Arthritis Foundation®






Ease of Use Rigid Packaging Guide | BOXES & BAGS

TABLE OF CONTENTS

INTRODUCTION

In the United States, arthritis is the #1 cause of disability, affecting nearly 60 million adults and hundreds of thousands of children. This complex disease can cause chronic, debilitating pain — and make daily activities difficult to do — while also impacting physical and social wellness and mental health. People of all ages, races and sexes live with arthritis.

Arthritis symptoms include pain, stiffness, swelling and diminished range of motion in joints. Symptoms vary, from mild to severe, and may come and go, getting progressively worse over time. Arthritis can also cause permanent joint damage, often leading to immobility. In addition, arthritis can affect the heart, lungs, kidneys, eyes, skin and other organs.

For almost eight decades, the Arthritis Foundation has led the way in supporting people with arthritis and their caregivers. As the largest nonprofit organization focused on arthritis and related conditions, we've played a key role in the development of groundbreaking arthritis treatments — and have successfully advocated for policies and laws that make health care more accessible and affordable for arthritis patients.

We also create life-changing resources that help patients take control of their disease. And we nurture a vibrant, caring community where they can connect with others and know they're not alone.

Arthritis Foundation®

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EASE OF USE PRODUCTS AND PACKAGING

The Arthritis Foundation's Ease of Use Certification program recognizes products and packaging that have been tested, approved and certified as easy to use for people who live with arthritis and chronic pain.

Consumer products and packaging are often not designed to meet the needs of those challenged by arthritis and chronic pain. When easy-to-use designs are implemented, products and packages are made easier to use for the arthritis community, which means they are easier to use by everyone.

Each product and package considered for Ease of Use is first independently tested by the Intuitive Design Applied Research Institute (IDARI). Upon receiving a favorable review, they are then eligible to license the Ease of Use Certified seal, which may be incorporated in all marketing initiatives as a shelf differentiator, in both retail and e-commerce, as well as become part of the Arthritis Foundation's Ease of Use annual marketing strategy.

Did You Know?

72% of consumers said they would switch brands if a product/package was certified as Ease of Use Certified. *- Nielsen Ease of Use Survey 2016*

Both the consumer and corporate sectors are gaining great value in updated designs of products and packages that are easy to use. Carrying the seal, brands like Pilot® Pen, Nexium, Advil®, Duracell®, IMAK®, SafeStep and others are seeing sales that outpace their competition. Many brands use the seal in presentations and buyer meetings, along with marketing in print, digital and television.

People living with arthritis and chronic pain also make shopping decisions when they see the item has been certified as easy to use. Easier to use designs are easier for everyone, whether living with chronic pain or not, and often become a shelf differentiator.

"I trust all products that are labeled Ease of Use. My absolute favorite that I use the most is the Advil® Easy Open Arthritis Cap. I've had arthritis for almost 20 years, and I've always struggled to open a medicine bottle cap. Advil made it so much easier. My second favorite is the Ezy Dose® Pill Organizer. This helps me organize my meds and have easier access to them, despite any pain I may have in my hands. I'm grateful for the partnerships the Arthritis Foundation has made to create products that make life easier with arthritis."

–Ashley Nicole, autoimmune health coach and master trainer, diagnosed with rheumatoid arthritis at age 27

Intuitive Design Applied Research Institute

The Intuitive Design Applied Research Institute (IDARI), assists in identifying user needs and scientifically evaluating consumer product and packaging solutions. IDARI offers many research and evaluation services, specializing in objectively measuring human performance that delivers key insights. This, in turn, drives innovation — especially for the needs, aspirations and latent demands of consumers dealing with arthritis, chronic pain and other functional limitations.

IDARI serves as the official consumer product Ease of Use test lab for the Arthritis Foundation. A favorable evaluation by IDARI qualifies the manufacturer for inclusion in the Arthritis Foundation's Ease of Use Certification program.

Dr. Brad Fain, IDARI founder and Georgia Tech Regents' Researcher, has more than three decades of experience researching human factors engineering and design. From Ease of Use evaluation and universal design studies to ethnographic research and consumer product design, Dr. Fain founded IDARI to conduct usability and accessibility testing for the Arthritis Foundation and other entities across the globe. At Georgia Tech, his research has spanned projects for the U.S. Department of Defense to manufacturers of critical health systems. He established the Accessibility Evaluation Facility at Georgia Tech, which performs objective accessibility evaluations of workplace information technology for both industry and government customers. Learn more about Dr. Fain and his research at idarinstitute.com.

Dr. Brad Fain

PARTNERSHIP

The Arthritis Foundation is the largest nonprofit organization dedicated to the prevention, control and cure of America's No. 1 cause of disability. The Arthritis Foundation champions the fight to conquer arthritis through life-changing science, resources, advocacy and community connections. Taking diversity, equity and inclusion very seriously, the Arthritis Foundation strives to empower all people with arthritis to live a better lifestyle and remove barriers that limit quality of life. As the leading expert in Ease of Use design certification, the Arthritis Foundation helps generate more than $100 million in annual sales of products and packages carrying the Ease of Use seal.

Target is one of America's leading retailers and an iconic brand with a single purpose: to help all families discover the joy of everyday life. Diversity, equity and inclusion are part of Target's core values, shaping culture and driving business. At the heart of this endeavor is the Owned Brand Product Design & Packaging organization. This team designs and engineers products and packaging for an industry-leading portfolio of over 45 Target-owned brands. Inclusive design and accessibility improvements have been long-term goals of this team. Target collaborates with external partners to advance their owned brands portfolio with exclusive designs only found at Target.

This collaborative partnership is driving innovation on product and package designs. The mutual goal is to provide products and packages that are easier to use for people living with arthritis and chronic pain, plus other consumers who are also looking for easy-to-use items. Together, we want to help all families discover the joy of everyday life, driving innovation that leads to life-changing satisfaction.

This Ease of Use Design Guide provides the first guidelines developed in the United States, offering resources for engineers and designers in the requirements definition and design development stage. Our collaboration is leading the way in design accessibility.

This innovative partnership of the Arthritis Foundation, Target and IDARI has been a collaborative effort of industry experts in the Ease of Use design space — with Target funding the research and contributing to the illustrations, photographs and graphic design of these guidelines.

HIGH-LEVEL CONSIDERATIONS: ISSUES AND RECOMMENDATIONS

Common Issues and High-Level Recommendations

Packaged items are too heavy. People with arthritis can have difficulty holding and transporting heavy items. Items over 5.0 pounds can be difficult to carry with one hand. If items exceed 5.0 pounds, consider adding design elements to facilitate a two-handed hold. Items over 10.0 pounds can be difficult to carry regardless of handle placement.

The linear force required is too high. People with arthritis can experience pain when asked to apply a linear force to a design element. Consider requiring less than 3.0 pounds of linear force for design elements meant to be operated with a single finger or designed to be pinched between two fingers. Consider requiring less than 5.0 pounds of force for design elements that are to be operated by multiple fingers or a palm press.

The rotational force requirement is too high. People with arthritis may have difficulty rotating design elements, such as twist off closures. The amount of force a user can apply to a rotating design element will depend on multiple factors, such as the diameter, height, coefficient of friction and the knurling pattern of the element. Small and large-diameter rotating design elements can be particularly difficult to operate. Avoid design element shapes or knurling patterns that directly apply pressure to finger joints during rotation.

Users become fatigued after prolonged usage. Users with arthritis may become fatigued when using products that must be held or actuated repeatedly over a prolonged period. When designing the product for extended use, reduce the number of individual actions required and minimize the amount of effort required for each action.

Use of the product causes joints to be placed in an uncomfortable position or posture. Some products require users to articulate their joints in an uncomfortable position. Whenever possible, design the product to maintain a neutral position of the wrist joint. Do not require users to extend their arms above shoulder height.

Use of the product causes painful pressure across finger joints. Ridges, bumps and other small-radius protrusions along the graspable area of the product can increase pressure along painful finger joints. Ensure that all graspable areas are designed to distribute the load across the entire grasp point so that pressure is not concentrated on individual finger joints.

Use of the product requires an excessive grip span. Some users with arthritis have increasingly diminishing grip strength once the grip span exceeds 2.5 to 3.0 inches. Design graspable items to allow the adult hand to grasp the box without exceeding a comfortable grip span.

The product requires the use of a tool. Users with arthritis are more likely to injure themselves if interacting with the product requires a sharp instrument like scissors or a knife. Consider not requiring the use of a tool to open or interact with the product.

The product requires simultaneous actions. Some users with arthritis have difficultly performing two actions at the same time, such as rotating and pinching a closure. If the use of the product requires multiple actions, design the product in a way that those actions can be performed sequentially.

Sharp edges cause pain. Sharp edges can create a hazard or may be uncomfortable if users are required to apply force to the edge. Consider rolling metal edges or finishing plastic edges with a dull surface.

OVERVIEW

Boxes are a widely used format of packaging. In many industrial and consumer segments, boxes are the most common format of packaging because they are used for primary packaging, the packaging a consumer purchases when they purchase a product, and for secondary and tertiary packaging for case packs and the stacks of case packs assembled on pallets.

Boxes are typically made from paperboard or corrugated fiberboard, but they can be made from plastic materials or other natural materials. Paperboard is a pulp-based, semi-rigid material like common paper, but much thicker. Corrugated fiberboard is often called “cardboard” by consumers, but it refers to material that typically contain three sheets of fiberboard: a top sheet, bottom sheet and fluted sheet. The fluted sheet is formed into a wave-like pattern and attached to the top and bottom sheet with an adhesive.

Boxes are manufactured in many shapes and sizes, but there are several widely used methods for sealing and transporting boxes. This guide focuses on opening mechanisms and carrying mechanisms used for high-volume retail packaging in the United States in the early 2020s.

Bags are another widely used format of packaging. Like boxes, bags are used for primary packaging as well as secondary and tertiary packaging. Bags come in many shapes and sizes. This guide focuses on paper bags used for high-volume retail packaging in the United States in the early 2020s.

This guide is part of a series of guides covering rigid bottles and bases, rigid components, films and pouches, sealed trays, cards, boxes and bags. This guide starts with a review of the high-level issues and recommendations across all packaging. Following this section, the guide discusses optimum design guidelines, common issues and recommendations for boxes and bags.

CORRUGATED BOXES

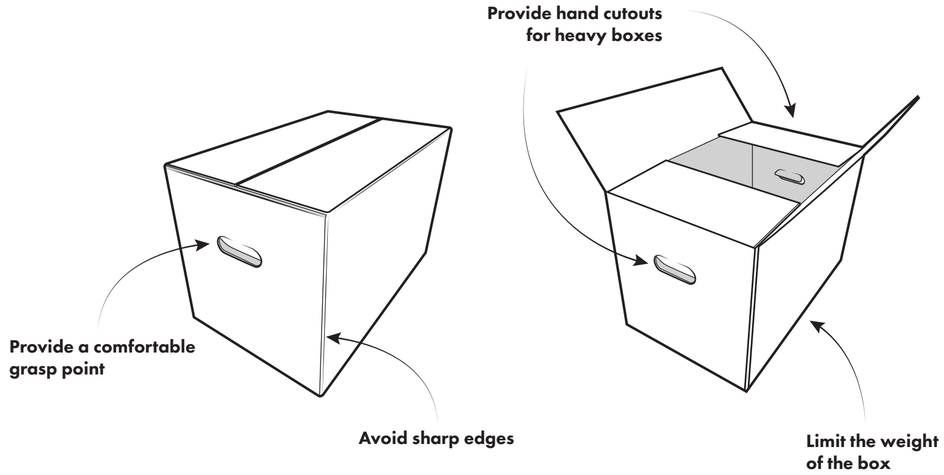
Boxes are typically made from paperboard or corrugated fiberboard, commonly called “cardboard,” but corrugated boxes can be made from plastic materials or other materials. To open a box, the user needs to remove the adhesive, tape or staples and fold back the overlapping flaps. Small boxes are carried by holding the box. Most larger boxes have a handle feature for carrying. Optimum design considerations and common issues will be discussed for Regular Slotted Containers, Tuck Boxes (Straight Tuck, Reverse Tuck), Sequence Bottom Boxes, Auto Bottom Boxes, Top Tuck Boxes, Front Tuck Boxes and Two Piece Boxes.

Examples of Corrugated Boxes

Optimum Box Design Guidelines

Recommendation Highlights

- **Provide a comfortable grasp point**
- **Limit the weight of the box**
- **Provide hand cutouts for heavy boxes**
- **Avoid sharp edges**



CORRUGATED BOXES ISSUES

Ease-of-use issues associated with the use of corrugated boxes primarily pertain to the transportation of boxes. Issues associated with opening the boxes are addressed in separate sections specific to the technology used to seal the boxes. The following pages have detailed descriptions, population-impact considerations and potential solutions for each issue.

1. Transportation and handling issues

1.1. The box is too heavy.

1.2. The box does not have a comfortable, graspable area.

1.1 The box is too heavy.

Detailed Description: People with arthritis who experience limited strength or painful finger joints may have difficulty transporting boxes that exceed 5.0 pounds for long distances. Heavier items that exceed 10.0 pounds may require a two-handed carry.

Populations Impacted: Limited strength

Potential Solutions: *Reduce weight of the box to below 5.0 pounds.* Users may need to use two hands to carry and transport boxes exceeding 5.0 pounds.

Design a second grasp point to facilitate a two-handed carry for boxes that weigh more than 5.0 pounds. Heavy boxes over 5.0 pounds should be designed to be carried using two hands. Multiple grasp points or a grasp point accommodating two hands can be useful when the box needs to be transported as part of the use case.

Design the shape of the grasp point to distribute the load across the inner surface area of the grasp point. Pressure points at the load-bearing portion of the grasp point can cause discomfort across painful finger joints. Consider designing the inner surface of the grasp point to distribute the load across the hand.

1.2 The box does not have a comfortable, graspable area.

Detailed Description: People with arthritis who experience painful finger joints may have difficulty grasping the box or may not know where to grasp the box if a clear graspable area is not provided.

Populations Impacted: Limited strength, limited range of motion

Potential Solutions: *Limit the width of the graspable area.* Users with arthritis may experience limited strength with excessive grip spans. Some users experience reductions in strength when grip spans exceed 2.5 to 3.0 inches. Select a graspable area width that allows the adult hand to grasp the box without exceeding a comfortable grip span.

Design the shape of the graspable area to distribute the load across the inner surface area of the graspable area. Pressure points at the load-bearing portion of the graspable area can cause discomfort across painful finger joints. Consider designing the graspable area to distribute the load across the hand, avoiding ridges, seams and small-radius protrusions.

Eliminate sharp edges. Sharp edges caused bycut edges can cause discomfort while grasping the box. Consider folding the material at the grasp point to reduce or eliminate sharp edges.

Provide hand cutouts. Boxes with built-in cutouts to accommodate hand insertion into the box can be useful for grasping heavy or large boxes. Design the cutouts to accommodate full hand insertion without causing pressure on painful finger joints. The box's contents should be secured so they do not shift and pinch the fingers during transportation.

ADHESIVES, TAPES & STAPLES

Boxes are formed from flat, corrugated or paperboard sheets that are folded into three-dimensional structures and sealed with tucked flaps, adhesive, tape or staples. Adhesives and staples are frequently used for sealing boxes in automated assembly lines, while tape is frequently used for manual sealing of boxes.

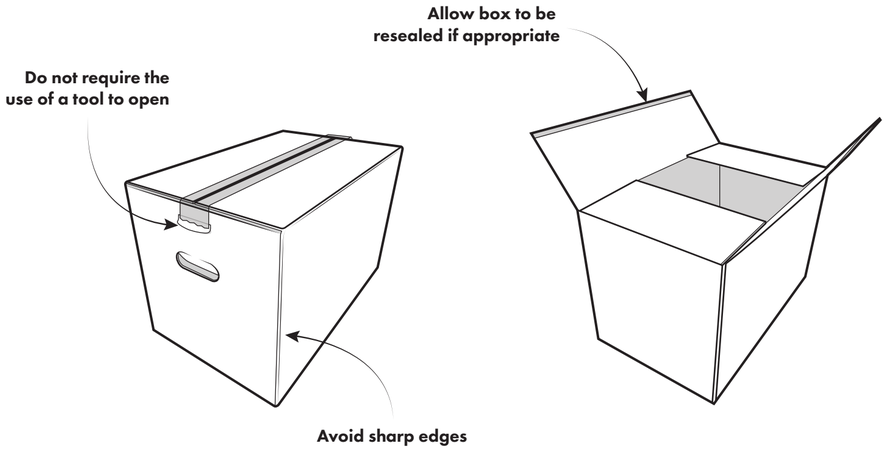
Groups of boxes may be joined together with tape, plastic wrap, metal strapping, plastic strapping or rope.

Examples of Sealant Mechanisms

Optimum Adhesives, Tapes & Staples Design Guidelines

Recommendation Highlights

- **Do not require the use of a tool**
- **Allow box to be resealed if appropriate**
- **Minimize opening force**
- **Avoid sharp edges**



ADHESIVES, TAPES & STAPLES ISSUES

Ease-of-use issues associated with the use of adhesives, tapes and staples primarily pertain to requiring the use of tools to open the box. Sharp instruments might be required to cut the box or the tape. Additional tools might be required to remove staples or straps. Strong adhesives can make boxes difficult to open and can cause damage to the box during opening. Box flaps and tape end points may lack a sufficient grasp point to facilitate opening. The following pages have detailed descriptions, population impact considerations and potential solutions for each issue.

1. Opening Issues

1.1. Opening the box requires the use of a tool.

1.2. Opening the box requires excessive force.

2. Resealing Issues

2.1. The box is difficult to reseal once opened.

1.1 Opening the box requires the use of a tool.

Detailed Description: Boxes sealed with adhesives, tapes or staples can be difficult to open without using a tool. A sharp instrument, such as a knife or scissors, may be required to cut the box or slice through tape. Other tools may be required to remove staples. Users with arthritis may injure themselves while using a tool, especially if the tool isn't well suited to the task of opening the box.

Populations Impacted: Limited strength, limited range of motion

Potential Solutions: *Do not require the use of a tool.* Boxes that require puncturing or cutting with a tool can pose a potential hazard for users with arthritis. Do not require a knife or scissors to open the box.

Provide a graspable surface for peeling. A portion of the tape or seal should be designed to be grasped. The graspable surface should be free of adhesive and sufficiently sized to support a key grip. The tape or seal should be removed in one continuous motion and should not tear during removal.

Provide pull strips. Tapes or seals could be designed with a separate pull strip to facilitate the opening of the box flap. The graspable area of the pull strip should be sufficiently sized to support a key grip. The amount of force required to pull the strip should be less than 3.0 pounds. The strip should be removeable in one continuous motion.

Avoid straps. Straps, particularly metal straps, should be avoided. Straps often require a tool, such as shears, scissors or a knife, to cut the strap. Use of a tool may pose a hazard to users with arthritis.

Provide ropes that are easy to untie. Tied ropes or strings used to keep a box closed may require excessive fine motor control to untie. Consider providing knots that are easy to untie and/or use large-diameter ropes that do not require fine motor control to untie.

1.2 Opening the box requires excessive force.

Detailed Description: Boxes sealed with adhesives, tapes or staples can require excessive force to open. Adhesives can fail to separate, causing the box to be torn. Tapes can be difficult to peel or puncture. Staples can be difficult to remove from the box, and straps can be difficult to cut. People with arthritis may not have the functional abilities necessary to open the box.

Populations Impacted: Limited strength, limited range of motion

Potential Solutions: *Avoid staples.* Staples are difficult to remove and sometimes require a tool to extract the staple. Staples on boxes may cause injury. Avoid the use of staples to seal boxes.

Avoid excessive adhesives. Excessive adhesives can make it difficult to separate the flap from the box or peel back tapes and seals. Excessive adhesives can damage the box during opening. Avoid the excessive use of adhesives and limit the amount of force required to separate components affixed with an adhesive to less than 3.0 pounds for a surface designed to be grasped between fingers, and 5.0 pounds for a surface designed to be grasped by the whole hand. When opening, ensure that the adhesive does not damage the box.

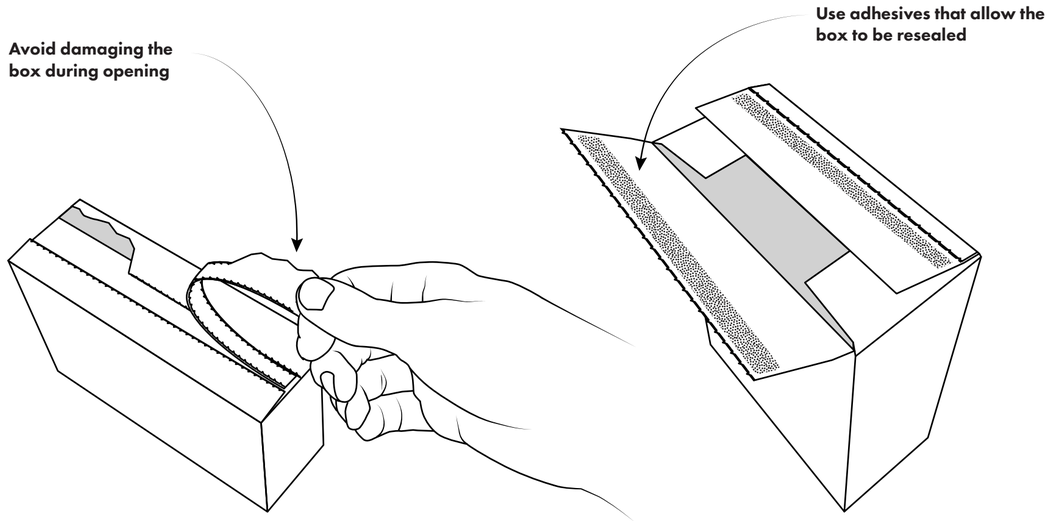
2.1 The box is difficult to reseal once opened.

Detailed Description: If the box's contents are designed to be used over time, the box should be easily resealed to preserve the contents. Users with arthritis may have difficulty resealing the box if the box is damaged or compromised during opening or if the mechanism used to seal the box is removed to access the contents.

Populations Impacted: Limited strength, limited range of motion

Potential Solutions: *Use resealable adhesives.* Resealable adhesives can be used to reseal the box once opened. Tape or box flaps treated with a resealable adhesive can be pressed back into place to reseal the box if necessary.

Avoid damaging the box during opening. If the box is damaged during opening, the box may not be a suitable container for extended storage of the contents. Ensure that reusable tape and the box itself are not torn, ripped or otherwise damaged in a way that would prevent resealing the box contents.



TEAR STRIPS & WAFER SEALS

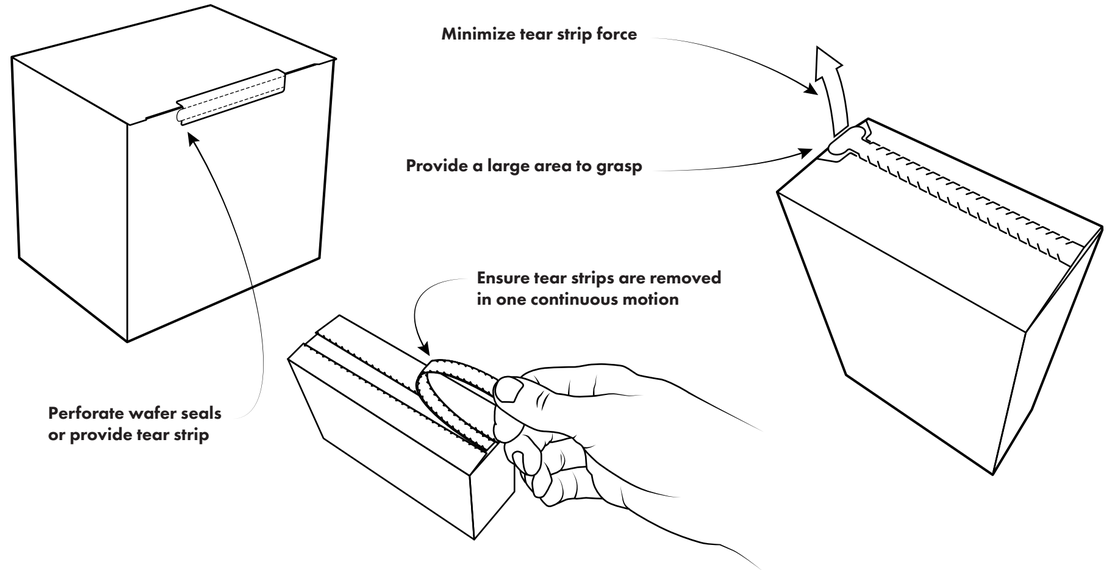
Tear strips and wafer seals are used to secure paperboard and corrugated boxes along with adhesives, tape and staples. Tear strips can be secondary components made from plastic or fiber, or they can be die cut into the paperboard or corrugated material. Wafer seals function like tape but are smaller. They can be made from plastic or paper materials.

Examples of Tear Strips & Wafer Seals

Optimum Tear Strips & Wafer Seals Design Guidelines

Recommendation Highlights

- **Provide a large graspable pull area**
- **Minimize tear strip force**
- **Perforate wafer seals or provide a tear strip**
- **Ensure tear strips are removed in one continuous motion**



TEAR STRIPS & WAFER SEALS ISSUES

Ease-of-use issues associated with the use of tear strips and wafer seals primarily pertain to the user's inability to sufficiently grasp provided grasp points and the user's inability to apply sufficient force to peel the strip or seal away from the packaging. Some people with arthritis may have difficulty grasping small grasp points. People with low vision or low contrast sensitivity may have difficulty locating the grasp point on the tear strip or the wafer seal. The following pages have detailed descriptions, population impact considerations and potential solutions for each issue.

1. Opening Issues

1.1. Opening the box requires the use of a tool.

1.2. Opening the box requires excessive force.

1.3. The grasp point is not sufficient.

2. Resealing Issues

2.1. The box is difficult to reseal once opened.

1.1 Opening the box requires the use of a tool.

Detailed Description: Boxes sealed with tear strips or wafer seals can be difficult to open without using a tool. A sharp instrument, such as a knife or scissors, may be required to cut the box or slice through seals. Users with arthritis may injure themselves while using a tool, especially if the tool isn't well suited to the task of opening the box.

Populations Impacted: Limited strength, limited range of motion

Potential Solutions: *Do not require the use of a tool.* Boxes that require puncturing or cutting with a tool can pose a potential hazard for users with arthritis. Do not require a knife or scissors to open the box.

1.2 Opening the box requires excessive force.

Detailed Description: Boxes sealed with adhesives, tapes or staples can require excessive force to open. Adhesives can fail to separate, causing the box to be torn. Tape can be difficult to peel or puncture. Staples can be difficult to remove from the box, and straps can be difficult to cut. People with arthritis may not have the functional abilities necessary to open the box.

Populations Impacted: Limited strength, limited range of motion

Potential Solutions: *Avoid staples.* Staples are difficult to remove and sometimes require a tool to extract the staple. Staples on boxes may cause injury. Avoid the use of staples to seal boxes.

Avoid excessive adhesives. Excessive adhesives can make it difficult to separate the flap from the box or peel back tapes and seals. Excessive adhesives can damage the box during opening. Avoid the excessive use of adhesives and limit the amount of force required to separate components affixed with an adhesive to less than 3.0 pounds for a surface designed to be grasped between fingers and 5.0 pounds for a surface designed to be grasped by the whole hand. When opening, ensure the adhesive does not damage the box.

Provide perforated wafer seals. Wafer seals can feature a perforated seal if the seal is not designed to peel away from the packaging. The act of opening the box should separate the seal at the perforation without requiring excessive force. Provide detailed directions for the safe opening of the sealed tray or tub. Instructions for the safe opening of the sealed tray or tub should be provided on the packaging in a high-contrast, easy-to-read font. The instructions should indicate the point of opening, any required tool usage and safety instructions for handling the tool while opening the packaging. The consumer should be informed of risks associated with using a tool in an unsafe manner.

Provide an obvious affordance for opening the package. Provide an obvious way to open the package, such as designing a visually distinct grasp point to facilitate removing the film or membrane from the tray or tub.

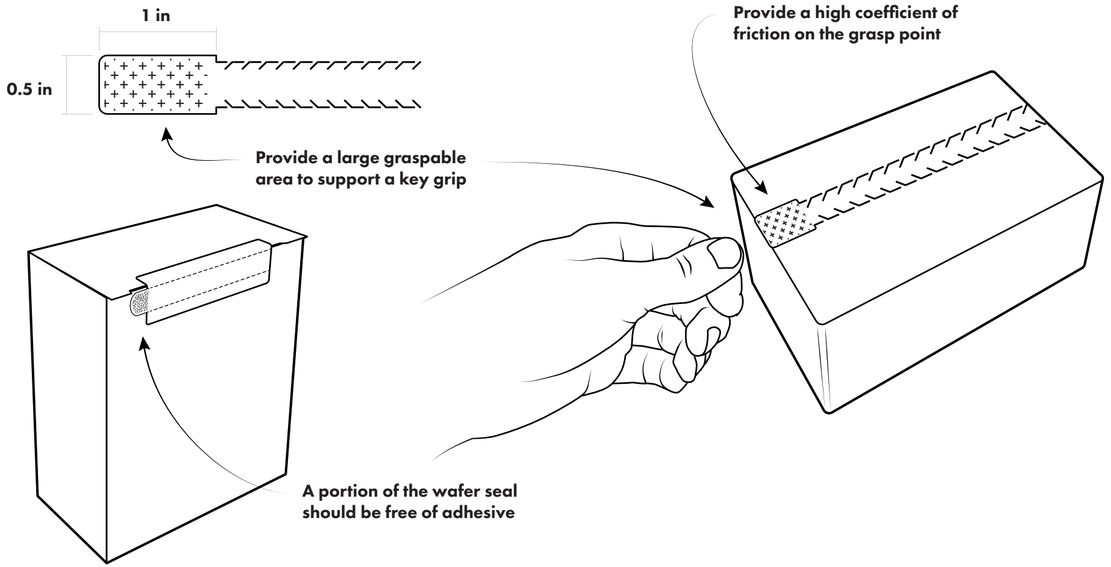
1.3 The grasp point is not sufficient.

Detailed Description: Users may be unable to fully grasp and pull tear strips or wafer seals if the grasp point is insufficiently sized or has a poor coefficient of friction. The grasp point may slip from the user's grasp, requiring users to find an alternative method of opening the package. People with arthritis may lack the fine motor control or finger strength to grasp the grasp point securely.

Populations Impacted: Limited strength, Limited fine motor control

Potential Solutions: *Provide a graspable surface for peeling.* A portion of the tear strip or wafer seal should be designed to be grasped. The graspable surface should be free of adhesive and sufficiently sized (approximately 0.5 inches wide by 1.0 inches long) to support a key grip. The tear strip should be removed in one continuous motion and should not tear during removal.

Provide a high coefficient of friction grasp point. The graspable portion of the tear strip or wafer seal should have a high coefficient of friction surface, achieved by a surface coating of texture or die cut pattern. Ensure the coefficient of friction is sufficiently high compared to the required pull force.



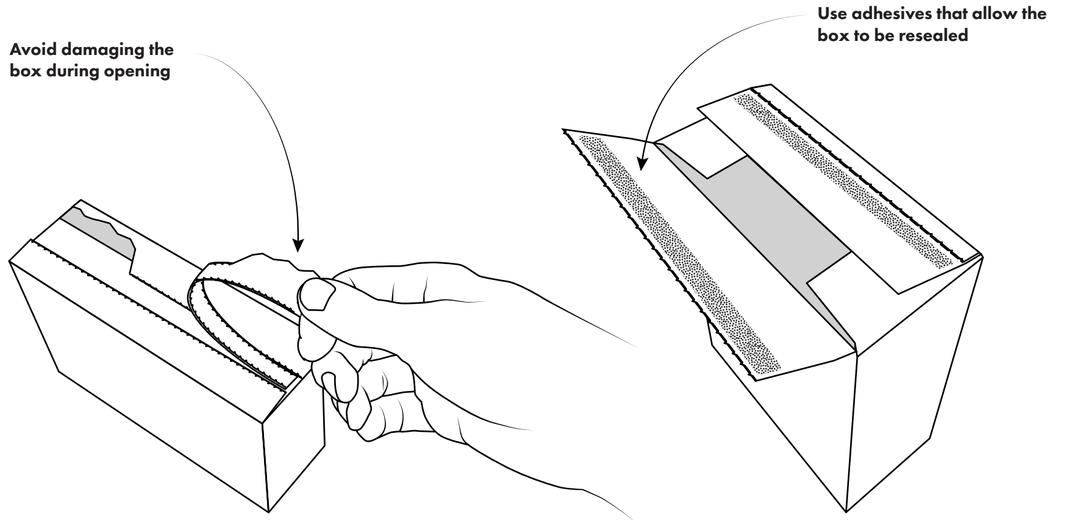
2.1 The box is difficult to reseal once opened.

Detailed Description: If the box's contents are designed to be used over time, the box should be easily resealed to preserve the contents. Users with arthritis may have difficulty resealing the box if the box is damaged or compromised during opening or if the mechanism used to seal the box is removed to access the contents.

Populations Impacted: Limited strength, limited range of motion

Potential Solutions: *Use resealable adhesives.* Resealable adhesives can be used to reseal the box once opened. Seals treated with a resealable adhesive can be pressed back into place to reseal the box if necessary.

Avoid damaging the box during opening. If the box is damaged during opening, the box may not be a suitable container for extended storage of the contents. Ensure that reusable seals and the box itself are not torn, ripped or otherwise damaged in a way that would prevent resealing the box contents.



FINGER CUTOUTS & POSTAL LOCKS

Many box designs include a finger cutout or raised tab to aid in opening the lids and panels. Some panels are locked with a hinged feature called a postal lock. Some postal locks will feature cutouts or a raised piece of material to aid in unhinging the lock.

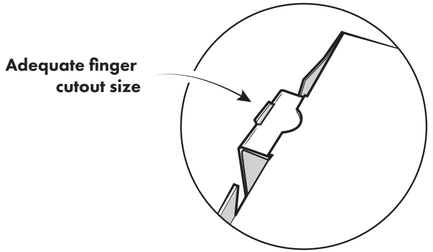
Some boxes will use perforated sections to dispense the product. This can be found with boxes for facial tissue, foils, plastic wrap, plastic bags, beverage containers and many other grocery packages.

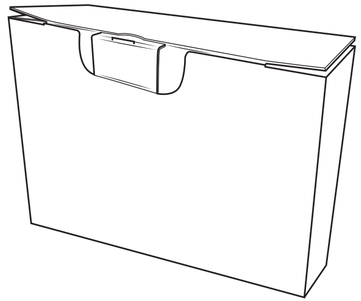
Examples of Finger Cutouts

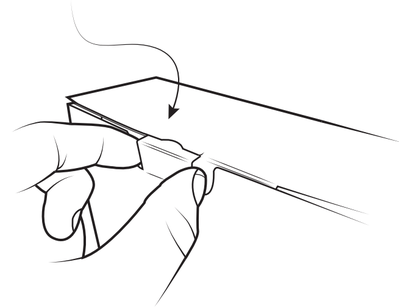
Optimum Finger Cutouts & Postal Locks Design Guidelines

Recommendation Highlights

- **Die cut notch for sliding postal lock and lifting lid**
- **Adequate finger cutout size**
- **Minimal force required to disengage lock and lift lid**
- **Tab length not too long**







FINGER CUTOUTS & POSTAL LOCKS ISSUES

Ease-of-use issues associated with the use of postal locks and finger cutouts in packaging primarily pertain to the size of the cutouts and the ability of the user to successfully disengage and engage the postal lock. Some postal locks are difficult to open because of the amount of force required to remove the tab from the insert. Other locks may be difficult to disengage because the lock lacks design features, such as finger cutouts and die cut notches, that facilitate removing the tab from the slot.

1. Opening Issues

1.1. The postal lock is difficult to disengage.
1.2. The lid is difficult to lift.

2. Resealing Issues

2.1. It is difficult to secure the lid.

1.1 The postal lock is difficult to disengage.

Detailed Description: Some users may have difficulty opening the postal lock because they lack the fine motor control required to grasp the postal lock tab and slide the tab out of the slot. Other users may experience difficulty because of the amount of force required to slide the postal lock tab out of the slot.

Populations Impacted: Limited strength, limited fine motor control

Potential Solutions: *Provide die cut notch.* A die cut notch extending sufficiently out of the tab portion of the postal lock can provide sufficient purchase to allow users to easily slide the postal lock tab out of the slot.

Provide a sufficiently large die cut notch. The die cut notch, when extended after folding the tab, should extend above the tab so that when the user slides a finger over the top of the box in the direction of tab removal, the user can provide sufficient force against the notch to dislodge the tab from the slot. The die cut notch should be sufficiently wide to catch the user's finger and resist deforming while removing the tab from the slot.

Provide a sufficiently stiff die cut notch. The die cut notch should not deform or bend during opening. Bent or deformed die cut notches may not provide sufficient purchase for removing the tab from the slot.

Minimize the amount of force required. The amount of force required to slide the postal lock tab out of the slot should not exceed 3.0 pounds.

1.2 The lid is difficult to lift.

Detailed Description: Some users may have difficulty lifting the lid because they lack the fine motor control required to grasp the lid and lifting. Other users may experience difficulty because of the amount of force required to open the lid.

Populations Impacted: Limited strength, limited fine motor control

Potential Solutions: *Provide die cut notch.* A die cut notch extending sufficiently out of the lid in front of the front edge of the box can provide sufficient purchase to allow users to easily slide the lid upwards.

Provide a sufficiently large die cut notch. The die cut notch, when extended after folding the lid lip, should extend in front of the front plane of the box so when the user slides a finger over the front plane of the box in the direction of lip removal, the user can provide sufficient force against the notch to open the lid. The die cut notch should be sufficiently wide to catch the user's finger and resist deforming while opening the lid.

Provide a sufficiently stiff die cut notch. The die cut notch should not deform or bend during opening. Bent or deformed die cut notches may not provide sufficient purchase for opening the lid.

Provide finger cutouts. Sufficiently sized finger cutouts can help users provide sufficient friction against the front edge of the lip to lift the lid. Cutouts should be sized sufficiently to allow finger insertion.

Minimize the amount of force required. The amount of force required to lift the lid to fully access the box's contents should not exceed 3.0 pounds.

2.1 It is difficult to secure the lid.

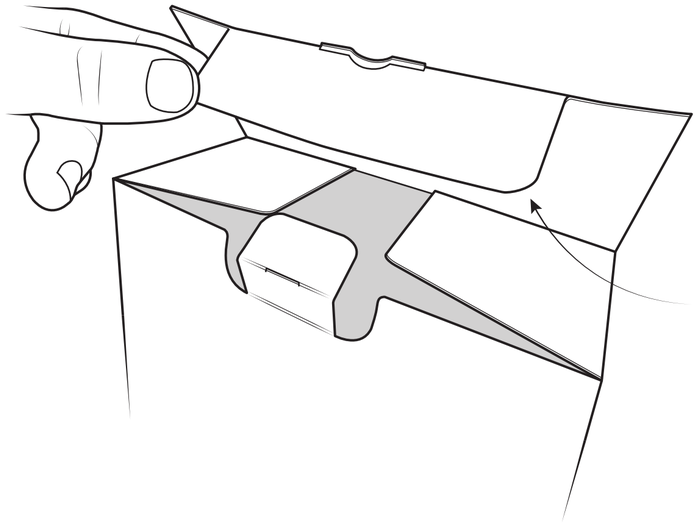
Detailed Description: Boxes that are damaged during opening may be difficult to reseal once opened. The amount of fine motor control required to insert various tabs into box slots may exceed the functional abilities of users with arthritis.

Populations Impacted: Limited strength, limited fine motor control

Potential Solutions: *Ensure box design elements are not damaged by opening.* Damaged tabs, slots or folds may make it difficult to reinsert box components during closing. The box components should be sufficiently strong to support repeated opening and closing of the box.

Provide design elements that guide tabs and other design elements into slots. Rounded corners and other guide design features, such as funnel-shaped openings, can assist users without sufficient fine motor controls in closing the box. Provide design elements that properly align tabs into slot openings without requiring the users to excessively manipulate the box.

Minimize the amount of force required. The amount of force required to close and secure the box contents should not exceed 3.0 pounds.

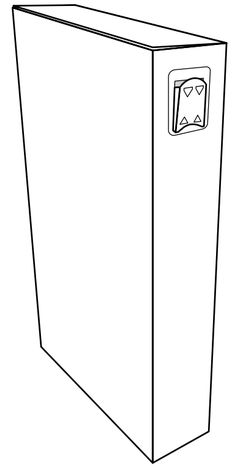


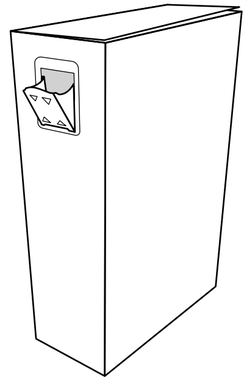
Use rounded corners and other features to help guide the lid for closing

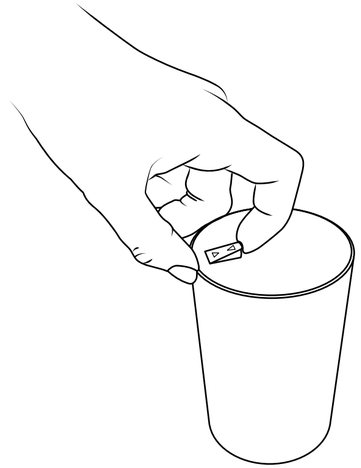
POUR SPOUTS

Some boxes will include a pour spout for dispensing a product. These are small components made of metal, plastic or paper affixed to the box. They are opened by using a fingertip to rotate the spout away from the box, and closed by pushing the spout, rotating it back into the box. These features are found on boxes for powdered dish and laundry detergents, fertilizers, salts, rice and other dry goods packaged in boxes.

Examples of Pour Spouts



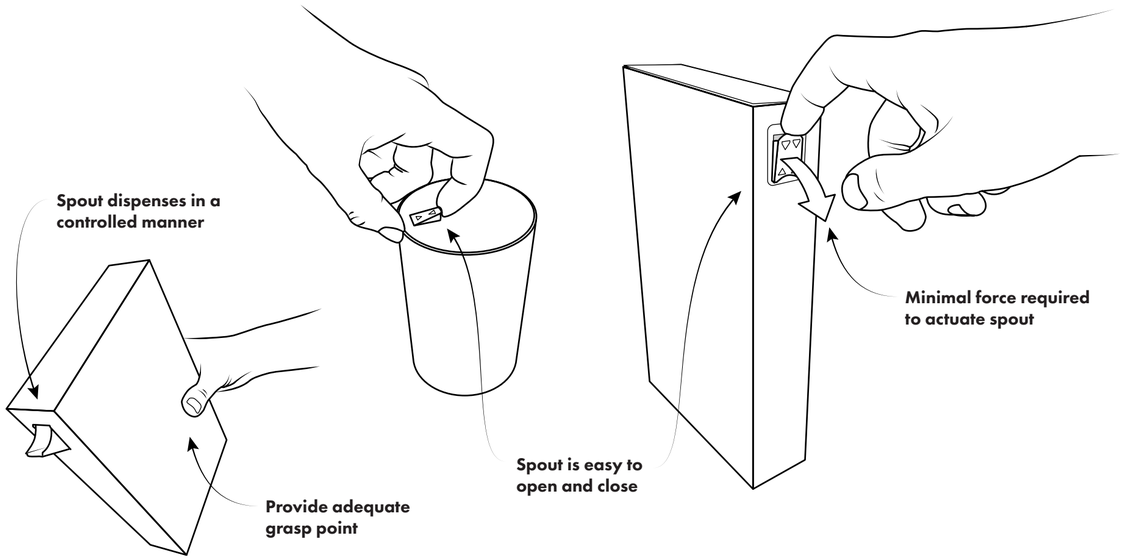




Optimum Pour Spouts Guidelines

Recommendation Highlights

- **Minimal force required to actuate spout**
- **Spout easy to open and close**
- **Adequate spout grasp point**
- **Spout dispenses in a controlled manner**



POUR SPOUTS ISSUES

Ease-of-use issues associated with the use of pour spouts primarily pertain to opening and closing the spout. The force required to open the spout may be too high or the grasp point for opening the spout may be difficult to grasp. Spouts may dispense in an uncontrolled fashion if the spout is sized too large for the application.

1. Pour Spout Issues

1.1. Articulating the spout requires too much force.
1.2. The spout grasp point is too small.
1.3. The pour spout seal is difficult to remove.

2. Pour Spout Dispensing Issues

2.1. Product dispensing is difficult to control.
2.2. The product does not dispense at the desired rate.

1.1 Articulating the spout requires too much force.

Detailed Description: Moving the spout from the closed to the open position may be at a level of force that exceeds the functional capacities of someone with arthritis. Pushing the spout closed may be difficult, particularly if the product is trapped inside the spout opening after dispensing.

Populations Impacted: Limited strength

Potential Solutions: *Minimize the spout operation force.* Minimize the amount of force required to move the spout. The amount of force required to fully open and close the spout should not exceed 3.0 pounds.

Design the spout to prevent blockage. Product may remain in the spout after dispensing the product. Ensure that the spout is not blocked by the product in such a way that the product would impede the user's ability to close the spout.

1.2 The spout grasp point is too small.

Detailed Description: The spout grasp point may be too small to allow the user to grasp the spout to slide it into the open position. Users may be required to use a tool, such as a knife, to pry the spout open.

Populations Impacted: Limited strength, limited fine motor control

Potential Solutions: *Minimize the spout operation force.* Minimize the amount of force required to move the spout. The amount of force required to fully open and close the spout should not exceed 3.0 pounds.

Design spout to prevent blockage. Product may remain in the spout after dispensing it. Ensure that the spout is not blocked by the product in such a way that the product would impede the user's ability to close the spout.

1.3 The pour spout seal is difficult to remove.

Detailed Description: Some pour spouts may be sealed with a paper or plastic cover. The cover must be peeled away from the spout prior to opening it for the first time. Users may have difficulty grasping and applying sufficient force to remove the seal.

Populations Impacted: Limited strength, limited fine motor control

Potential Solutions: *Minimize the pour spout removal force.* The force required to remove the spout seal may exceed the functional capacity of the user. Consider reducing the amount of force required to 3.0 pounds or less.

Provide an adequately sized pour spout seal grasp point. The grasp point for the seal may be too small. Consider designing the grasp point of the seal to support a key pinch.

2.1 Product dispensing is difficult to control.

Detailed Description: Dispensing the product in a controlled manner may be difficult for those with limited strength and fine motor skills. The shape of the spout and the grasp point of the product during dispensing should be designed in such a way as to produce a controlled pour of the product.

Populations Impacted: Limited strength, limited fine motor control

Potential Solutions: *The pour spout should direct product flow.* The pour spout should be designed to direct the flow of the product in accordance with the anticipated task. For example, if precision is required, the pour spout should be designed to direct the stream of the product to a precise location.

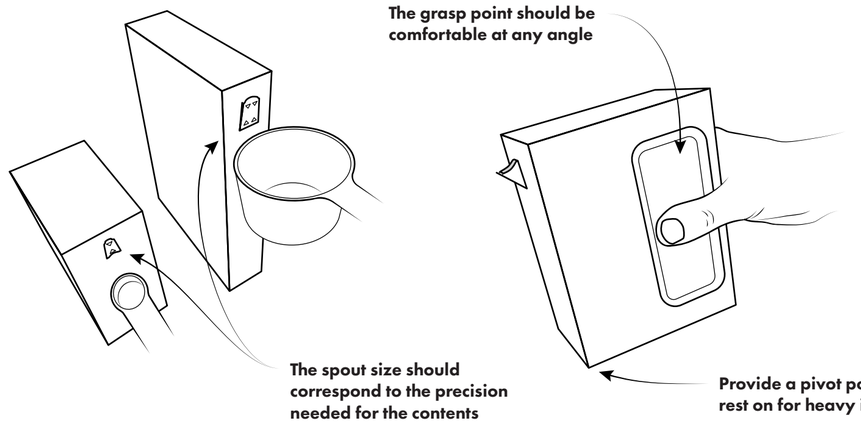
The grasp point of the product should facilitate a controlled pour. As the product is dispensed, the product must be rotated to continue the pour. The grasp point of the product should be designed so it is comfortable at all angles required to fully dispense the product. If the product is heavy, the weight of the product should rest on a pivot point built into product packaging during the pour.

2.2 The product does not dispense at the desired rate.

Detailed Description: The pour spout may be too small or too large to dispense the product at the designed rate. Slow dispense rates can cause excessive fatigue. Fast dispense rates can cause spills or make the product dispense difficult to control with precision.

Populations Impacted: Limited strength, limited fine motor control, fatigue

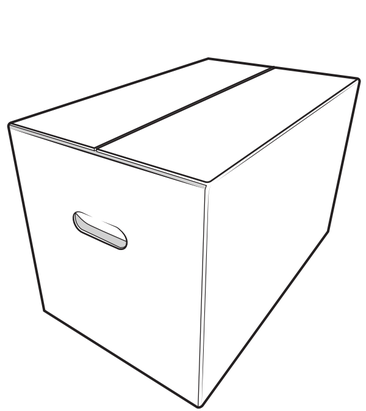
Potential Solutions: *Provide suitable pour rates.* Design the pour spout opening to be appropriate for the expected task. High pour rates should be used when the product is dispensed in bulk and precision is not required. Lower pour rates should be used if precision is required, or specific amounts of product are required to be dispensed.

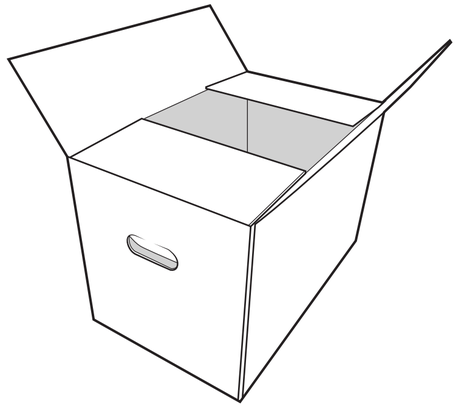


REGULAR SLOTTED CONTAINERS

Regular slotted containers (RSC) are one of the most common box types. These boxes have four top flaps and four bottom flaps of equal height attached to the main body of the box. To seal the top or bottom, a user folds over two of the flaps, then folds the remaining two flaps on top of those flaps. These latter flaps are designed to meet in the center of the box and are sealed with tape, glue or a mechanical fastener.

Examples of Regular Slotted Containers

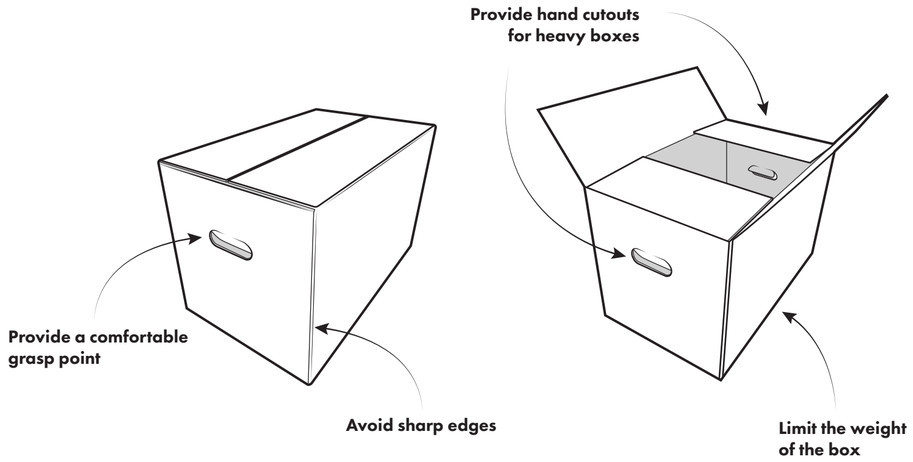




Optimum Regular Slotted Containers Design Guidelines

Recommendation Highlights

- **Provide a comfortable grasp point**
- **Limit the weight of the box**
- **Provide hand cutouts for heavy boxes**
- **Avoid sharp edges**



REGULAR SLOTTED CONTAINERS ISSUES

Ease-of-use issues associated with the use of regular slotted containers primarily pertain to the transportation of the containers. Issues associated with opening the containers are addressed in separate sections specific to the technology used to seal the containers. The following pages have detailed descriptions, population impact considerations, and potential solutions for each issue. Users may have difficulty with the tapes, seals or adhesives typically used in regular slotted containers.

1. Transportation and Handling Issues

1.1. The box is too heavy.
1.2. The box does not have a comfortable, graspable area.

1.1 The box is too heavy.

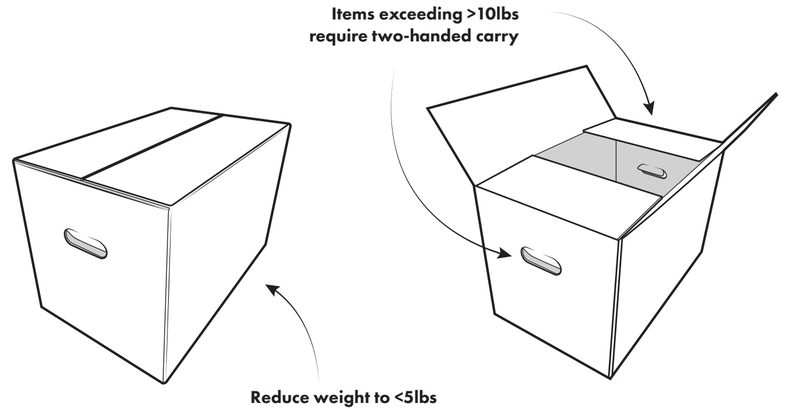
Detailed Description: People with arthritis who experience limited strength or painful finger joints may have difficulty transporting boxes that exceed 5.0 pounds for long distances. Heavier items that exceed 10.0 pounds may require a two-handed carry.

Populations Impacted: Limited strength

Potential Solutions: *Reduce weight of the box to below 5.0 pounds.* Users may need to use two hands to carry and transport boxes exceeding 5.0 pounds.

Design a second grasp point to facilitate a two-handed carry for boxes that weigh more than 5.0 pounds. Heavy boxes over 5.0 pounds should be designed to be carried using two hands. Multiple grasp points or a grasp point accommodating two hands can be useful when the box needs to be transported as part of the use case.

Design the shape of the grasp point to distribute the load across the inner surface area of the grasp point. Pressure points at the load-bearing portion of the grasp point can cause discomfort across painful finger joints. Consider designing the inner surface of the grasp point to distribute the load across the hand.



1.2 The box does not have a comfortable, graspable area.

Detailed Description: People with arthritis who experience painful finger joints may have difficulty grasping the box or may not know where to grasp the box if a clear graspable area is not provided.

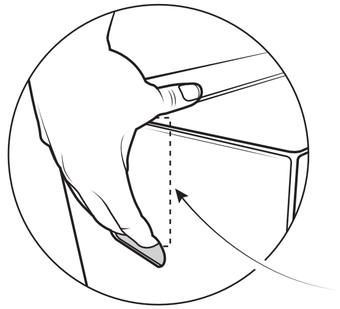
Populations Impacted: Limited strength, limited range of motion

Potential Solutions: *Limit the width of the graspable area.* Users with arthritis may experience limited strength with excessive grip spans. Some users experience reductions in strength when grip spans exceed 2.5 to 3.0 inches. Select a graspable area width that allows the adult hand to grasp the box without exceeding a comfortable grip span.

Design the shape of the graspable area to distribute the load across the inner surface area of the graspable area. Pressure points at the load-bearing portion of the graspable area can cause discomfort across painful finger joints. Consider designing the graspable area to distribute the load across the hand, avoiding ridges, seams and small-radius protrusions.

Eliminate sharp edges. Sharp edges caused by cut edges can cause discomfort while grasping the box. Consider folding the material at the grasp point to reduce or eliminate sharp edges.

Provide hand cutouts. Boxes with built-in cutouts to accommodate hand insertion into the box can be useful for grasping heavy or large boxes. Design the cutouts to accommodate full hand insertion without causing pressure on painful finger joints. The box's contents should be secured so they do not shift and pinch the fingers during transportation.

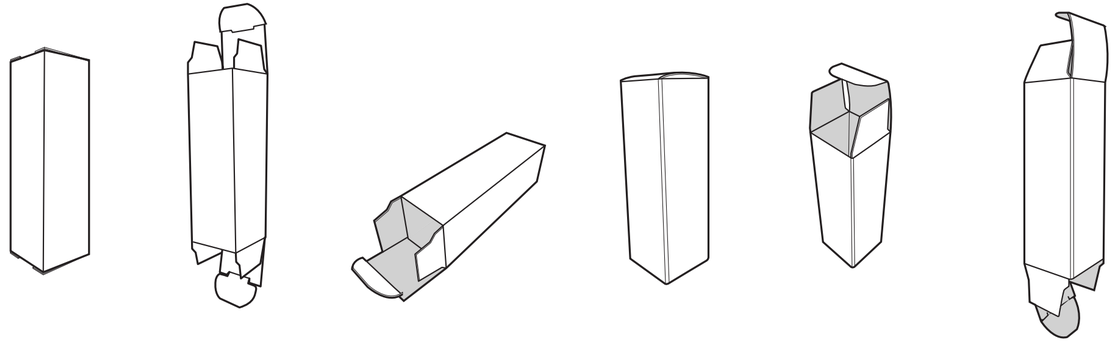


Limit the handle grip span to < 2.5-3.0″

STRAIGHT TUCK & REVERSE TUCK BOXES

Tuck boxes are designed for repeated opening and closing. They have a top panel and bottom panel attached to the main body of the box. The main difference between types of tuck boxes is whether they have a glue joint. Straight tuck boxes and reverse tuck boxes have a glue joint on the side of the main body of the box. Straight tuck boxes have panels that fold in the same direction, while reverse tuck boxes have panels that fold in opposite directions (i.e., the top folds from back to front, and the bottom folds from front to back). Companies will use a reverse tuck to save money because the die line can be nested on a sheet, minimizing waste.

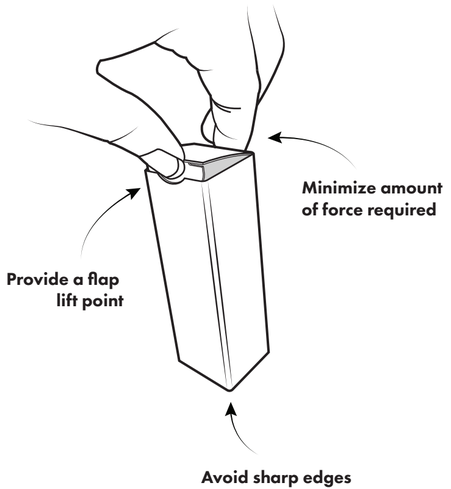
Examples of Straight Tuck & Reverse Tuck Boxes

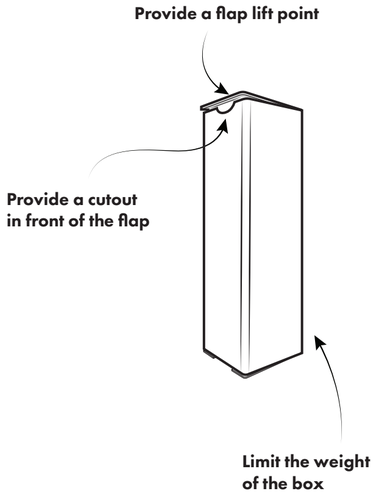


Optimum Straight Tuck & Reverse Tuck Box Design Guidelines

Recommendation Highlights

- **Provide a flap lift point**
- **Minimize the amount of force required**
- **Provide a cutout in front of the flap**
- **Provide a comfortable grasp point**
- **Limit the weight of the box**
- **Avoid sharp edges**





STRAIGHT TUCK & REVERSE TUCK BOX ISSUES

Ease-of-use issues associated with the use of straight tuck and reverse tuck boxes are primarily associated with transportation and opening of the boxes. Users may have difficulty lifting the flap to access the box contents. The following pages have detailed descriptions, population impact considerations and potential solutions for each issue. Users may have difficulty with tapes, seals or adhesives if they are used to secure the flap.

1. Transportation and Handling Issues

1.1. The box is too heavy.
1.2. The box does not have a comfortable, graspable area.

2. Opening Issues

2.1. The flap is difficult to lift.
2.2. The contents are difficult to remove.

1.1 The box is too heavy.

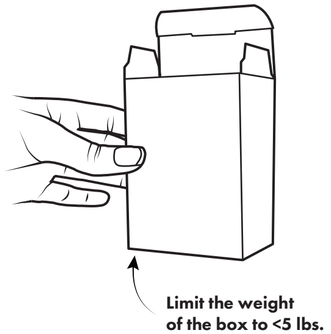
Detailed Description: People with arthritis who experience limited strength or painful finger joints may have difficulty transporting boxes that exceed 5.0 pounds for long distances. Heavier items that exceed 10.0 pounds may require a two-handed carry.

Populations Impacted: Limited strength

Potential Solutions: *Reduce weight of the box to below 5.0 pounds.* Users may need to use two hands to carry and transport boxes exceeding 5.0 pounds.

Design a second grasp point to facilitate a two-handed carry for boxes that weigh more than 5.0 pounds. Heavy boxes over 5.0 pounds should be designed to be carried using two hands. Multiple grasp points or a grasp point accommodating two hands can be useful when the box needs to be transported as part of the use case.

Design the shape of the grasp point to distribute the load across the inner surface area of the grasp point. Pressure points at the load-bearing portion of the grasp point can cause discomfort across painful finger joints. Consider designing the inner surface of the grasp point to distribute the load across the hand.



1.2 The box does not have a comfortable, graspable area.

Detailed Description: People with arthritis who experience painful finger joints may have difficulty grasping the box or may not know where to grasp the box if a clear graspable area is not provided.

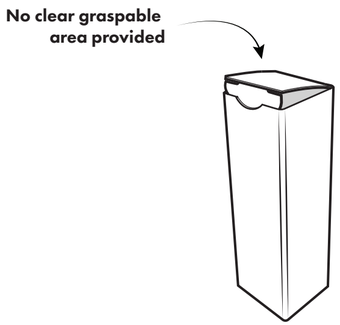
Populations Impacted: Limited strength, limited range of motion

Potential Solutions: *Limit the width of the graspable area.* Users with arthritis may experience limited strength with excessive grip spans. Some users experience reductions in strength when grip spans exceed 2.5 to 3.0 inches. Select a graspable area width that allows the adult hand to grasp the box without exceeding a comfortable grip span.

Design the shape of the graspable area to distribute the load across the inner surface area of the graspable area. Pressure points at the load-bearing portion of the graspable area can cause discomfort across painful finger joints. Consider designing the graspable area to distribute the load across the hand, avoiding ridges, seams and small-radius protrusions.

Eliminate sharp edges. Sharp edges caused by cut edges can cause discomfort while grasping the box. Consider folding the material at the grasp point to reduce or eliminate sharp edges.

Provide hand cutouts. Boxes with built-in cutouts to accommodate hand insertion into the box can be useful for grasping heavy or large boxes. Design the cutouts to accommodate full hand insertion without causing pressure on painful finger joints. The box's contents should be secured so they do not shift and pinch the fingers during transportation.



2.1 The flap is difficult to lift.

Detailed Description: Users may have difficulty lifting the flap to open the box due to the amount of force required or the lack of space to grasp the flap for lifting. Sharp edges on the wall of the box adjacent to the flap may cause discomfort as the user attempts to extract the flap.

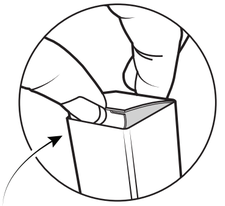
Populations Impacted: Limited strength, limited range of motion, limited fine motor control

Potential Solutions: *Provide design elements to assist in lifting the flap.* Cutouts on the front of the box in front of the flap can provide users with a convenient point to lift the flap. A separate die cut element near the front fold of the flap that causes a portion of the flap to extend beyond the front plane of the box can provide the user with sufficient purchase to lift the flap.

Minimize the amount of force required to lift the flap. The amount of force required to lift the flap should not exceed 3.0 pounds.

Minimize damage to the flap to support resealing. The act of lifting the flap should not damage the flap in a way that prevents the box from being resealed.

Eliminate sharp edges. Sharp edges near where users might insert their fingers while opening the packaging should be avoided.



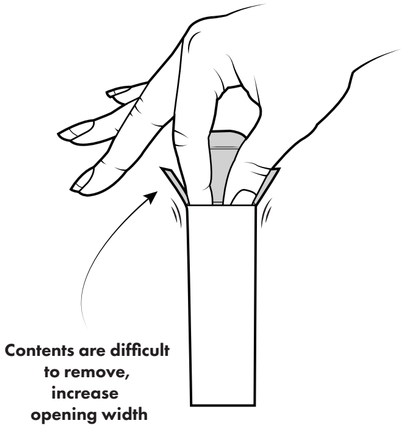
2.2 The contents are difficult to remove.

Detailed Description: Users may have difficulty safely extracting the contents of the box. Contents designed to be poured may not flow out of the box in a controlled manner due to the box top components' design. Contents designed to be pulled out of the box may not accommodate the size of an adult hand.

Populations Impacted: Limited range of motion, limited fine motor control

Potential Solutions: *Provide design elements and affordances for products that require pouring.* Products that should be poured out of the box should be packaged in a box with design elements designed to promote a controlled pour.

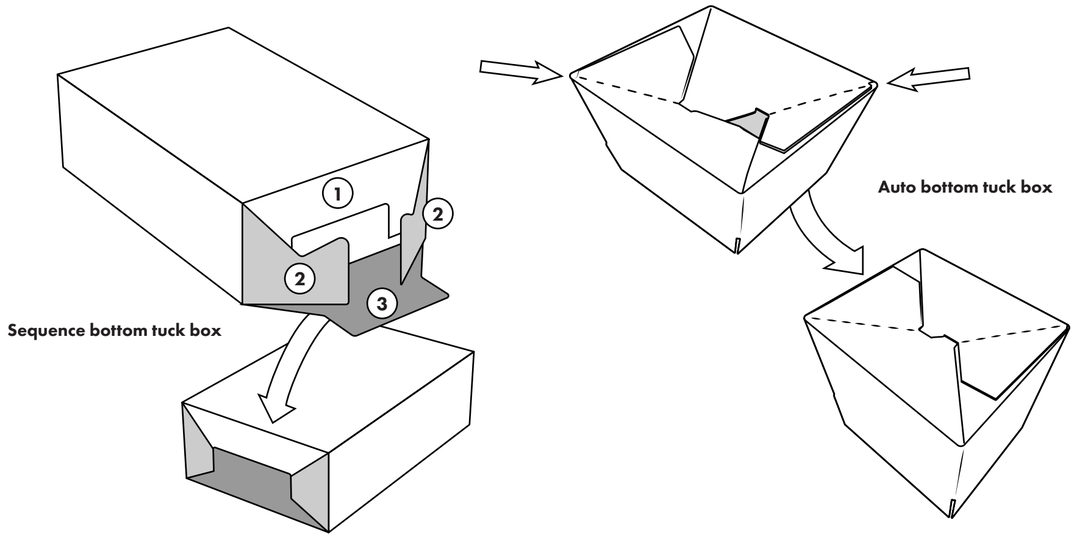
Provide sufficiently sized opening for products designed to be extracted. Products designed to be extracted by reaching in the box to grasp the product should be packaged in a box with an opening that accommodates the adult hand's size. If the top area is too small, consider using the side of the box for opening.



SEQUENCE BOTTOM & AUTO BOTTOM TUCK BOXES

Tuck boxes can have two additional types of bottom construction: sequence bottom or auto bottom. Sequence bottom and auto bottom boxes have four panels on the bottom of the box attached to the main body of the box. These four panels lock into each other and create a strong bond for packaging heavier items. Sequence bottom boxes are manually constructed, and auto bottom boxes are constructed with machinery.

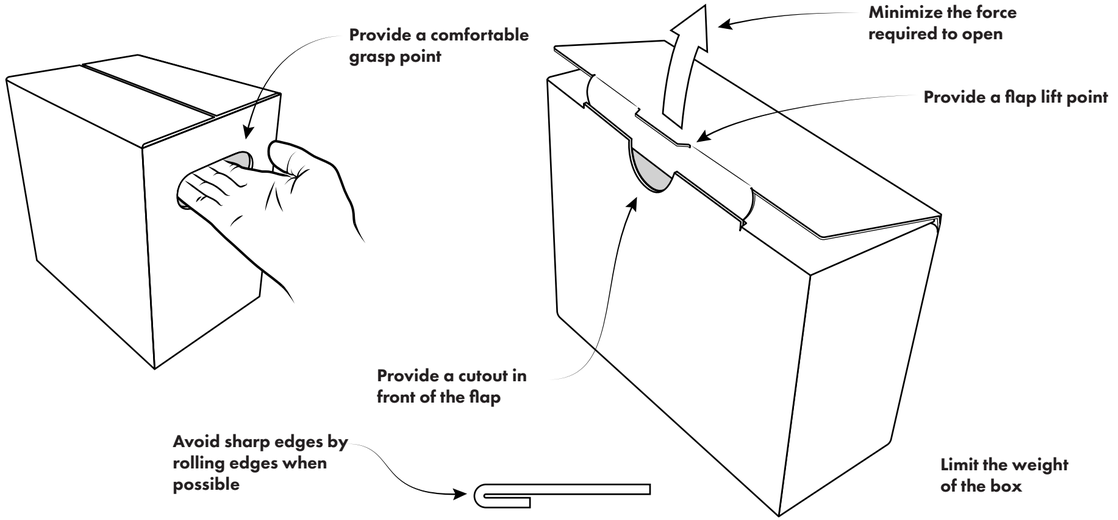
Examples of Sequence Bottom & Auto Bottom Tuck Boxes



Optimum Sequence Bottom & Auto Bottom Tuck Boxes Design Guidelines

Recommendation Highlights

- **Provide a flap lift point**
- **Minimize the amount of force required**
- **Provide a cutout in front of the flap**
- **Provide a comfortable grasp point**
- **Limit the weight of the box**
- **Avoid sharp edges**



SEQUENCE BOTTOM & AUTO BOTTOM TUCK BOXES ISSUES

Ease-of-use issues associated with the use of sequence bottom and auto bottom tuck boxes primarily pertain to the transportation and opening and opening of the boxes. Users may have difficulty lifting the flap to access the box contents. The following pages have detailed descriptions, population impact considerations and potential solutions for each issue. Users may have difficulty with tapes, seals or adhesives if they are used to secure the flap.

1. Transportation and Handling Issues

1.1. The box is too heavy.
1.2. The box does not have a comfortable, graspable area.

2. Opening Issues

2.1. The flap is difficult to lift.
2.2. The contents are difficult to remove.

1.1 The box is too heavy.

Detailed Description: People with arthritis who experience limited strength or painful finger joints may have difficulty transporting boxes that exceed 5.0 pounds for long distances. Heavier items that exceed 10.0 pounds may require a two-handed carry.

Populations Impacted: Limited strength

Potential Solutions: *Reduce weight of the box to below 5.0 pounds.* Users may need to use two hands to carry and transport boxes exceeding 5.0 pounds.

Design a second grasp point to facilitate a two-handed carry for boxes that weigh more than 5.0 pounds. Heavy boxes over 5.0 pounds should be designed to be carried using two hands. Multiple grasp points or a grasp point accommodating two hands can be useful when the box needs to be transported as part of the use case.

Design the shape of the grasp point to distribute the load across the inner surface area of the grasp point. Pressure points at the load-bearing portion of the grasp point can cause discomfort across painful finger joints. Consider designing the inner surface of the grasp point to distribute the load across the hand.

1.2 The box does not have a comfortable, graspable area.

Detailed Description: People with arthritis who experience painful finger joints may have difficulty grasping the box or may not know where to grasp the box if a clear graspable area is not provided.

Populations Impacted: Limited strength, limited range of motion

Potential Solutions: *Limit the width of the graspable area.* Users with arthritis may experience limited strength with excessive grip spans. Some users experience reductions in strength when grip spans exceed 2.5 to 3.0 inches. Select a graspable area width that allows the adult hand to grasp the box without exceeding a comfortable grip span.

Design the shape of the graspable area to distribute the load across the inner surface area of the graspable area. Pressure points at the load-bearing portion of the graspable area can cause discomfort across painful finger joints. Consider designing the graspable area to distribute the load across the hand, avoiding ridges, seams and small-radius protrusions.

Eliminate sharp edges. Sharp edges caused by cut edges can cause discomfort while grasping the box. Consider folding the material at the grasp point to reduce or eliminate sharp edges.

Provide hand cutouts. Boxes with built-in cutouts to accommodate hand insertion into the box can be useful for grasping heavy or large boxes. Design the cutouts to accommodate full hand insertion without causing pressure on painful finger joints. The box's contents should be secured so they do not shift and pinch the fingers during transportation.

2.1 The flap is difficult to lift.

Detailed Description: Users may have difficulty lifting the flap to open the box due to the amount of force required or the lack of space to grasp the flap for lifting. Sharp edges on the wall of the box adjacent to the flap may cause discomfort as the user attempts to extract the flap.

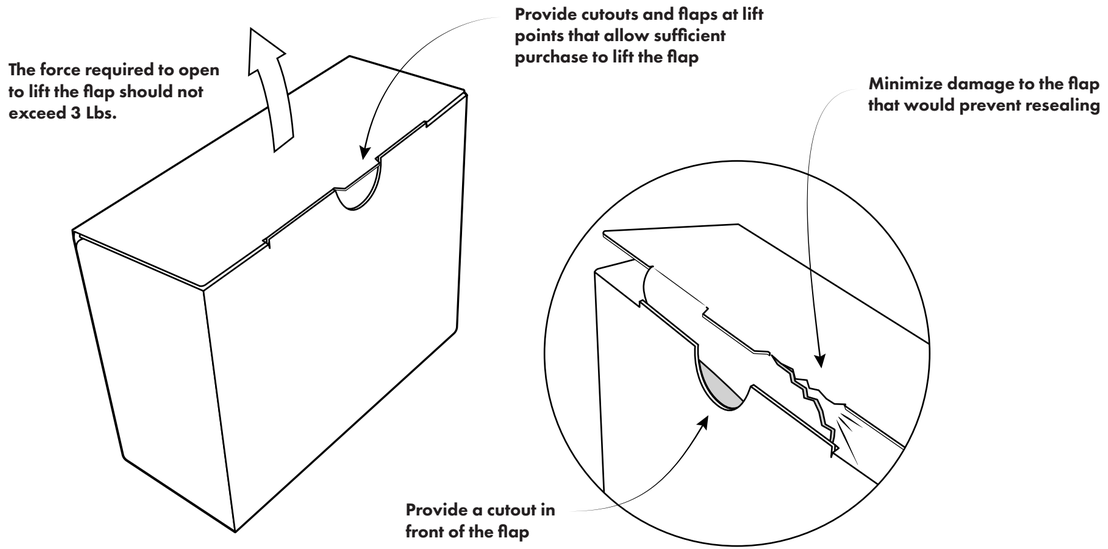
Populations Impacted: Limited strength, limited range of motion, limited fine motor control

Potential Solutions: *Provide design elements to assist in lifting the flap.* Cutouts on the front of the box in front of the flap can provide users with a convenient point to lift the flap. A separate die cut element near the front fold of the flap that causes a portion of the flap to extend beyond the front plane of the box can provide the user with sufficient purchase to lift the flap.

Minimize the amount of force required to lift the flap. The amount of force required to lift the flap should not exceed 3.0 pounds.

Minimize damage to the flap to support resealing. The act of lifting the flap should not damage the flap in a way that prevents the box from being resealed.

Eliminate sharp edges. Sharp edges near where users might insert their fingers while opening the packaging should be avoided.



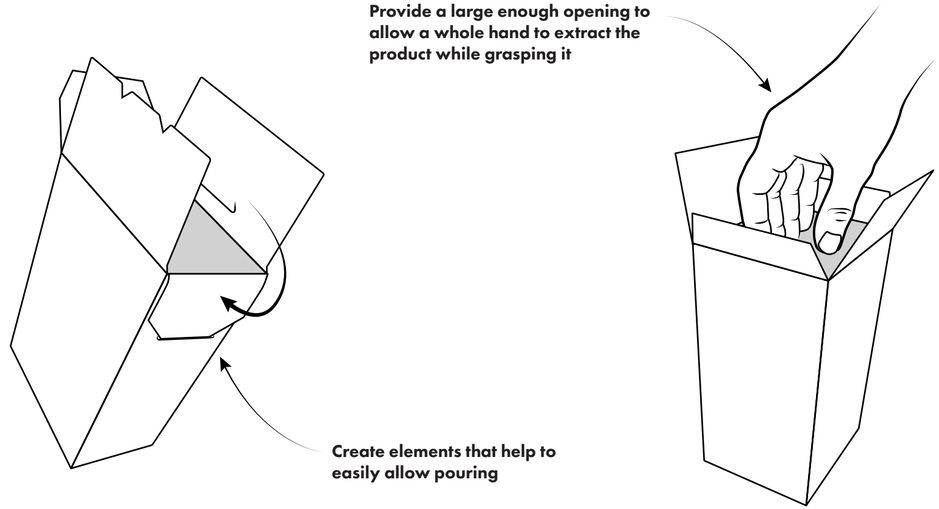
2.2 The contents are difficult to remove.

Detailed Description: Users may have difficulty safely extracting the contents of the box. Contents designed to be poured may not flow out of the box in a controlled manner due to the box top components' design. Contents designed to be pulled out of the box may not accommodate the size of an adult hand.

Populations Impacted: Limited range of motion, limited fine motor control

Potential Solutions: *Provide design elements and affordances for products that require pouring.* Products that should be poured out of the box should be packaged in a box with design elements designed to promote a controlled pour.

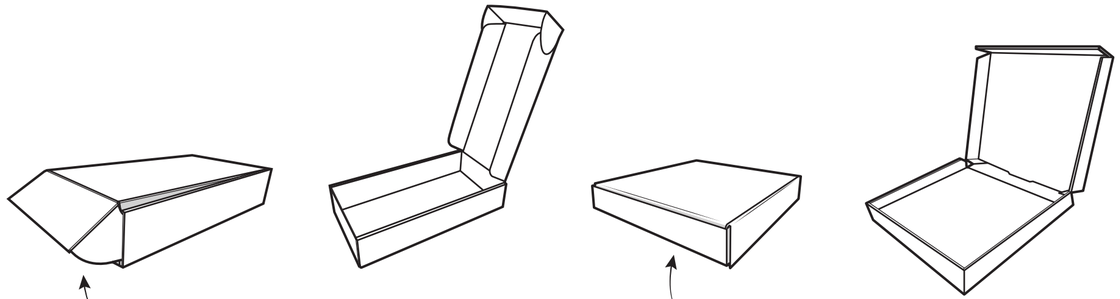
Provide sufficiently sized opening for products designed to be extracted. Products designed to be extracted by reaching in the box to grasp the product should be packaged in a box with an opening that accommodates the adult hand's size.



TOP TUCK & FRONT TUCK BOXES

Top tuck and front tuck boxes do not have a glue joint; the structure is done through folding and tucking only. The main body of the box has rolled sides, and the tabs from the lid lock into the opening between the rolled sides. Top tuck boxes are commonly used for pizza boxes.

Examples of Top Tuck & Front Tuck Boxes



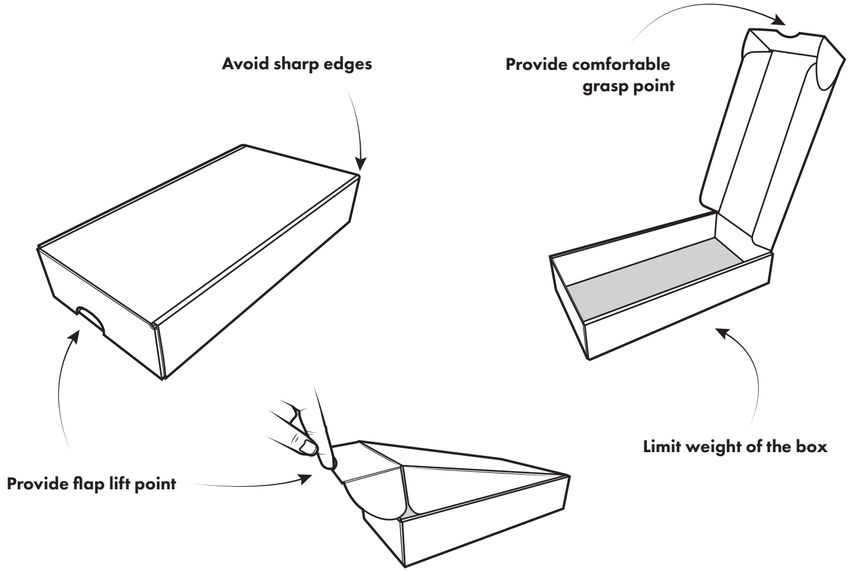
Front Tuck: tabs from the lid lock into the opening between the rolled sides

Top Tuck: no tabs on front lid

Top Tuck & Front Tuck Box Design Guidelines

Recommendation Highlights

- **Provide a flap lift point**
- **Minimize the amount of force required**
- **Provide a cutout in front of the flap**
- **Provide a comfortable grasp point**
- **Limit the weight of the box**
- **Avoid sharp edges**



TOP TUCK & FRONT TUCK BOX ISSUES

Ease-of-use issues associated with the use of top tuck and front tuck boxes are primarily associated with transportation and opening of the boxes. Users may have difficulty lifting the flap to access the box contents. The following pages have detailed descriptions, population impact considerations and potential solutions for each issue. Users may have difficulty with tapes, seals or adhesives if they are used to secure the flap.

1. Transportation and Handling Issues

1.1. The box is too heavy.
1.2. The box does not have a comfortable, graspable area.

2. Opening Issues

2.1. The flap is difficult to lift.
2.2. The contents are difficult to remove.

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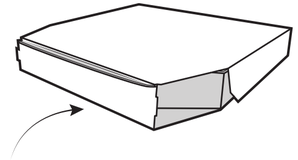
1.1 The box is too heavy.

Detailed Description: People with arthritis who experience limited strength or painful finger joints may have difficulty transporting boxes that exceed 5.0 pounds for long distances. Heavier items that exceed 10.0 pounds may require a two-handed carry.

Populations Impacted: Limited strength

Potential Solutions: *Reduce weight of the box to below 5.0 pounds.* Users may need to use two hands to carry and transport boxes exceeding 5.0 pounds.

Design a second grasp point to facilitate a two-handed carry for boxes that weigh more than 5.0 pounds. Heavy boxes over 5.0 pounds should be designed to be carried using two hands. Multiple grasp points or a grasp point accommodating two hands can be useful when the box needs to be transported as part of the use case.



Keep weight < 5 lbs.

Design the shape of the grasp point to distribute the load across the inner surface area of the grasp point. Pressure points at the load-bearing portion of the grasp point can cause discomfort across painful finger joints. Consider designing the inner surface of the grasp point to distribute the load across the hand.

1.2 The box does not have a comfortable, graspable area.

Detailed Description: People with arthritis who experience painful finger joints may have difficulty grasping the box or may not know where to grasp the box if a clear graspable area is not provided.

Populations Impacted: Limited strength, limited range of motion

Potential Solutions: *Limit the width of the graspable area.* Users with arthritis may experience limited strength with excessive grip spans. Some users experience reductions in strength when grip spans exceed 2.5 to 3.0 inches. Select a graspable area width that allows the adult hand to grasp the box without exceeding a comfortable grip span.

Design the shape of the graspable area to distribute the load across the inner surface area of the graspable area. Pressure points at the load-bearing portion of the graspable area can cause discomfort across painful finger joints. Consider designing the graspable area to distribute the load across the hand, avoiding ridges, seams and small-radius protrusions.

Eliminate sharp edges. Sharp edges caused by cut edges can cause discomfort while grasping the box. Consider folding the material at the grasp point to reduce or eliminate sharp edges.

Provide hand cutouts. Boxes with built-in cutouts to accommodate hand insertion into the box can be useful for grasping heavy or large boxes. Design the cutouts to accommodate full hand insertion without causing pressure on painful finger joints. The box's contents should be secured so they do not shift and pinch the fingers during transportation.

2.1 The flap is difficult to lift.

Detailed Description: Users may have difficulty lifting the flap to open the box due to the amount of force required or the lack of space to grasp the flap for lifting. Sharp edges on the wall of the box adjacent to the flap may cause discomfort as the user attempts to extract the flap.

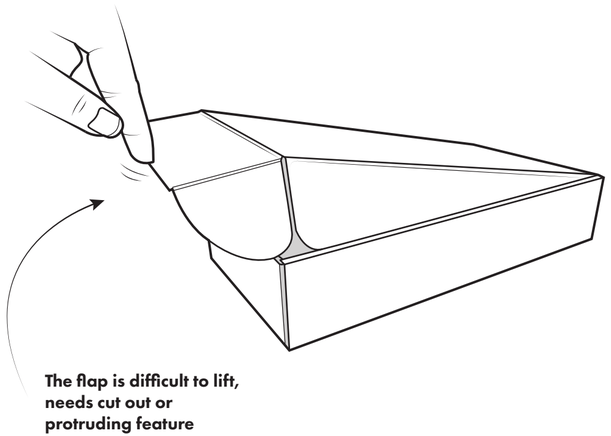
Populations Impacted: Limited strength, limited range of motion, limited fine motor control

Potential Solutions: *Provide design elements to assist in lifting the flap.* Cutouts on the front of the box in front of the flap can provide users with a convenient point to lift the flap. A separate die cut element near the front fold of the flap that causes a portion of the flap to extend beyond the front plane of the box can provide the user with sufficient purchase to lift the flap.

Minimize the amount of force required to lift the flap. The amount of force required to lift the flap should not exceed 3.0 pounds.

Minimize damage to the flap to support resealing. The act of lifting the flap should not damage the flap in a way that prevents the box from being resealed.

Eliminate sharp edges. Sharp edges near where users might insert their fingers while opening the packaging should be avoided.



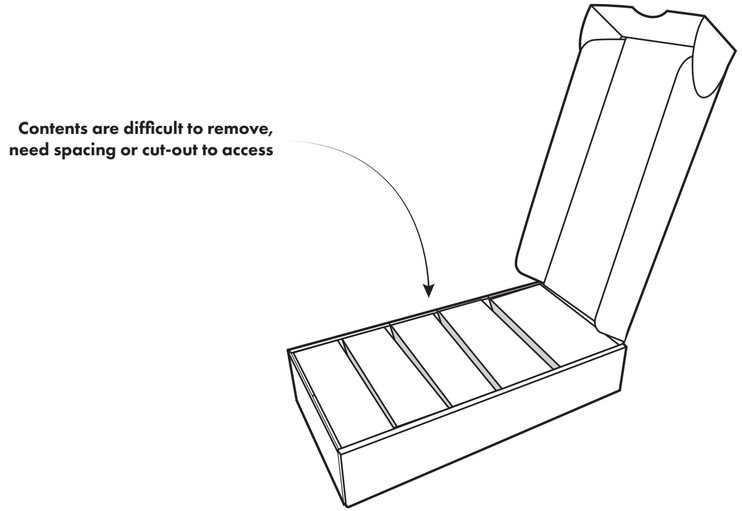
2.2 Contents are difficult to remove.

Detailed Description: Users may have difficulty safely extracting the contents of the box. Contents designed to be poured may not flow out of the box in a controlled manner due to the box top components' design. Contents designed to be pulled out of the box may not accommodate the size of an adult hand.

Populations Impacted: Limited range of motion, limited fine motor control

Potential Solutions: *Provide sufficiently sized opening for product designed to be extracted.* Products designed to be extracted by reaching in the box to grasp the product should be packaged in a box with an opening that accommodates the adult hand's size.

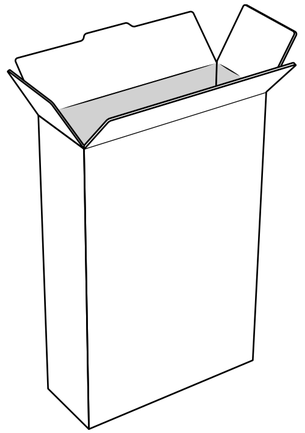
Avoid design elements that would impede product removal. Products that are secured by wire, straps or cardboard retaining features should be avoided because they may make the product difficult to remove once the box has been opened. Products that are held in place by friction may be difficult to extract.

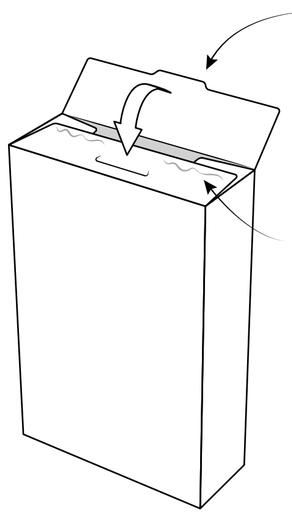


GLUED OVERLAPPING FLAP BOXES

Glued overlapping flap boxes are a common type of box used for packaging cereal, pasta, rice, dehydrated beverages and many other dry grocery products. They are made from die cut paperboard. Some of the packages, such as cereal boxes, will have a tab and slit in the top flaps to enable repeated opening and closing.

Examples of Glued Overlapping Flap Boxes

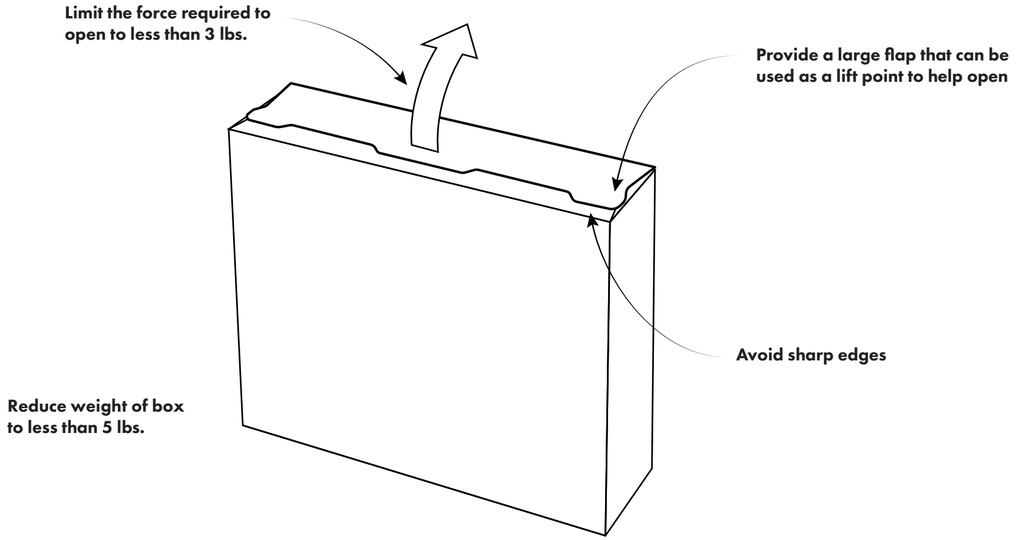




Glued Overlapping Flap Boxes Design Guidelines

Recommendation Highlights

- **Provide a flap lift point**
- **Minimize the amount of force required**
- **Limit the weight of the box**
- **Avoid sharp edges**



GLUED OVERLAPPING FLAP BOXES ISSUES

Ease-of-use issues associated with the use of glued overlapping flap boxes primarily pertain to the transportation and opening of the boxes. Users may have difficulty lifting the glued flap to access the box contents. Users may also have difficulty inserting tabs into the slit to reseal the box. The following pages have detailed descriptions, population impact considerations and potential solutions for each issue. Users may have difficulty with tapes, seals or adhesives if they are used to secure the flap.

1. Transportation and Handling Issues

1.1. The box is too heavy.
1.2. The box does not have a comfortable, graspable area.

2. Opening Issues

2.1. The flap is difficult to lift.
2.2. The contents are difficult to remove.

3. Closing Issues

3.1. The flap is difficult to reseal.

1.1 The box is too heavy.

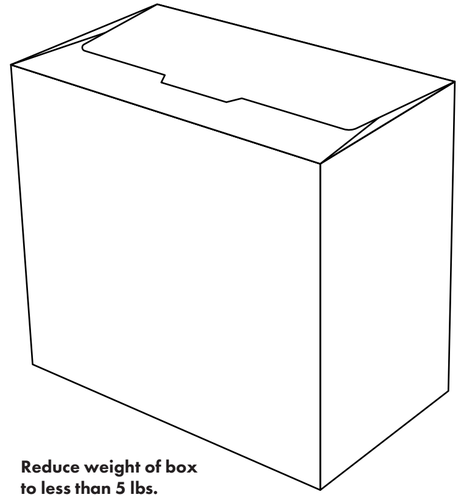
Detailed Description: People with arthritis who experience limited strength or painful finger joints may have difficulty transporting boxes that exceed 5.0 pounds for long distances. Heavier items that exceed 10.0 pounds may require a two-handed carry.

Populations Impacted: Limited strength

Potential Solutions: *Reduce weight of the box to below 5.0 pounds.* Users may need to use two hands to carry and transport boxes exceeding 5.0 pounds.

Design a second grasp point to facilitate a two-handed carry for boxes that weigh more than 5.0 pounds. Heavy boxes over 5.0 pounds should be designed to be carried using two hands. Multiple grasp points or a grasp point accommodating two hands can be useful when the box needs to be transported as part of the use case.

Design the shape of the grasp point to distribute the load across the inner surface area of the grasp point. Pressure points at the load-bearing portion of the grasp point can cause discomfort across painful finger joints. Consider designing the inner surface of the grasp point to distribute the load across the hand.



Reduce weight of box to less than 5 lbs.

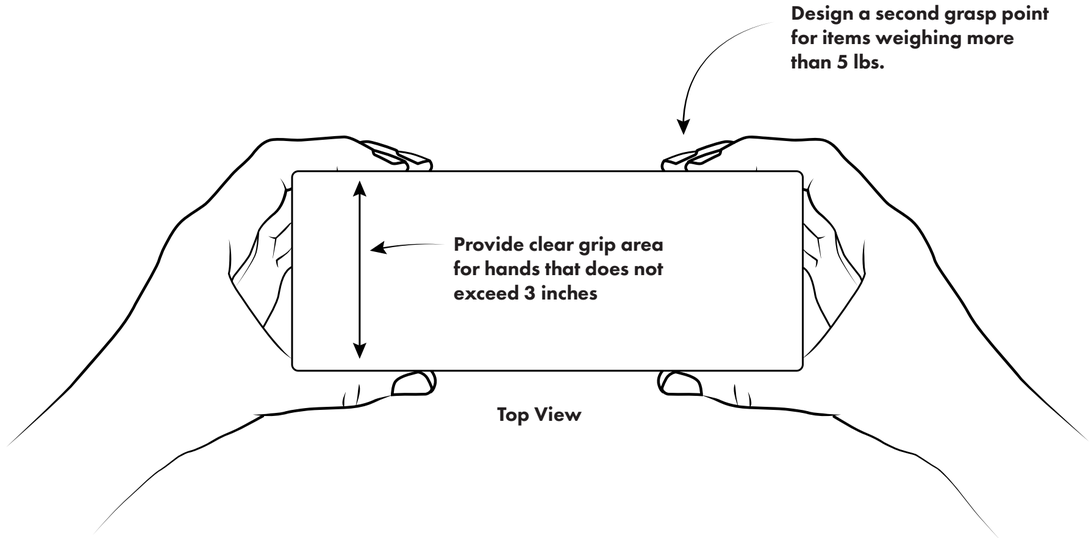
1.2 The box does not have a comfortable, graspable area.

Detailed Description: People with arthritis who experience painful finger joints may have difficulty grasping the box or may not know where to grasp the box if a clear graspable area is not provided.

Populations Impacted: Limited strength, limited range of motion

Potential Solutions: *Limit the width of the graspable area.* Users with arthritis may experience limited strength with excessive grip spans. Some users experience reductions in strength when grip spans exceed 2.5 to 3.0 inches. Select a graspable area width that allows the adult hand to grasp the box without exceeding a comfortable grip span.

Design the shape of the graspable area to distribute the load across the inner surface area of the graspable area. Pressure points at the load-bearing portion of the graspable area can cause discomfort across painful finger joints. Consider designing the graspable area to distribute the load across the hand, avoiding ridges, seams and small-radius protrusions.



2.1 The flap is difficult to lift.

Detailed Description: Users may have difficulty lifting the flap to open the box due to the amount of force required or the lack of space to grasp the flap for lifting. Sharp edges on the wall of the box adjacent to the flap may cause discomfort as the user attempts to extract the flap.

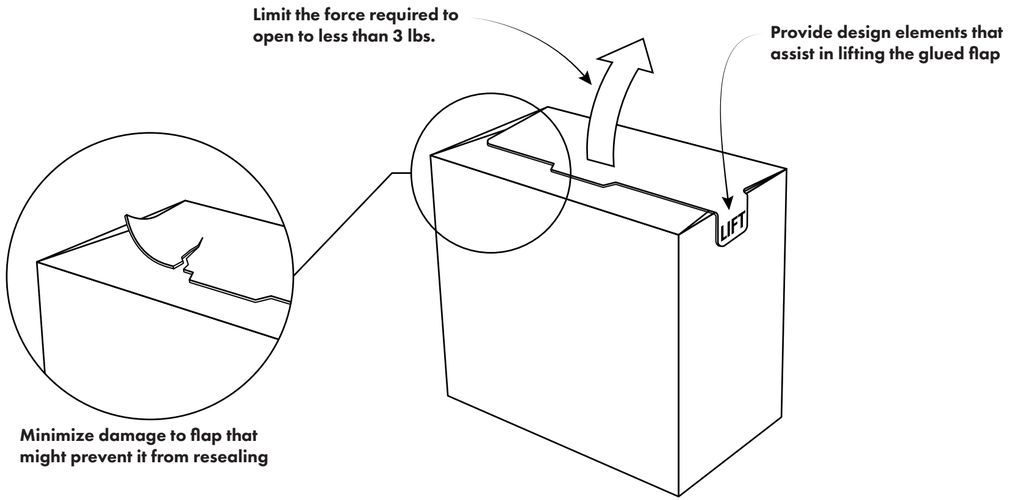
Populations Impacted: Limited strength, limited range of motion, limited fine motor control

Potential Solutions: *Provide design elements to assist in lifting the flap.* Unglued portions of the flap on the front of the box can provide users with a convenient point to lift the flap.

Minimize the amount of force required to lift the flap. The amount of force required to lift the flap should not exceed 3.0 pounds.

Minimize damage to the flap to support resealing. The act of lifting the flap should not damage the flap in a way that prevents the box from being resealed.

Eliminate sharp edges. Sharp edges near where users might insert their fingers while opening the packaging should be avoided.



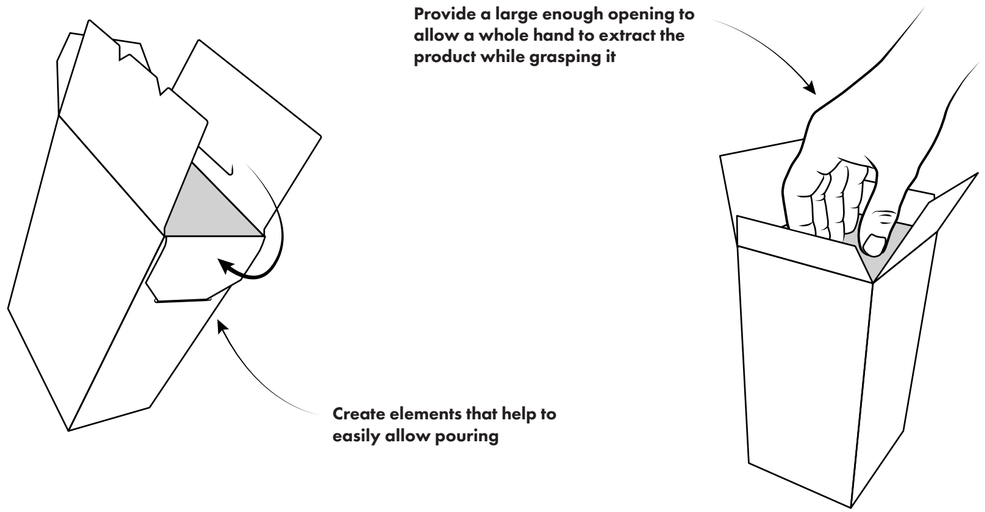
2.2 The contents are difficult to remove.

Detailed Description: Users may have difficulty safely extracting the contents of the box. Contents designed to be poured may not flow out of the box in a controlled manner due to the box top components' design. Contents designed to be pulled out of the box may not accommodate the size of an adult hand.

Populations Impacted: Limited range of motion, limited fine motor control

Potential Solutions: *Provide design elements and affordances for products that require pouring.* Products that should be poured out of the box should be packaged in a box with design elements designed to promote a controlled pour.

Provide sufficiently sized opening for product designed to be extracted. Products designed to be extracted by reaching in the box to grasp the product should be packaged in a box with an opening that accommodates the adult hand's size.



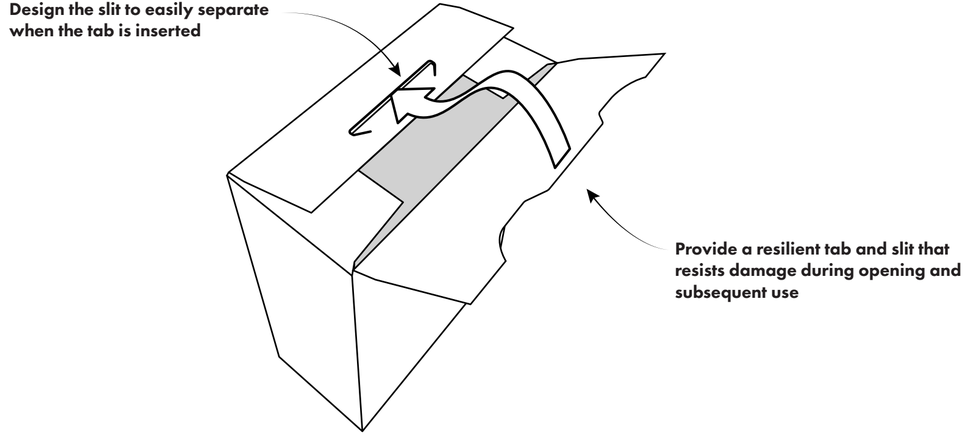
3.1 The flap is difficult to reseal.

Detailed Description: Users may have difficulty resealing the flap if the box features tab and slit design elements. The slit can fail to separate, making it difficult to insert the tab. The tab and/or slit can become damaged when the glued portion of the flap is opened. Damage to the tab and slit area can make it difficult or impossible to reseal the flap.

Populations Impacted: Limited range of motion, limited fine motor control

Potential Solutions: *Provide a resilient tab and slit feature.* Design the glued flap in such a way as to minimize damage during opening. Thicker cardboard can resist tearing. Glue that separates at the interface, between the glue and the surface of the flap, can preserve the integrity of the tab and slit.

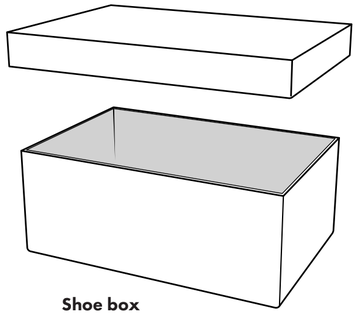
Ensure the slit easily opens. The slit should separate easily, with minimum force, as the tab is inserted into the slit location.



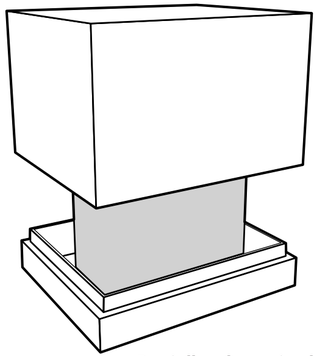
TWO-PIECE BOXES

Two-piece boxes consist of a base box and removeable lid. They are used for various functions, most notably shoe boxes and apparel items. Two-piece boxes, where the top component fully overlaps with the base, are called fully telescoping boxes. And two-piece boxes, where the top component partially overlaps with the base component, are called partially telescoping boxes. Partially telescoping boxes are used for appliances, furniture and other heavy items because they can be unpacked without lifting the heavy item out of the box.

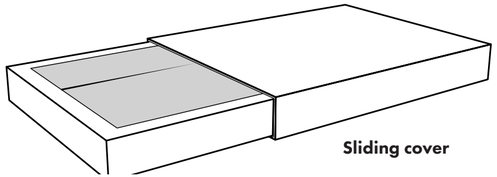
Examples of Two-Piece Boxes



Shoe box



Partially telescoping box

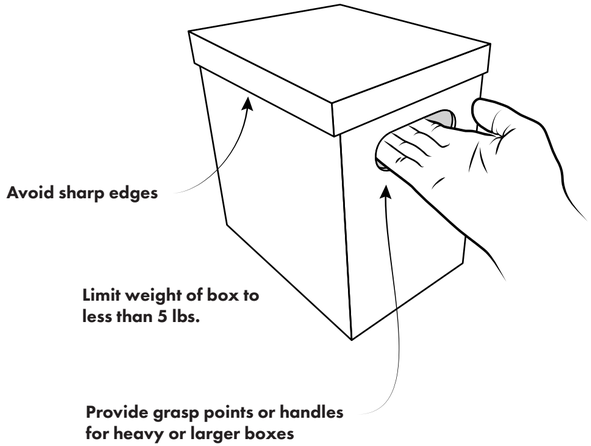


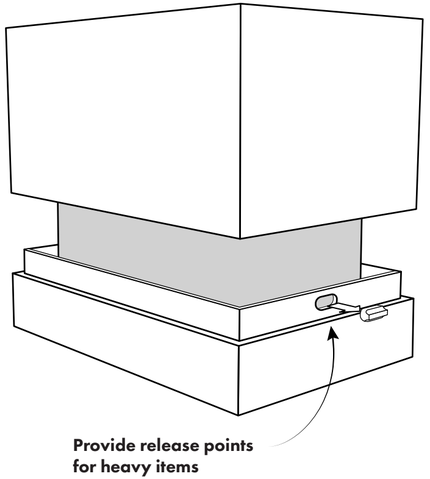
Sliding cover

Two-Piece Boxes Design Guidelines

Recommendation Highlights

- **Limit the weight of the box**
- **Avoid sharp edges**
- **Provide grasp points or handles for larger boxes**
- **Provide release points for heavy items**





TWO-PIECE BOXES ISSUES

Ease-of-use issues associated with the use of two-piece boxes are primarily associated with transportation and opening of the boxes. Users may have difficulty releasing and lifting the top to access the box contents. The following pages have detailed descriptions, population impact considerations and potential solutions for each issue. Users may have difficulty with tapes, seals, straps, fixtures or adhesives if they are used to secure the components of the box.

1. Transportation and Handling Issues

1.1. The box is too heavy.
1.2. The box does not have a comfortable, graspable area.

2. Opening Issues

2.1. The box top is difficult to lift.
2.2. The contents are difficult to remove.

1.1 The box is too heavy.

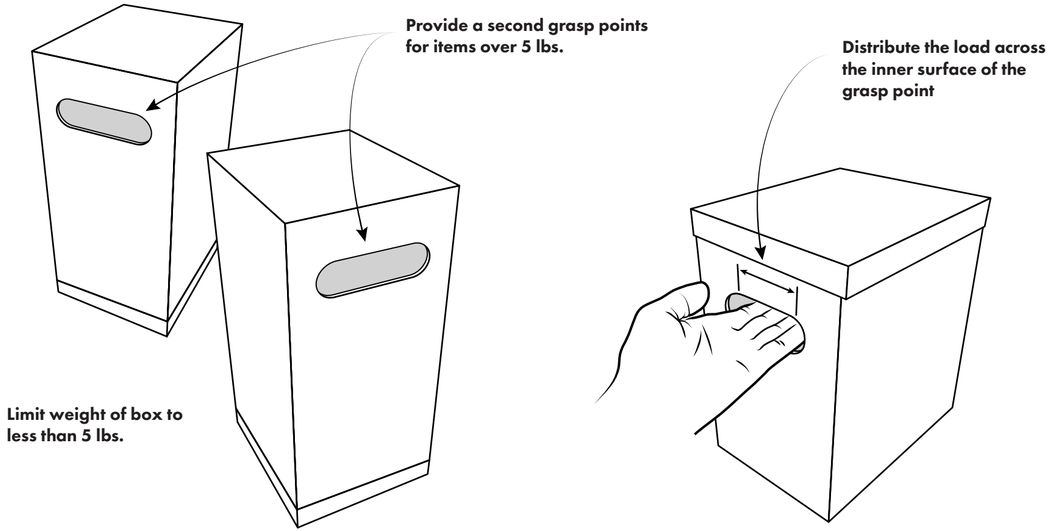
Detailed Description: People with arthritis who experience limited strength or painful finger joints may have difficulty transporting boxes that exceed 5.0 pounds for long distances. Heavier items that exceed 10.0 pounds may require a two-handed carry.

Populations Impacted: Limited strength

Potential Solutions: *Reduce weight of the box to below 5.0 pounds.* Users may need to use two hands to carry and transport boxes exceeding 5.0 pounds.

Design a second grasp point to facilitate a two-handed carry for boxes that weigh more than 5.0 pounds. Heavy boxes over 5.0 pounds should be designed to be carried using two hands. Multiple grasp points or a grasp point accommodating two hands can be useful when the box needs to be transported as part of the use case.

Design the shape of the grasp point to distribute the load across the inner surface area of the grasp point. Pressure points at the load-bearing portion of the grasp point can cause discomfort across painful finger joints. Consider designing the inner surface of the grasp point to distribute the load across the hand.



1.2 The box does not have a comfortable, graspable area.

Detailed Description: People with arthritis who experience painful finger joints may have difficulty grasping the box or may not know where to grasp the box if a clear graspable area is not provided.

Populations Impacted: Limited strength, limited range of motion

Potential Solutions: *Limit the width of the graspable area.* Users with arthritis may experience limited strength with excessive grip spans. Some users experience reductions in strength when grip spans exceed 2.5 to 3.0 inches. Select a graspable area width that allows the adult hand to grasp the box without exceeding a comfortable grip span.

Design the shape of the graspable area to distribute the load across the inner surface area of the graspable area. Pressure points at the load-bearing portion of the graspable area can cause discomfort across painful finger joints. Consider designing the graspable area to distribute the load across the hand, avoiding ridges, seams and small-radius protrusions.

Eliminate sharp edges. Sharp edges caused by cut edges can cause discomfort while grasping the box. Consider folding the material at the grasp point to reduce or eliminate sharp edges.

Provide hand cutouts. Boxes with built-in cutouts to accommodate hand insertion into the box can be useful for grasping heavy or large boxes. Design the cutouts to accommodate full hand insertion without causing pressure on painful finger joints. The box's contents should be secured so they do not shift and pinch the fingers during transportation

2.1 The box top is difficult to lift.

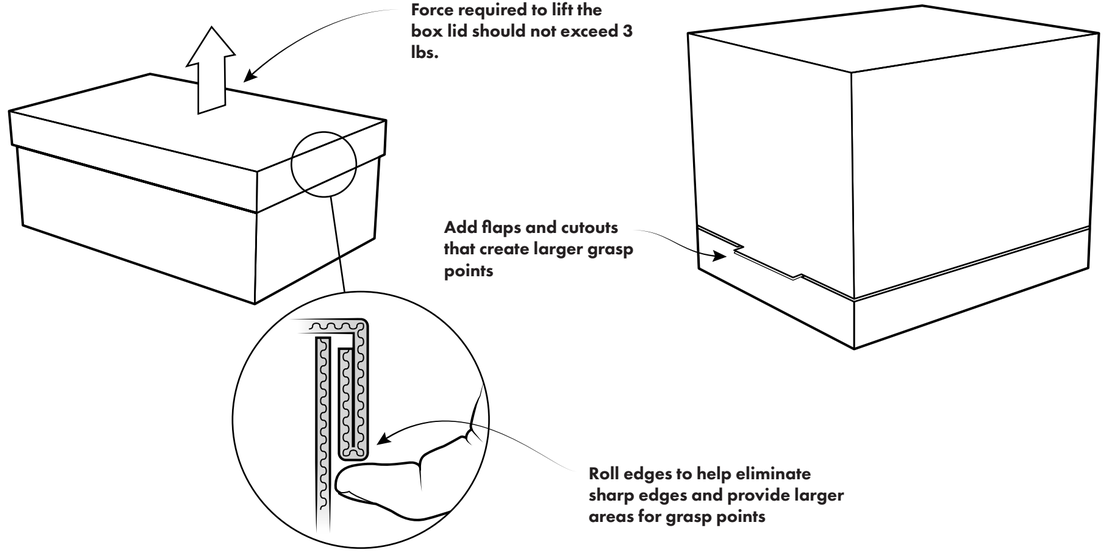
Detailed Description: Users may have difficulty lifting the box top due to the amount of force required or the lack of space to grasp the box top lip. Sharp edges on the underside of the box top lip may cause discomfort as the user attempts to lift the top.

Populations Impacted: Limited strength, limited range of motion, limited fine motor control

Potential Solutions: *Provide design elements to assist in lifting the box top.* Rolled or folded grasp points with cutouts can provide lifting points for the box top.

Minimize the amount of force required to lift the flap. The amount of force required to lift the box top should not exceed 3.0 pounds.

Eliminate sharp edges. Sharp edges near where users might insert their fingers while opening the packaging should be avoided.



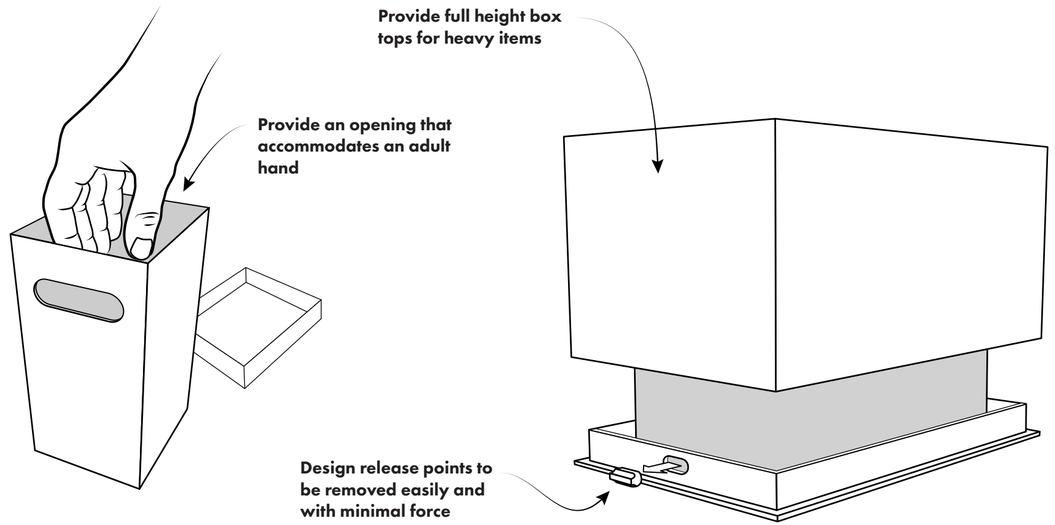
2.2 The contents are difficult to remove.

Detailed Description: Users may have difficulty safely extracting the contents of the box. Contents designed to be pulled out of the box may not accommodate the size of an adult hand. Heavy items, such as appliances, may not be able to be lifted out of the box.

Populations Impacted: Limited range of motion, limited fine motor control

Potential Solutions: *Provide sufficiently sized opening for product designed to be extracted.* Products designed to be extracted by reaching in the box to grasp the product should be packaged in a box with an opening that accommodates the adult hand's size.

Provide full-height box tops and external release points for heavy items. Users may have difficulty lifting heavy items out of a box. Consider eliminating or reducing the need to lift heavy items by providing a full-height box top that attaches to the bottom of the box with external release points or plugs. Design the release points or plugs to be easily removed by the user with a minimum amount of force. Release points or plugs should be easily graspable with a key pinch or inserted fingers.



HANDLES FOR BOXES

Large boxes can include handles for transporting the boxes. There are many sizes and shapes of handles. Some handles are one piece die cuts into the sheet material on one or more sides. Other handles, such as the handles on 12-packs of beverage boxes, are two-piece die cuts, formed from the negative space between the two die cuts.

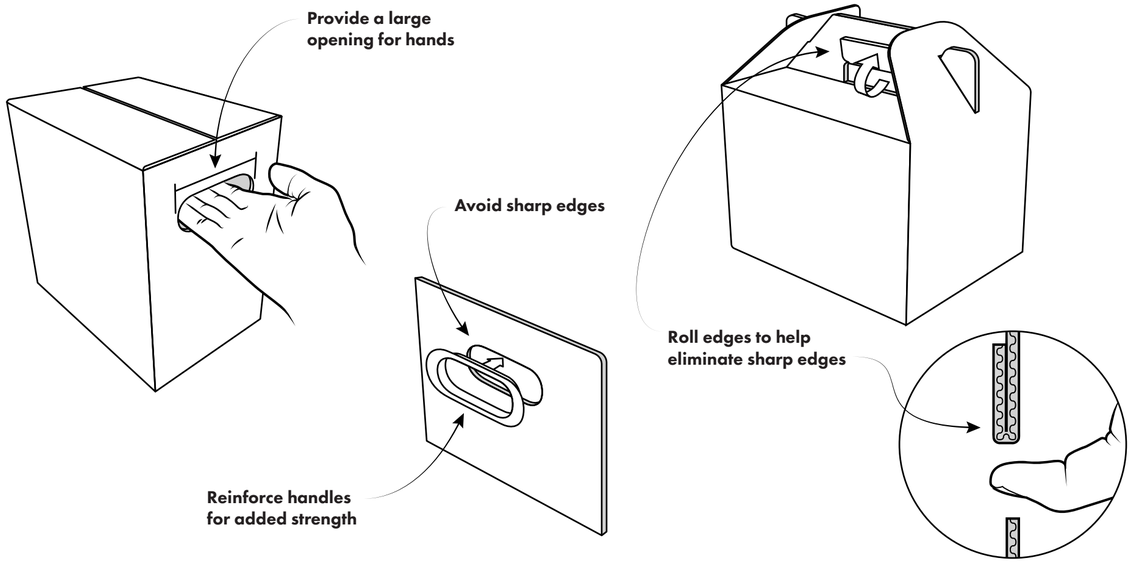
Handles can be additional parts formed from plastic straps, rope, cording or additional corrugated material.

Examples of Handles Boxes

Optimum Handle Design Guidelines

Recommendation Highlights

- **Handles reinforced for strength**
- **Avoid sharp edges**
- **Large openings**
- **Rolled interior edges for comfort**



HANDLES FOR BOXES ISSUES

Ease-of-use issues associated with boxes with handles are mainly associated with transportation of the box. Sharp edges can cause pain while lifting. Inadequately sized hand cutouts can make it impossible to fully insert the hand without experiencing pain. Weak materials can cause cutouts to tear or rip while lifting. Products inside the box can shift, pinching the inserted hand.

1. Transportation Issues

1.1. The box is too heavy.
1.2. The box does not have a comfortable, graspable area.

1.1 The box is too heavy.

Detailed Description: People with arthritis who experience limited strength or painful finger joints may have difficulty transporting boxes that exceed 5.0 pounds for long distances. Heavier items that exceed 10.0 pounds may require a two-handed carry.

Populations Impacted: Limited strength

Potential Solutions: *Reduce weight of the box to below 5.0 pounds.* Users may need to use two hands to carry and transport boxes exceeding 5.0 pounds.

Design the shape of the handle to distribute the load across the inner surface area of the handle. Pressure points at the load-bearing portion of the handle can cause discomfort across painful finger joints. Consider designing the inner surface of the handle to distribute the load across the hand.

1.2 The box does not have a comfortable, graspable area.

Detailed Description: People with arthritis who experience painful finger joints may have difficulty grasping the box or may not know where to grasp the box if a clear graspable area is not provided.

Populations Impacted: Limited strength, limited range of motion

Potential Solutions: *Limit the width of the handle.* Users with arthritis may experience limited strength with excessive grip spans. Some users experience reductions in strength when grip spans exceed 2.5 to 3.0 inches. Select a handle width that allows the adult hand to grasp the box without exceeding a comfortable grip span.

Design the shape of the handle to distribute the load across the inner surface area of the handle. Pressure points at the load-bearing portion of the handle can cause discomfort across painful finger joints. Consider designing the graspable area to distribute the load across the hand, avoiding ridges, seams and small-radius protrusions.

Eliminate sharp edges. Sharp edges caused by cut edges can cause discomfort while grasping the box. Consider folding the material at the grasp point to reduce or eliminate sharp edges.

Provide hand cutouts. Boxes with built-in cutouts to accommodate hand insertion into the box can be useful for grasping heavy or large boxes. Design the cutouts to accommodate full hand insertion without causing pressure on painful finger joints. The box's contents should be secured so they do not shift and pinch the fingers during transportation.

Reinforce hand cutouts. Strengthen hand cutouts so they are unlikely to tear or rip while lifting the box.

Provide radiused triangle cutouts. Consider providing a radiused triangle cutout instead of a rectangular cutout. The radiused triangle cutout allows the user to maintain a more neutral hand posture during a two-handed carry, potentially reducing user fatigue.

PAPER BAGS

Paper bags are primarily used for low-cost products, such as sugar, flour and charcoal. The bags are formed from folded sheets of paper. These bags can be sealed with adhesives, tape or mechanical fasteners, such as staples or wire.

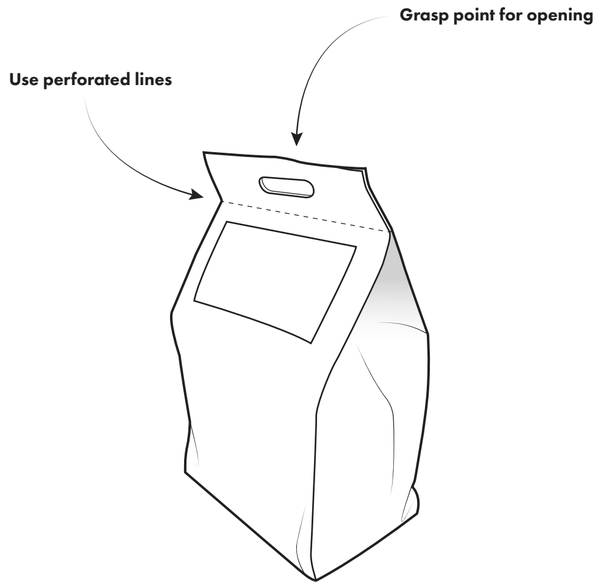
Many paper bag formats have been replaced with plastic pouches and plastic bags. Design guidelines for plastic bags and pouches are included in the Films and Pouches guidelines.

Examples of Paper Bags

Optimum Paper Bag Guidelines

Recommendation Highlights

- **Grasp point for opening**
- **Minimize damage while opening**
- **Use perforated lines**



PAPER BAG ISSUES

Ease-of-use issues associated with the use of paper bags are primarily associated with transportation and opening of the bags. Users may have difficulty lifting and tearing the top of the paper bag to access the contents. The following pages have detailed descriptions, population impact considerations and potential solutions for each issue. Users may have difficulty with tapes, seals or adhesives if they are used to secure the paper bag.

1. Transportation and Handling Issues

1.1. The bag is too heavy.
1.2. The paper bag does not have a comfortable, graspable area.

2. Opening Issues

2.1. Folded bag tops are difficult to lift.
2.2. The bag is difficult to tear.
2.3. The contents are difficult to remove.

1.1 The bag is too heavy.

Detailed Description: People with arthritis who experience limited strength or painful finger joints may have difficulty transporting paper bags that exceed 5.0 pounds for long distances. Heavier items that exceed 10.0 pounds may require a two-handed carry.

Populations Impacted: Limited strength

Potential Solutions: *Reduce weight of the paper bags to below 5.0 pounds.* Users may need to use two hands to carry and transport paper bags exceeding 5.0 pounds.

Design the shape of the grasp point to distribute the load across the inner surface area of the grasp point. Pressure points at the load-bearing portion of the grasp point can cause discomfort across painful finger joints. Consider designing the inner surface of the grasp point to distribute the load across the hand.

1.2 The paper bag does not have a comfortable, graspable area.

Detailed Description: People with arthritis who experience painful finger joints may have difficulty grasping the paper bag or may not know where to grasp the bag if a clear graspable area is not provided.

Populations Impacted: Limited strength, limited range of motion

Potential Solutions: *Limit the width of the graspable area.* Users with arthritis may experience limited strength with excessive grip spans. Some users experience reductions in strength when grip spans exceed 2.5 to 3.0 inches. Select a graspable area width that allows the adult hand to grasp the paper bag without exceeding a comfortable grip span.

Design the shape of the graspable area to distribute the load across the inner surface area of the graspable area. Pressure points at the load-bearing portion of the graspable area can cause discomfort across painful finger joints. Consider designing the graspable area to distribute the load across the hand, avoiding ridges, seams and small-radius protrusions.

Eliminate sharp edges. Sharp edges caused by cut edges can cause discomfort while grasping the box. Consider folding the material at the grasp point to reduce or eliminate sharp edges.

Provide hand cutouts. Paper bags with built-in cutouts to accommodate hand insertion into the bag can be useful for grasping heavy or large bags. Design the cutouts to accommodate full hand insertion without causing pressure on painful finger joints. The bag's contents should be secured so they do not shift and pinch the fingers during transportation.

2.1 Folded bag tops are difficult to lift.

Detailed Description: Users may have difficulty lifting the top if it is affixed to the top of the bag due to the amount of force required or the lack of space to grasp the bag top. Some paper bags may have tops that are folded or rolled for shipping. Folded tops may be glued in place.

Populations Impacted: Limited strength, limited range of motion, limited fine motor control

Potential Solutions: *Provide design elements to assist in lifting the bag top.* Unglued portions of the paper bag top can provide users with a convenient point to lift the top.

Minimize the amount of force required to lift the top. The amount of force required to lift the top should not exceed 3.0 pounds.

Minimize damage to the top to support resealing. Lifting the folded top should not tear the paper bag in a way that causes a spill or prevents resealing the product.

2.2 The top is difficult to tear.

Detailed Description: Users may have difficulty tearing the top of the paper bag to access the contents because of the amount of force required or the difficulty in grasping the top of the bag for tearing.

Populations Impacted: Limited range of motion, limited fine motor control, limited strength

Potential Solutions: *Minimize the amount of force required to tear the top.* If the paper bag must be torn to access the contents, minimize the amount of force required to below 3.0 pounds Perforations can be used to assist the user in tearing the paper bag.

Minimize damage to the top to support resealing. The tear should be guided so the bag is not accidentally torn in a way that causes a spill or prevents resealing the product.

2.3 Contents are difficult to remove.

Detailed Description: Users may have difficulty safely extracting the contents of the paper bag. Contents designed to be poured may not flow out of the paper bag in a controlled manner due to damage during opening or the design of the bag. Contents designed to be pulled out of the paper bag may not accommodate the size of an adult hand.

Populations Impacted: Limited range of motion, limited fine motor control

Potential Solutions: *Provide design elements and affordances for products that require pouring.* Products that should be poured out of the paper bag should be packaged with design elements designed to promote a controlled pour.

Provide sufficiently sized opening for product designed to be extracted. Products designed to be extracted by reaching into the paper bag to grasp the product should be packaged in a paper bag with an opening that accommodates the adult hand's size.

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