



Beck

FISH BLOCK MANUAL

Contents

| | |
|---|----|
| INTRODUCTION TO MAKING FROZEN FOOD BLOCKS WITH BECK BLOCK LINERS® | 4 |
| DEFINITION OF A BECK FOOD BLOCK..... | 5 |
| BECK LINERS® AND FRAMES..... | 5 |
| BECK CERTIFICATIONS..... | 5 |
| BECK FRAMES..... | 6 |
| BECK FREEZER FRAME BOTTOMS..... | 7 |
| BLOCK FORMING PROCESS..... | 7 |
| PLACING A BECK LINER® IN A BECK FREEZING FRAME | 7 |
| PACKING A BECK LINER® | 8 |
| BECK-LASE..... | 9 |
| FREEZING THE BLOCKS..... | 10 |
| HORIZONTAL CONTACT PLATE FREEZERS..... | 10 |
| EJECTION OF THE BLOCK FROM FRAME..... | 12 |
| STORAGE OF FROZEN PRODUCTS..... | 12 |
| FRAME WASHER | 13 |
| SECONDARY PROCESSING REQUIREMENTS..... | 13 |
| QUALITY CONSIDERATIONS | 13 |
| BLOCK PACKING TRAINING SEMINARS..... | 14 |
| CONCLUSION..... | 14 |
| CONTACT INFORMATION..... | 16 |

INTRODUCTION TO MAKING FROZEN FOOD BLOCKS WITH BECK BLOCK LINERS®

Welcome to the world of frozen food blocks. The process of producing fish blocks was developed by Beck Pack Systems over 50 years ago. It is a process using Beck products to help produce perfectly uniform and solid blocks of food that can resist dehydration and freezer burn for a number of years. Read on and let our knowledge assist you in developing the best process to ensure freshness and food safety for your product.

Frozen food blocks are rectangles of fillets, bits and pieces, roe, mince, or pulp protected by a Beck Liner®. Fish, chicken, beef, pork, and various types of foodstuffs¹ are frozen in Beck Liners®. Freshly packed Beck Liners® are placed in horizontal plate freezers for a quick freeze ensuring the highest level of product freshness. Frozen foods processed in Beck Liners® reveal themselves as the premier primary product form to be further processed within hours of production or years later after being pulled from frozen storage.

The Beck Liner® design protects food blocks better than any other method from the time of packing until the liners are removed, assuring the processors of the highest yields. Frozen blocks' vulnerability to dehydration and oxidation during storage and transport to their next destination is the reason the Beck Liner® is the most utilized liner in the world. Beck delivers protection throughout the supply chain. Beck's design also ensures food safety and traceability for the customer. The Beck Liners® are the only liners in the world to be FSSC 22000 certified. Your product is safe, as is your investment.

Beck Liners® offer their customers the best performing liner which adheres to the food product to protect it yet releases easy enough to guarantee no sticking. This will enable you to experience the highest profits available for your products.

Beck Liners® are part of a system including:

- Beck Liners®.
- Beck Freezer Frames to give shape to the product to be formed.
- Beck-Lase traceability system for safe and easy laser marking of each individual block.
- Beck Trolley for intermediate storage before freezing.

- Horizontal plate freezers for freezing.
- Beck block ejectors to remove the blocks of food from the frames after freezing.
- Frame washer for cleaning the frames.
- Further packing system for long-term storage.
- Beck Block Packing Training Seminar.

Secondary processors (i.e. fast food restaurants, wholesalers, and retailers) of food blocks require a nearly perfect rectangle of food with straight edges and sharp corners. Frozen food blocks are stripped of their Beck Liners® and sent through very accurate portioning systems. When the block passes through the portioning machine perfectly and produces flawlessly sized burgers, fingers (sticks), portions, nuggets, cubes or other items, secondary and primary processors are on their way to a financial success. Beck Liners® give you the security in knowing that your blocks will meet and exceed your customers' expectations creating a profitable future for both of you.

Beck guarantees precise liner dimensions and pre-folds the liners for ease and accurate insertion into a Beck Freezer Frame. This is a constant promise from Beck: consistency every time you make a sale.

At the end of the day, Beck Liners® give you the confidence to know you have the highest quality product possible, returning to you the highest possible profits.



¹ Please contact Beck Pack Systems A/S to ensure that the Beck Liner® is suitable for your specific foodstuff.

DEFINITION OF A BECK FOOD BLOCK

A food block packed in a Beck Liner® is a uniform, compact and cohesive mass of fish, chicken, beef, pork, fruit pulp, vegetable or other food frozen together under high pressure in a horizontal plate freezer.

A typical block is 7,484 g (16.5 lbs). Why this size? Optimal freezing times and ease in handling by packers and by requirements of the secondary processors. Block sizes can range from small retail portions to larger wholesale units. Beck customizes to industry needs.

MARKET STANDARD BLOCK

Weight: 7,484 g (16.5 lbs) +/- 55 g.
Dimensions: 48.2 cm x 25.4 cm x 6.27 cm (19 inches x 10 inches x 2.5 inches).

BECK LINERS® AND FRAMES

There is no better protection for frozen food products other than using a Beck Liner®. Beck Liners® protect your product until the liner is removed for secondary processing.

Beck Liners® are of vital importance in producing top quality blocks. Beck Liners' role is multi-purpose:

- To prevent formation of voids (air pockets).
- To protect against freezer burn during plate freezing and during cold storage.
- To make a block with sharp edges and corners.
- To adhere just enough to the block surface to protect against freezer burn yet allow easy removal.

No liner or freezing method is better than Beck's at maintaining the delicate balance between two factors. Each Beck Liner® is thick enough to withstand handling during the packing process and will protect the fish blocks against damages during storage and transportation. The Beck Liner® is also thin enough to optimize the insulation property as well as yield the shortest freezing period.

The coating on the outside of a Beck Liner®, a proprietary food grade coating, is impermeable (oxygen barrier) as it prevents dehydration of the product. During the block ejection process, Beck's coating allows easy separation between the liners and the frames without any damage to the liners.

The inner surface of a Beck Liner® gives food blocks an incomparable completely smooth surface, with an abso-

lute minimum of air pockets. Beck's coating eases in the removal of the liners from the food block. Conversely, Beck Liners® adhere to the food blocks to prevent dehydration and freezing burn. The adhesion and release of a Beck Liner® is a delicate balance. You will find your customers extremely satisfied and you also see them become dependent on your future supplies.

Customers often choose to custom print their Beck Liners® for product differentiation. For example, in the fish sector, there can be multiple products packed at one time with varying values (i.e. deep skin fillets, fillets, skin-on fillets, bits and pieces, mince and roe). Processor logos are also applied to promote brand recognition. Beck Liners® can be pre-printed before delivery to the block packer or laser printed during block production. With our years of printing experience, we look forward to assisting in developing your printing solution and artwork.

BECK CERTIFICATIONS

Among other certifications, Beck Liners® are FSSC 22000 and ISO 9001 certified. Please visit our website (www.beck-liner.com) to view all of Beck's certification. These certifications enforce our commitment to food safety and traceability.



BECK FRAMES

Beck Freezer Frames, for freezing food blocks, are approved for packaging and handling of foodstuffs. The frames are made of aluminum, they are sea water resistant, and the material quality is approved for food contact use.

Profiles can vary between U, E and XU profiles, in a single or double frame configuration, with loose or fixed bottoms.

U frames are lighter and used more typically in manual operations. Beck XU frames are the strongest freezer frames on the market offering a heavy-duty alternative typically seen on board fishing vessels. Beck XU frames are designed not to lock into one another and are ideal for conveyors. Beck Freezer Frames are guaranteed to be structurally strong and capable of withstanding the expansion pressure of the freezing block. We guarantee that the final block dimensions will be completely accurate.

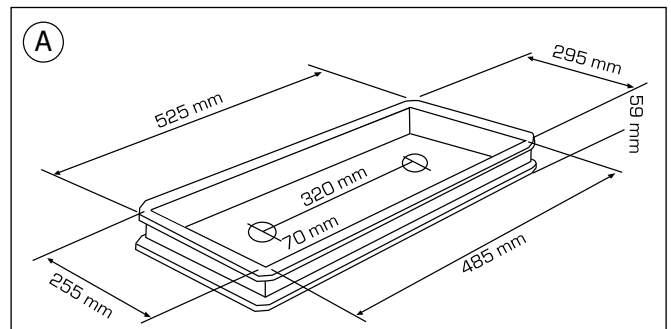
Perfectly shaped food blocks are further processed into fingers, burgers, cubes, and cutouts. Exact portioning of these items is a stringent demand by the block producers' customers. The strength of the Beck Freezer Frame ensures that food blocks are strong, precisely sized and has sharp edges. The inside length and width of new Beck Freezer Frames is within +/- 0.5 mm to guarantee correct frozen block size and maintain the sharp edged shape. Double and single frames are available, but most frames used today are the single type. The importance of using Beck Liners® and frames to ensure the correct size and shape of the final food block will also ensure the highest profits for you and the greatest yields for your customers.

Regardless of whether Beck U-, E- or XU-profile frames are used, the frames must be maintained in good condition, and cleaned between each freezing cycle. Templates/frame measurement boards are available to check on the proper shape and condition of the frames.

Dimensions of Beck Single frames:

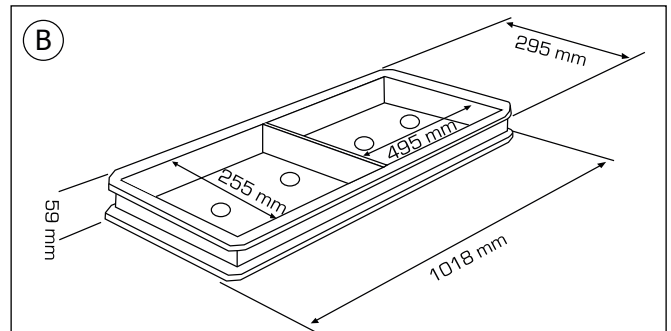
Inside Dimensions: 485 x 255 mm

Outside Dimensions: 525 x 295 mm Height: 59 mm



Dimensions of Beck Double frames:

Inside Dimensions of Individual Block Area: 485 x 255 mm



Outside Dimensions of Entire Frame (2 Block Areas):
1018 x 295 mm Height: 59 mm

BECK FREEZER FRAME BOTTOMS

A snug fitting bottom plate is used below the frame to assist moving the frame and block from the worktable to the plate freezer. With Beck's years of experience, we can guarantee the best bottom fit and best performance in the block ejector. This saves time and money.

Beck Freezer Frame bottoms are made of:

- Stainless Steel AISI304: 0.8 mm, 1.0 mm, 1.25 mm and 1.5 mm
- Aluminum: 2.0 - 3.0 mm

For sanitary reasons, stainless steel bottom plates are recommended.

Do not use bottom trays as lids on top of the block, as it will impair the contact between block and plate freezer.

LOOSE FREEZER FRAME BOTTOM

Beck's loose Freezer Frame bottoms are removable so that with each use, cleaning of the frames and bottoms is easier.

ATTACHED/FIXED FREEZER FRAME BOTTOM

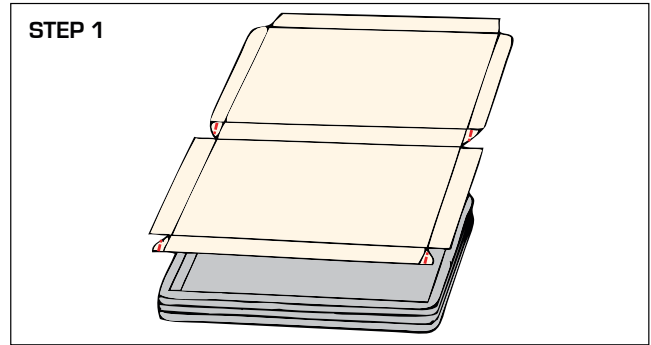
Holes are punched in the Beck Freezer Frame Bottoms to allow pistons on the Beck Block Ejector to press out the frozen block from the frames. Holes are made to fit the Beck ejector loading directions and piston type or per customer requirements.

Contact Beck for advice about which type of frame and bottom is suitable for your application.

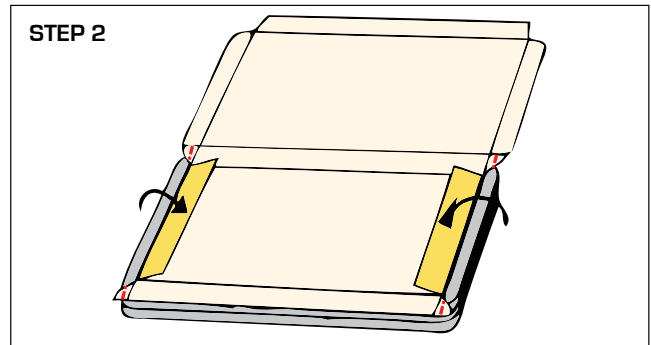
BLOCK FORMING PROCESS

PLACING A BECK LINER® IN A BECK FREEZING FRAME

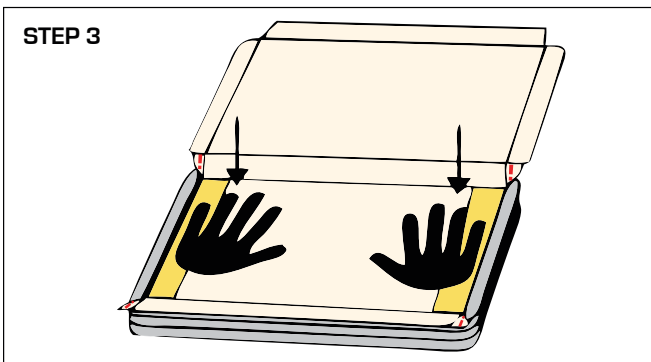
Food products to be frozen into blocks are packed in a Beck Liner® which rests in the Beck Freezer Frame. A Beck Liner® is inserted into a freezer frame using the following steps. These steps guarantee the correct placement of the flaps, which, in turn, guarantees that your customer will be processing the highest quality blocks.



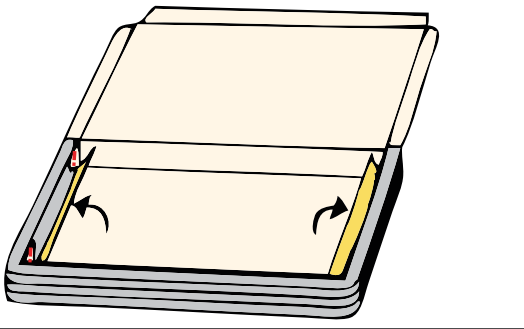
- Set the Beck Liner® above the frame. The lid of the liner is the furthest away from the frame.
- The bottom of the liner should be directly over the frame body. Side flaps will overhang the frame in this position.



- The Beck Liner® will fit inside of the frame and the side flaps will fold into the frame.



- Push the Beck Liner® down and into the frame with both hands.

STEP 4

- Side flaps are folded up to be along the side of the frame.
- The Beck Liner® is now ready to have the product (fish, chicken, fruit, etc.) placed inside of the liner.
- When full, the lid can be folded back over the frame.
- Ensure to establish contact between the Beck Liner® and the product to remove air by gently stroking the liner with your hands.
- The three lid flaps (sides and front) are tucked in between the bottom flaps and the frame.
- The packed frame is now ready to go to the plate freezer.

PACKING A BECK LINER®

After the fresh or thawed food products have been processed into fillets, bits and pieces, mince or pulp, they are portioned into the Beck Liner® which sits perfectly in a Beck Freezer Frame.

Beck Liners® are designed in such a way to ensure that as the block freezes, the expanding mass will fill out the Beck Liner® evenly and have square corners. This configuration also allows for continuous contact with the plate freezer at all times during the process.

FILLETS

Fillet blocks are normally packed with the fillets placed lengthwise in the Beck Liner®. The butt ends of the fillets are placed flush against the liner with the tails towards the center with none of the fillets folded over. It is important to keep the fillets straight and flat to avoid areas where water is able to build up. Fillets must be laid in the liner in a staggered or shingled manner to even out the pack height. Large fillets must be cut to avoid the formation of internal voids and ice pockets.

1) LONG PACK

The flesh sides of the fillets (the side from the center of the fish's body) are all oriented in one direction, facing towards the top and bottom of the block. This keeps the skin or a fattier side of the fillets more protected and reduces oxidation and early rancidity of that area of the fillet.

2) SANDWICH PACK

Both the top and bottom layers of the block are packed as in the typical long pack block. The difference is that the center of the block is filled with a jumble of fillets without any specific orientation. Folding and twisting of the fillets in the center of this style is acceptable. Fillets on the top and bottom of the block serve as anchors for the interior and give the block strength to withstand cutting/portioning. Care must be taken to ensure that no internal ice pockets and/or voids are created in this procedure. To minimize this risk, it is imperative that the fillets be somewhat dry and folded over rather than a 100% random jumble. A Sandwich block is usually faster to pack than the more carefully packed long pack block.

3) STRIP BLOCK

This is when fillets are sliced lengthwise by rotation knives set at $\frac{3}{4}$ to 1 inch (19 - 25 mm) apart. The sliced fillets are poured into the Beck Liner® and frozen. No layering on the top and bottom surface is needed as in the Sandwich style. The fillets should be dryer than a typical Long Pack. This style of block is very rapid to produce and the lines that make it can be semi-mechanized to reduce labor costs.

4) SCRAMBLE/JUMBLE BLOCK

This is a form of Sandwich Block without the necessary alignment at the top and bottom of the block. Whole fillets are used.

BITS AND PIECES AND MINCE

These are the easiest and most tolerant of the packing styles. These blocks may be composed of trimmings, pieces of fillets and partially ground portions. To avoid drip loss, it will be necessary to keep the raw material to be minced as free of excess moisture as is possible. Another key advantage to the minced block is that with the proper piping and pumps, the mince can be moved anywhere in the factory to a packing location. In addition, the process can be mechanized with automated weigh portioners.

Care must be taken to use proper mince pumping equipment. Aggressive pumps can damage the protein of the small pieces and result in a tough finished texture. Pulping machines also damage the final texture.

When factories are packing multiple products (i.e. fillets and mince) care must be taken not to mix the various styles in the finished packaging. The easiest way to do this is through custom pre-printing the Beck Liners® or by using the Beck-Lase marking system and a printable Beck Liner during block production.

PACKING WEIGHT

The target weight of an industrial standard block is 7.484 kg (16.5 lbs). The initial infill (fresh) weight of a block should be packed slightly higher than the target weight. The extra weight will compensate for water loss during the freezing process. The initial infill weight of the fresh fish is to be established by trial and error weight tests.

The major difference between minced blocks and fillet blocks is that the raw input weight typically must be higher for minced blocks. This is due to the increased moisture content in the minced flesh. As in fillet blocks, trial and error will determine the exact input weight.

| Type of block | Target weight | Recommended initial over pack* |
|---------------------------------|---------------------|--------------------------------|
| Fillet & Bits and pieces blocks | 7.484 kg (16.5 lbs) | +25-75 g |
| Mince blocks | 7.484 kg (16.5 lbs) | +100-150 g |

* Note: the over pack is dependent upon free moisture content of the fish, type of fish, possible storage/stand time and temperature and customer desires. As a rule, overfilling reduces surface pockets and voids but also depends on the elasticity of the fillets. To avoid internal ice/void problems, it is extremely important that the fillets be out of rigor and dry.

The Beck Liner® is designed for holding 7.484 kg (16.5 lbs) of fish. Excessive over pack of the liner may cause the liner to burst.

BECK-LASE

Ensuring traceability in your block production is crucial and requires each block to be clearly marked. For this purpose, Beck has developed a fully automated block marking and traceability system, which eliminates manual marking of fish blocks.



The system is based on marking with a CO2 laser which works without compromising the waxed layer or the paper. The marking of the fish block is created between the wax and paper with a special food safe ink that reacts with the laser, thereby permanently marking the blocks with for instance details about product type, time of production, batch codes, barcodes or QR codes.

The system has several benefits over manual marking of blocks with crayons:

- Automated marking of each block
- 100% traceability
- Increased production efficiency (much faster than manual marking)
- Eliminates mislabeling
- Clear print - no smearing
- No more use of crayons in the production area
- Increased food safety

Printing of the block is recommended to take place after the product is filled in the Beck Liner®, but should happen before plate freezing, as the surface of the Beck Liner® must be as dry and clean as possible during printing.

FREEZING THE BLOCKS

Once the liners have been filled with product and marked, they are either conveyed or hand delivered to a plate freezer.

It is important not to stack the packed frames on top of each other before plate freezing as stacking results in excessive pressure on the product which leads to drip loss and underweight blocks.

It is recommended to always use a Beck trolley for intermediate storage of packed frames before plate freezing. Beck trolleys are available for both single and double frames for easy transport of both packed and empty frames.



It is recommended that intermediate storage (time between packing and starting of freezing) is no more than 30 minutes – this to reduce drip loss and stressing of the Beck Liner®. However, there should also be sufficient time for the porous inner surface of the liners to absorb the humidity necessary to protect the blocks against dehydration during storage, and to get the flaps to adhere to the block.

Beck Freezer Frames are made of aluminum which is an extraordinary conveyor of cold. Aluminum is soft enough to be damaged on conveyor belts lined with stainless steel. Aluminum can also be damaged when hit with metal bars used to remove the frame and block from the freezer. Any metal (or metal covered with plastic) hit against the frame will cause it to chip and flake minute pieces of aluminum. These tiny fragments WILL find their way into the finished product. This process will result in blocks being rejected by secondary processors at great expense to the manufacturer of the block. As a rule: DO NOT ALLOW FRAMES TO BE DAMAGED IN THE PROCESSING STEPS. Constant vigilance and checks must be made to assure the frames are not being damaged.

HORIZONTAL CONTACT PLATE FREEZERS

Horizontal contact plate freezers offer the best way to freeze and preserve portioned food products while providing ease in handling, ease in transportation and ease during storage. Beck Liners® packed with product in freezer frames are slid into the plate freezers, in between plates. When the freezer is fully loaded the operator activates the plates to push down onto the filled Beck Freezer Frames. The applied pressure pushes product out into all the air space in the Beck Liner® (in the frame). After freezing, the plates are released and the frozen product in the frames is removed.

Pressure during freezing must be exerted evenly across the entire block to provide a cohesive block, just the right amount of water retention and maintain smooth, uniform surfaces around the block.

The plate freezers are generally for manual loading and unloading. However, freezers for automatic operation are available but need more room in the processing plant.

The freezing plant must have ample capacity to operate at an evaporating temperature of -38°C to -40°C (-36°F to -40°F) to ensure a surface temperature of the freezing plates of approx. -34°C. (-29°F)

The handling time for unloading and loading of a plate freezer depends on the size of the plate freezer, the number of Beck Freezer Frames in the freezer, availability of a full number of packed frames for a freezer and the quickness of the handling. Generally, the handling time can be estimated to 15 - 25 minutes. Blocks waiting in the freezer should never be allowed to sit for longer than 30 minutes. The longer times allow water in the block to drain out of the block, which causes ice pocket formation and possible degradation of the liner.

The effective freezing time of freezing blocks to a core temperature of approx. -18°C (0°F) will typically be 1.5 to 2 hours, provided the freezing plates are free from ice and the bottom plates of the frames are smooth so that good contact is obtained. Note; in a properly functioning plate freezer, core temperatures of the blocks after freezing can range anywhere from -23°C to -34°C to. (-10°F to -29°F)

For most products a plate pressure of the plate freezers of about 0.2 - 0.25 bar is sufficient. However, for blocks, which are to be cut up into "fingers"/portions, a plate pressure of 0.5 - 0.7 bar is often required to make sure that the blocks are homogeneous and without air pockets.

The freezing process causes the high moisture fillets to expand by as much as 7%. This expansion is in all directions but is most pronounced at the top surface. Freezers designed for this operation have pressure relief valves, which allow the plates to move and thus allow most of the expansion to raise the top edge of the block. The pressure also causes the fillets to press against each other and literally fuse together into a single block of flesh. Note; voids can be caused by a lack of sufficient plate freezer pressure on the block or by lack of sufficient flesh in the liner.

Crowning: If blocks are taken out of a plate freezer too early, and the core temperature of approx. -18°C (0°F) was not obtained in the plate freezer, a problem will occur. The product will continue to freeze while in the storage freezer without a frame to maintain the proper dimension. Due to the continuous freezing in storage the blocks will expand further, and a curved surface will result.

Rigor: It is vital that all fillets packed into a block have passed through rigor. When pre-rigor or in-rigor fillets are packed in a Beck Liner®, the continuing movement of the fillets will result in breakage of the portions cut from the block in the post freezing manufacturing plant. Product packed in rigor can also cause voids and ice pockets. For example, as fish in rigor release intracellular fluids, even while in the plate freezer, ice pockets can form. When the fillets eventually go through rigor (even during the frozen state), the previously fused fillets will separate.

EJECTION OF THE BLOCK FROM FRAME

The most common and least damaging method of removing the frozen block from the Beck Freezer Frames is with a pneumatic/hydraulic Beck Block Ejector. A Beck Block Ejector uses metal pistons to push the block of food packed in a Beck Liner® out of the Beck Freezer Frame (through holes in the bottom plate if one is attached).

If the block is too cold during storage it will result in very brittle and easily damaged block. At -30°C (-22°F) the block will maintain its protein quality but can be easily damaged if mishandling occurs. This is why hammers cannot be used to remove the blocks from the frame. It will also crack the frame.

Beck block ejectors come in different versions from manually operated to fully automatic or custom made.

The Beck Block Ejector shown below is for single Beck Freezer Frames, hydraulic or pneumatic and can be equipped with a bucket for a master carton 3 x 7,5 kg (3 x 16½ lbs).



The Beck Block Ejector shown below is a fully automatic version for single Beck Freezer Frames, hydraulic or pneumatic. The ejector is designed for in-line automatic ejection of frozen blocks.



STORAGE OF FROZEN PRODUCTS

Blocks to be stored for a long period must be protected against dehydration by being packed into a master carton with a poly bag or stacked on a pallet and wrapped in plastic wrap. It is important to pack the blocks as per end-user requirements.

It is important to store frozen products in rooms with a stable and even temperature. Fluctuations of the storage temperature will result in dehydration of the product. Long-term cold storage is -19 to -32°C (-2 to -25°F). In reality, -18°C (0°F) is the typical cut off point for frozen block storage.

When stacking the frozen product in a cold store it is necessary to leave a free space between the product and the bulkhead/wall to allow the cold air to be circulated. If product is stacked entirely against the bulkhead/wall it might easily be spoiled by heat penetration from the outside.

CLEANING OF EQUIPMENT AND MAINTENANCE

Time must be set aside for cleaning and maintenance of freezing equipment. A rule of thumb is: 1 hour per day should be set aside for cleaning and defrosting of each plate freezer.

During that hour, the freezer can be defrosted as ice formation on the freezing plates (insulation) extends freezing time and it will also cause deformations (dents) to the bottom plates of the frames.

FRAME WASHER

A frame washer is used to clean the frames after the blocks have gone through the ejection process. Cleaned frames are typically conveyed back to the pack area.

SECONDARY PROCESSING REQUIREMENTS

For secondary seafood processors, the most commonly used liner is a Beck Liner®. As a matter of fact, many require Beck Liners® as this gives them the confidence in knowing they have purchased the highest quality product available. A 7.5 kg (16.5 lbs) block of frozen fish has average dimensions of 482 x 254 x 62.7 mm. Tolerances for the block dimensions are typically as follows:

Length: 482 mm +/- 1.0 mm
Width: 254 mm +/- 1.0 mm
Height: 62.7 mm +/- 0.9 mm

98% of all blocks must be longer than 480 mm, wider than 252 mm and higher than 60.9 mm. Blocks shorter than 479 mm, narrower than 251 mm or lower than 60 mm are not acceptable.

The average weight of all the blocks must be within 7,484 grams +/- 55 grams. 98% of all blocks must contain more than 7,400 grams while none of the blocks must contain less than 7,300 grams.

Frozen blocks are portioned by secondary processors into burgers, fingers (sticks), portions, nuggets, cubes and other forms.



QUALITY CONSIDERATIONS

Even with the use of first class raw materials, the right frames and high-quality liners the final block products can be disappointing and in the worst case rejected by the buyers.

The following items have resulted in low prices or rejected blocks:

- Unacceptable quality of the product.
- Inaccurate weighing of the product into the liners.
- Careless work when filling the product mass into the liners. Care has to be taken to fill all corners.
- Wrong insertion of the liner into the frame leading to embedded flaps.
- Inaccurate freezing frames resulting in block dimensions out of specifications. Liners lower than 1 mm above the frame will not encounter sufficient pressure on the block.
- If the freezing takes place immediately after packing, there might not be sufficient time for the porous inner surface of the liners to absorb the humidity necessary to protect the blocks against dehydration during storage. It is recommended to have a stand time of minimum 10 minutes. Note that the minimum stand time may vary as it depends on the fish type and its' free moisture content.
- If the freezing occurs too long after packing, the liners might turn soft giving the risk of residual liner sticking to the blocks during unpacking, and the drip loss may lead to underweight blocks. The processing area where the packed frames are waiting should be kept at a temperature as low as possible, but not at a freezing temperature.

- If packed frames have been placed into an operating plate freezer gradually after they are being packed (using the freezer as a rack), it may result in a shell-freezing of the blocks, which cannot afterwards be pressed homogeneously during the freezing period. Due to this, the fish blocks might develop air pockets and/or curved surfaces and craters.

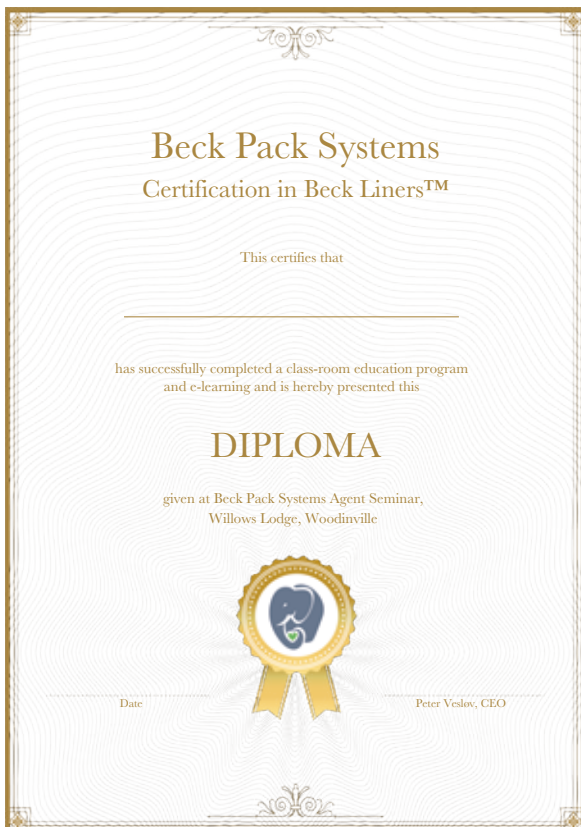
CONCLUSION

With over 50 years of experience behind every Beck Liner® and Freezer Frame, the highest possible quality of your food blocks can be assured. If you are considering a block production, please contact our sales people or agents to assist you in your project.

BLOCK PACKING TRAINING SEMINARS

Beck conducts block packing training seminars for both new and existing customers. The block packing training seminar is targeted to personnel working directly or indirectly with block packing such as operators, floor managers, packing buyers and quality managers. The seminar consists of presentations, e-learning as well as practical training, and will teach you how to identify and solve typical block quality problems.

Please contact us for more information and to book a block packing training seminar.



CONTACT INFORMATION

If you need further information about block production, block products, machinery, and developments, please do not hesitate to contact us.

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