual corrosion will occur, requires Checking
N	-	Not Suitable	-	Storage of these materials is not recommended. *Indicates known stress crack agents.
U	-	Unknown	-	No data available

	Chemical		IBC Composition				Ancillaries							Comments
		CONC. %	PE	ST	304	316	GRPP	GRPE	BRASS	STEEL	316	EPDM	VITON	
A	Acetic Acid	0-50	S	N	S	S	S	S	N	N	S	S	S	
		51-80	V	N	S	S	S	S	N	N	S	S	V	
		81+	V	N	S	S	S	S	N	N	S	S	N	
	Acetic Anhydride		N*	N	S	S	S	S	N	N	S	V	N	Suggested spec. 304 / PTFE seals
	Acetone		N	S	S	S	S	S	S	S	S	S	N	Suggested spec. 304
	Aluminium Chloride		S	N	N	N	S	S	N	N	N	S	S	Suggested spec. composite / EPDM
	Aluminium Sulphate		S	N	C	S	S	S	N	N	S	S	S	Suggested spec. composite / EPDM
	Ammonia Solution		S		S	S	S	S	N	S	S	S	S	Any container with PRV.
B	Battery Acid *See Sulphuric Acid 40%*													
	Benzene		N		S	S	V	V		V	S	N	V	Suggested spec. 304
	Benzyl Alcohol		N				S	S				V	N	
	Bleach *See Sodium Hypochlorite*													
C	Calcium Chloride	All	S	N	C	S	S	S	N	N	S	S	S	
	Calcium Hydroxide	All	S		C	S	S	S	S	S	S	S	S	
	Calcium Hypochlorite	All	S	N	C	S	S	S	N	N	S	S	S	
	Carbon Tetrachloride	10	N	N	C	C	N	N	N	N	C	N	S	
		Pure			S	S	N	N	N	N	S	N	S	
	Caustic Potash *See Potassium Hydroxide*													
	Caustic Soda *See Sodium Hydroxide*													
	Chloro benzene		N		S	S	N	N	V	V		N	N	
	Chloro methane		N		S	S	N	N	S	V		N	N	
	Chloroform		N		S	S	N	N	V	V		N	N	
	Chromic Acid	10	S		S	S	S	S	N	N	S	V	S	
		50	S		C	C	V	V	N	N	C	N	S	
		100	S		N	N	V	V	N	N	N	N	S	
	Citric Acid	10	S		S	S	S	S	N	N		S	S	
		50	S		C	C			N	N				
		Conc.	S		S	C			N	N				
	Copper Salts,		S		V	V	S	S	N	N	V	S	S	
	Inc. Chloride		S		N	C	S	S	N	N	C	S	S	
	Carbonate		S		S	S	S	S	N	N	S	S	S	
	Nitrate		S		S	S	S	S	N	N	S	S	S	
	Sulphate		S		S	S	S	S	N	N	S	S	S	
D	Detergents		V		S	S	V	V			S	V	V	Some detergents are known stress crack agents
	Dichlorobenzene		N				N	N	U	U		N	V	
	Dichloroethane		N		S	S	N	N	U	U		N	S	
	Dichloroethylene		N				N	N	U	U		N	N	
	Diesel		N				N	S	S	S		N	S	
	Diethyl amine		N				S	N	S	S		N	N	
	Dimethyl amine		N				S	S	U	U		N	N	
E	Ethyl acetate		N		S	S	S	S	N	V		V	N	
	Ethyl alcohol (ethanol)		S				S	S	V	S		S	N	
	Ethyl Chloride		N		S	S	N	N	N	N		N	N	
	Ethyl Ether		N		S	S	V	N				N	N	
	Ethylene Chloride *See Dichloroethane*													
	Ethylene Glycol		S		S	S	S	S	V	S		S	S	

	Chemical		IBC Composition				Ancillaries							Comments
		CONC. %	PE	ST	304	316	GRPP	GRPE	BRASS	STEEL	316	EPDM	VITON	
F	Ferric Chloride		S		N	C	S	S	N	N	N	S	S	
	Ferric Hydroxide		S		S	S	S	S			S	S	S	
	Ferric Nitrate		S		S	S	S	S	N	N	S	S	S	
	Ferric Sulphate		S		S	S	S	S	N	N	S	S	S	
	Ferrous Sulphate		S		S	S	S	S	N	N	S	S	S	
	Formaldehyde		S		S	S	S	S	S	N		S	S	
	Formic Acid	0-50	S	N	S	S	S	S	N	N	S	S	S	Suggested spec. composite or
		51-100	S	N	N	N	S	S	N	N	S	S	N	316 / EPDM seals
H	Heptane		N				V	V	S	S		N	S	
	Hexane		N				V	V	S	S		N	S	
	Hydrochloric Acid	All	S	N	N	N	S	S	N	N	N	S	S	Suggested spec. composite / EPDM or VITON
	Hydrofluoric Acid	0-40	S		N	N	N	N	N	N		N	S	
		41-60	S		N	N	N	N	N	N		N	V	
		61-100	S		N	N	N	N	N	N		N	V	
	Hydrogen Peroxide	0-50	S	N	C	S	S	S	N	N	S	N	S	Container must be vented
		51-100	S	N	C	S	V	S	N	N	S	N	V	including all cavities such as the ball valve
I	Isopropyl Alcohol		S				S	S	S	S		S	S	
L	Lactic Acid		S		C	S	S	S	S	N		V	S	
	Lubricating Oils		V		S	S	V	S	S	S		N	S	Advise PVC or steel valve
M	Methanol		N		S	S	S	S				S	N	
	Methyl Acetate		N				S	V	S	S		V	N	
	Methyl Amine						V	V				V	V	
	Methyl Chloride *See Chloro Methane*													
N	Nitric Acid	0-40	S	N	S	S	S	S	N	N	S	S	S	Suggested spec. 304 however
		41-50	S	N	S	S	S	S	N	N	S	V	S	composites can be used up to
		51-70	V	N	S	S	N	V	N	N	S	N	S	50%
		71-100	N	N	S	S	N	N	N	N	S	N	N	
P	Petroleum													
	- Paraffin		V		S	S	S	S			S	N	S	Special HDPE grades only
	- Petroleum		V		S	S	V	S			S	N	S	
	- Diesel		V		S	S	N	S	S	S	S	N	S	
	- Fuel Oil		V		S	S	N	N			S	N	S	
	Phosphoric Acid		S		C	S	S	S	N	N		S	S	
	Potassium Carbonate		S		S	S	S	S	S	N		S	S	
	Potassium Chlorate		S		S	S	S	S	S	N		S	S	
	Potassium Chlorite		S		S	S	S	S	S	N		S	S	
	Potassium Chromate		S		S	S	S	V				S	S	
	Potassium Hydroxide	All	S		S	S	S	S	N	S	S	S	N	
	Potassium Nitrate		S		S	S	S	S	S	S		S	S	
	Potassium Phosphate		S				S	S				S	S	
	Potassium Sulphate		S		S	S	S	S	S	S		S	S	
	Proprionic Acid	50	V				S	S				S	S	Suspected stress crack agent
		100	V				V	V				S	S	VITON seals advised
	Propylene Glycol		S				S	S	S	S	S	S	S	
S	Saltpetre *See Potassium Nitrate*													
	Sodium Carbonate		S		S	S	S	S	S	N	S	S	S	
	Sodium Chlorate		S		S	S	S	S	S	N	S	S	S	
	Sodium Chloride		S		C	S	S	S	S	N	S	S	S	
	Sodium Chlorite		S				S	V				S	S	
	Sodium Hydroxide	All	S	S	S	S	S	S	S	S	S	S	N	Seals EPDM, PTFE not VITON

	Chemical		IBC Composition				Ancillaries							Comments
		CONC. %	PE	ST	304	316	GRPP	GRPE	BRASS	STEEL	316	EPDM	VITON	
	Sodium Hypochlorite	All	S	N	N	C	S	S	N	N	C	S	S	Suggested spec. composite with black liner and PRV. Special conditions apply to PCM
	Sulphuric Acid	0-30	S	N	N	S	S	S	N	N	S	S	S	Suggested spec. up to 77% composite / EPDM, above 77% 316 / PTFE
		31-85	S	N	N	C	S	S	N	N	C	S	S	
		86-90	S	N	C	S	S	S	N	N	S	V	S	
		91-96	V	N	C	S	V	V	N	N	S	N	S	
		96+	N	N	S	S	N	N	N	N	S	N	V	
	Sulphurous Acid		S		S	S	S	S	N	N	S	V	S	
T	Toluene		N				N	N	S	S	S	N	N	
	Trichloroethylene		N		S	S	N	N	S	S	S	N	N	
	Turpentine		N		S	S	N	V	S	S	S	N	S	
U	Urea		S				S	S	S	S	S	S	S	
V	Vegetable & Animal Oils													
	- Aniseed		N											
	- Beeswax		S											
	- Butter		S											
	- Camphor		N*											
	- Castor Oil		N*											
	- Cinnamon		N											
	- Clove Oil		N											
	- Coconut		S				S	S				N	S	
	- Codliver		S											
	- Corn Oil		S				S	S				N	S	
	- Cottonseed		S											
	- Fir Needle		N											
	- Honey		S											
	- Lemon Oil		N											
	- Linseed		S				S	S				N	S	
	- Molasses		S				S	S				S	S	
	- Nutmeg Oil		N											
	- Olive Oil		S				S	S				N	S	
	- Palm Oil		S				S	S				V	S	
	- Peppermint		N											
	- Pine Oil		N											
	- Sesame		S											
	- Soy Oil		S											
	- Starch		V				S	S				S	S	
	- Tar Oil		N											
	Vinyl Chloride		N				N	N				N	V	
X	Xylene		N				N	N	S	S	S	N	S	
Z	Zinc Chloride		S		N	C	S	S	N	N	N	S	S	
	Zinc Sulphate	0-50	S		S	S	S	S	S	N	S	S	S	
		51-100	S		C	S	S	S	S	N	S	S	S	

UN Certification

Regulations and Testing

The packing and carriage of hazardous chemicals is controlled within the EC via modal regulations. Those most applicable to are the ADR and RID regulations which cover road and rail transportation respectively.

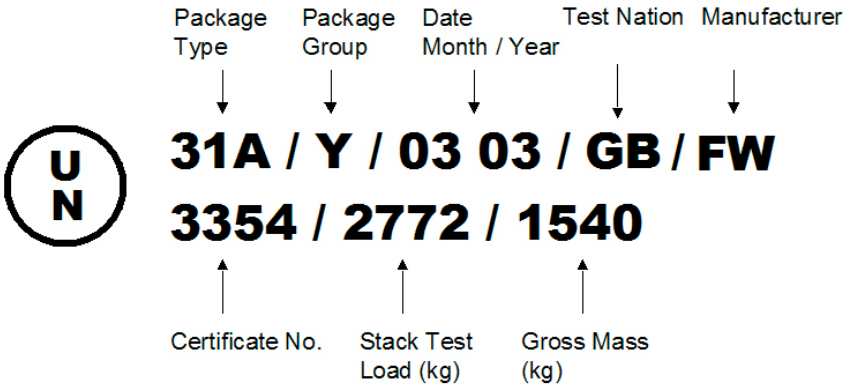
In order for an IBC to be used with hazardous chemicals it must be tested and certified in accordance with the ADR and RID regulations. The performance tests applied are those defined by the United Nations and include a bottom lift test, a top lift test, a stacking test, a leakproofness test, a hydraulic pressure test and a drop test.

IBC Marking

All chemical products have a hazard rating and an associated Packaging Group as follows:

Extreme Hazard	Group I	Pack Group X
Moderate Hazard	Group II	Pack Group Y
Low Hazard	Group III	Pack Group Z

IBC's, once tested, have to display a marking which indicates their UN test rating and packaging group. An example marking with an explanation of its components is shown below.



All UN certified Kingfisher Direct IBC's have corrosion resistant metal plates attached to them with their respective UN marking.

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