



Bath Alcove Wall Kit

Z041-4000 Bathtub Wall Kit

Read and
Understand
Before
Installing



Safety Guidelines
General Information
Bathtub Alcove Installation
Care and Cleaning
Warranty Information

The Bootz Assurance — if our product is properly installed and maintained, as stated in these instructions, it will not leak.

REMEMBER – SAFETY FIRST

IMPORTANT NOTICE

The manufacturer of this product cannot anticipate every possible circumstance that might involve a potential hazard during the installation of our product(s). The warnings and instructions in this installation guide are, therefore, not all-inclusive. If a tool, installation procedure, or work method that is not specifically recommended by the manufacturer is used, you must satisfy yourself that it is safe. You should also make sure that the product(s) will not be damaged by the methods you choose. The manufacturer will not be held responsible for water damage of any kind in connection with the installation of one of our panel kits.

⚠️ WARNING

To avoid product damage, personal injury, or even possible death, carefully read, understand, and follow all the instructions in this installation guide before installing this product(s). Do not use cleaning fluids or operate power tools unless you read and understand the instructions and warnings in this and all other applicable labels or manuals. Proper use of tools and the products described in this guide is your responsibility.

WARRANTY

This product is covered by a Limited Lifetime Warranty. Refer to the Warranty section in this manual for complete details.

Save this manual for future reference.

Important information on cleaning, maintenance, and repair is contained within.

IMPORTANT NOTICE

IMPORTANT NOTICE: Indicates that equipment or property damage can result if instructions are not followed.



Read and Understand the Manual

It is the responsibility of any individual who installs or maintains this product to fully understand and follow proper installation and maintenance procedures. Be aware of the inherent dangers in the use of power tools when installing this product. Read and understand all Warnings, Cautions, and Important Notices in this manual.



Work Safely

DO NOT proceed if any doubt arises about the correct or safe method of performing anything found in this manual. The installation of this product can require using power tools. Do not use power tools without adequate training. If necessary, hire or consult a trained professional for expert assistance before continuing.



Use Proper Tools

Always use proper tools which are in good, working condition during the installation of these products. Using tools other than those listed could adversely affect the integrity of floors, pipes, walls, or this product and could result in water damage or other damage to floors, pipes, walls, or other portions of your building or home.



Inspect Before Cutting

Make sure no electrical wiring or plumbing is present before cutting into a wall to install any accessories.



Wall Conditions

Inspect the walls before installing the panels. Never install panels over damp walls or an existing mold condition.

⚠️ CAUTION

CAUTION: Indicates a potentially hazardous situation which, if not avoided, may result in injury. It may also be used to alert against unsafe practices.



Use Proper Installation Methods

Follow all instructions related to stud wall construction. Failure to follow such instructions could cause the panels to fit improperly after installation, resulting in water damage.



Lifting Hazard

According to the National Institute for Occupational Safety and Health, the recommended maximum safe lifting weight is 51 pounds, with all lifting conditions perfect—minimal forward reach, steady load close to the body, straight back, load between knees and shoulders, and good grips. To avoid personal injury, always use these proper lifting techniques and use two people to move cartons weighing more than 51 lbs. The boxes containing wall kits can weigh in excess of 80 pounds. Use the appropriate lifting devices to move the load. Always use two people when lifting heavy or bulky cartons. DO NOT attempt to lift objects that are too heavy.

WHEN CARRYING A HEAVY LOAD—GET HELP!



Slipping Hazard

Do not install this product in the presence of water. Installing this product without drying all surfaces, or in the presence of water, could cause you to slip and fall due to wet floors or spilled fluids. Personal injury can result from slips or falls. Before installation, dry all surfaces, including the floor, with a cloth or paper towel. Clean up all water or spilled fluids immediately.



Tripping Hazard

Personal injury can result from tripping over power cords, tools, or other items. DO NOT leave items laying around the work area.



Personal Protection

Be sure to use all personal protective equipment, such as sturdy work boots, preferably with steel toes, gloves, and hard hat, if necessary, to ensure your own safety. To prevent possible damage to your hearing, always wear ear protection, such as earmuffs or earplugs, when working around power tools.



Cutting Hazard

The installation of product may require using power tools. Keep hands away from the cutting edge of any tool used in the installation of our product. Placing fingers in or around the cutting blades could result in serious personal injury.



Sharp Edge Hazard

After cutting the edge of the panel, it can be sharp. Wear protective gloves to prevent personal injury.



Room Temperature

Allow panels and silicone sealants to adjust to room temperature for at least six hours before installation. The panels should be installed at temperatures not less than 65°F. Panels should not be installed in areas where the temperature may drop below freezing 32°F.



Grab Bars and Shower Seats

Alcove wall kits are not designed to support grab bars or bolt-on shower seats. Do not rely on the panels for grab bar or shower seat support! Attaching grab bars or shower seats will distort and damage the alcove walls.

IMPORTANT NOTICE

For bathtub enclosures the side panel nailing flange is designed to extend beyond the front edge of the bathtub and will be covered by the finished moisture resistant wallboard.

For shower wall enclosures the side panel nailing flange is designed to extend beyond the front edge of the shower floor and will be covered by the finished moisture resistant wallboard.

⚠ WARNING

WARNING: Indicates a potentially hazardous situation which, if not avoided, could result in serious injury or death.



Eye Protection

Be sure to use all personal protective equipment to ensure your own safety. To avoid eye injury, always wear protective glasses with side shields when using power tools. Also, make sure no one else can be injured by flying particles when using power tools.



Fire Hazard

Personal injury or death can result from a fire caused by flammable liquids or silicone sealants. Cleaners or solvents can be highly explosive, resulting in personal injury or even death, when not used properly. Clean up any flammable substance immediately. Sparks or open flames can cause flammable substances to ignite. DO NOT smoke while working on or near any flammable substance.



Solvents Hazard

Follow all manufacturer's safety instructions for silicone sealants and denatured alcohol. Alcohol vapors are both flammable and hazardous to breathe. Silicone vapors may irritate eyes and nose. Personal injury can result from improperly handling or use of products, such as denatured alcohol. Always follow the manufacturer's recommendations for the safe use of these products. Ventilate any work area before beginning to apply silicone sealants, cleaning agents, or solvents.



Fumes Hazard

The fumes from the silicone and solvents used by the installer can be harmful if used in an unventilated room. Always work in a well-ventilated area. To keep the area well-ventilated, open windows and use exhaust fans. If adequate ventilation is not achievable or practical, use respiratory protective equipment.



Dust Hazard

When cutting or drilling into the product, use a dust collection method which prevents dust particles from going into the air. Always work in a well-ventilated area. Always use an OSHA approved dust mask when cutting, drilling, or sanding products.



Power Tool Hazard

To prevent personal injury or possible death, always follow the electrical safety recommendations of the power tool's manufacturer. Do not use power tools in an unsafe manner. Power tools should only be connected to a circuit protected by a ground-fault circuit interrupter (GFI).



Shock Hazard

Never use electric power tools around water, condensation, or other liquids. Electric shock can cause severe burns, significant injuries, and even death. If an extension cord is required, always use an OSHA approved extension cord. Power cords should only be connected to a circuit protected by a ground-fault circuit interrupter (GFI).



Electrical Shock Hazard

Contacting live electrical wiring with power tools or hand tools can cause serious injury or death. Make sure all related circuit breakers are turned OFF. Test for live circuits or wiring inside any wall where installation of the product requires cutting into a wall.



Electrocution Hazard

Water and other liquids conduct electric current and can create a short circuit, resulting in injury or death. Keep all liquids away from electrical cords and power tools. DO NOT create a short circuit between a source of electricity and a liquid by being in contact with both simultaneously.

General Information

Required Tools

- Drill with a 3/16 inch drill bit
- Countersink bit
- Hole saw for faucet(s), bathtub spout, and/or shower head
- Tape measure
- Level
- Caulking gun
- Course file
- Medium grit sandpaper
- Clean paper towels or shop towels
- Optional: A saber saw with fine tooth blade or a router with a fine cutting bit can be used in place of a hole saw and drill.

Alcove Wall Kit Contents

Confirm that all parts of the kit have been included before beginning installation.

IMPORTANT NOTICE

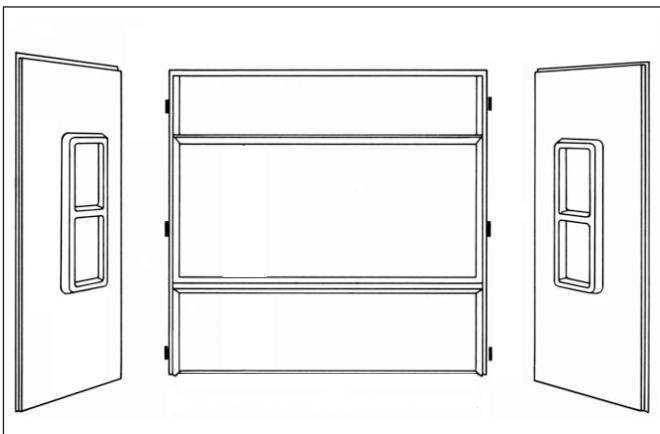
Alcove wall panel dimensions can vary slightly. For proper fit, you **MUST** measure the actual shower base, bathtub, and alcove wall panels, prior to building the stud walls, to determine the exact size needed.

Alcove wall kits are designed to be nailed directly to stud walls for support and must fit the alcove with minimum clearance. Vertical side panel nailing flanges are designed to extend past the front edge of the shower base or bathtub and **MUST** be supported from behind by a vertical stud.

Z041-4000 Alcove Bathtub Wall Kit

For bathtub enclosures 60 inches wide and 30 inches deep.

Note: Other manufacturer's bathtubs must have a nailing/tiling flange around the back and sides of the tub.



One back panel; One left side panel; One right side panel.

Unpacking the Carton

- Use care when opening the box so that you do not damage the panels.
- This product is shipped to you or your retail center after careful inspection. After purchasing the kit, carefully unpack and inspect the product for any shipping damage that may have occurred. If damage is found, report it immediately to the store of purchase. After inspection and during installation, protect the products from construction damage by moving them to another room or area until ready to install.
- Store panels in a flat area to avoid warpage until the time of installation. Do not store the panels outside of the original packaging in a vertical position.
- Please use the model number located on the side of the box, or the front of this manual, when contacting us with questions concerning the installation of this unit.
- Make sure the walls are the correct size and are in good condition. Installation of damaged product will void the warranty.

Helpful Hints

- Read these instructions carefully and familiarize yourself with the various parts of the kit.
- The variety of installations possible for this kit may require procedures other than those shown. Ensure construction is correctly sized, plumb, and square.
- Save the large cardboard box for protection of the bathtub during the installation process and to use as a template for cutting the wall panels for plumbing outlets.
- Allow sufficient time for the parts in this kit to adjust to room temperature. We do not recommend installation of this product at temperatures below 65°F.
- Sawhorses with 2 x 4 cross-members or a worktable are helpful during the installation process.
- Always transport the panels vertically. Use care when laying the panels flat to prevent flexing, especially when panels have a cutout in them.
- Store unused materials away from the work area to prevent accidental damage.
- If the or bathtub is placed over a garage or on an outside wall, care must be taken to ensure that the bathtub is properly insulated from cold temperatures.

Preparation Tips

- Alcove wall kits are designed to be fastened directly to wall studs and feature a sturdy interlocking system for a one piece appearance. The alcove kits are manufactured to fit a specific size opening and cannot be cut or modified to fit other dimensions. If the wall opening is too small, too large, or too short, other methods will be required to cover the wall.
- Turn off the hot and cold water supply.
- For remodeling, remove faucet handles, escutcheons, filler spouts, and/or anything mounted to the wall (i.e. towel bars, soap dishes, etc.).
- For remodeling, after removal of the old bathtub or shower, measure the alcove pocket to make sure the new alcove wall panels will fit. It may be necessary to reconstruct one or more of the pocket walls.

IMPORTANT NOTICE

All old ceramic tiles, plastic tiles, and deteriorated wall surfaces must be removed. For remodeling, it is best to strip the wall to the studs in order to inspect the structure, repair any existing damage, and install any required supports. Then the new alcove wall panels can be installed directly to the stud walls.

- For new construction, build a stud pocket wall structure to the rough opening dimensions included in this manual. Use wood or structural steel studding, and make sure that all framing is plumb and square.
- If installing one or more alcove wall panels over existing cement board, greenboard, or moisture resistant sheetrock, make sure the existing wall surface is smooth, plumb, true, and in good condition. A second layer of greenboard must be installed to cover the nailing flanges after alcove wall panel installation.
- Ensure all plumbing or electrical work inside the walls is finished prior to installation of the wall panels.
- Refer to the installation manual that came with the bathtub for instructions on installing the bathtub prior to installing the alcove wall kit.
- Always measure the location of the plumbing cutouts, as stated in the instructions for each specific Bootz tub wall kit. Make a cardboard template to trial fit all plumbing cutouts before cutting panels.

Product Features

- Bootz alcove wall panels easily fit through existing doorways and can be installed by one person.
- Made of Veritek™ compression-molded composite material with no surface coating to chip or crack - color runs throughout.
- Alcove wall panels are designed to be snapped together using the sturdy interlocking tabs included on the wall panels.
- All back and side wall panels feature a nailing flange for attaching directly to the stud wall.
- Moisture resistant sheetrock or greenboard is installed over the nailing flanges to give a custom finished appearance.

Followed carefully, these installation instructions will result in an easy, trouble-free installation of your Bootz product. Any deviations, additions, and/or deletions from the prescribed installation, without prior written approval, will void the warranty covering this product. Not following the directions could also result in personal injuries, water damage, and other damage to floors, pipes, walls, and other portions of your building or home.

Disclaimer

- The information contained in this Installation Manual is given free of charge. It is based upon technical data, which we believe to be reliable and is intended for use by persons having knowledge of this technical area at their own discretion and risk. Bootz assumes no responsibility for results obtained or damage incurred from the use of this material either in whole or in part by the buyer.
- This manual will give you basic instructions for the installation of the product in a step-by-step sequence that will work in most types of installations. If you have an installation application that is not covered in this manual, please call your local Bootz distributor or contact Bootz directly for additional information about your application.
- Follow all installation instructions. Failure to follow these instructions could result in personal injuries, water damage, or other damage to floors, pipes, walls, or other portions of your building or home.

Bathtub Alcove Installation Procedure

Install Bathtub Alcove Wall Kit

Preparation

1. Remove the bathtub and alcove wall kit from the protective shipping cartons and inspect them for damage. Check and make sure all the required components are included in the cartons.

IMPORTANT NOTICE

To prevent unnecessary delays, before starting the installation, refer to the Kit Contents section to verify the contents of the carton are correct.

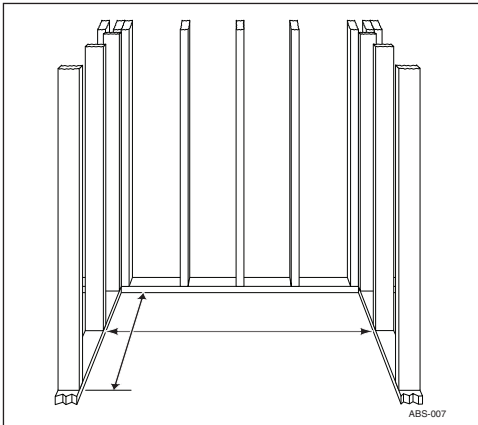
2. Allow the products to adjust to room temperature for at least six hours before installation. The alcove wall panels should be installed at temperatures not less than 65°F.

IMPORTANT NOTICE

For remodeling, upon removal of the old bathtub, measure the alcove pocket to be sure that the new bathtub and alcove wall panel kit will fit in the available space. It may be necessary to reconstruct one or more walls of the alcove.

If the alcove wall kit is to be installed over new or existing drywall (not recommended), allow for thickness of the drywall when building or modifying stud pocket walls.

Stud Wall Construction



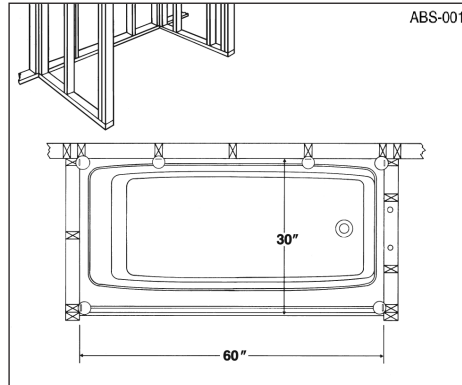
The key to a good Alcove Wall Kit installation is proper fit within the stud pocket walls. Remember these important points to ensure a smooth installation.

- Completely read and understand this manual and the appropriate bathtub installation manual prior to beginning the project.
- Measure the actual bathtub and alcove wall panels and use these dimensions to build the stud pocket walls to fit. Up to a 3/16" gap between the stud wall and the bathtub and/or alcove wall attachment flange is acceptable.

Note: The bottom of the alcove wall panels are designed to fit **INSIDE** the attachment flange on the bathtub threshold.

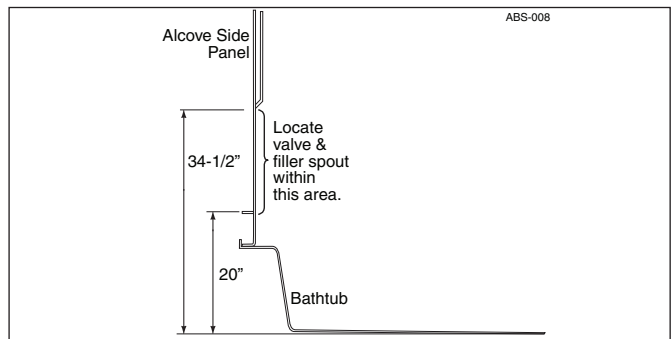
- A. Alcove side wall attachment flanges extend out past the front edge of the bathtub. Make sure to construct the stud pocket walls so that multiple studs (A) are installed (ganged) at the front threshold to provide backing for filler boards and the vertical attachment flange on each alcove side panel.
- B. The alcove wall panels feature a three-dimensional design. If shower doors will be installed, solid 3/4" thick filler boards (B) **MUST** be attached to the studs to fill in the space between the alcove side panels and front threshold studs prior to panel installation.

1. Build a stud pocket wall structure to the dimensions for the bathtub. Make sure all framing is plumb and square.

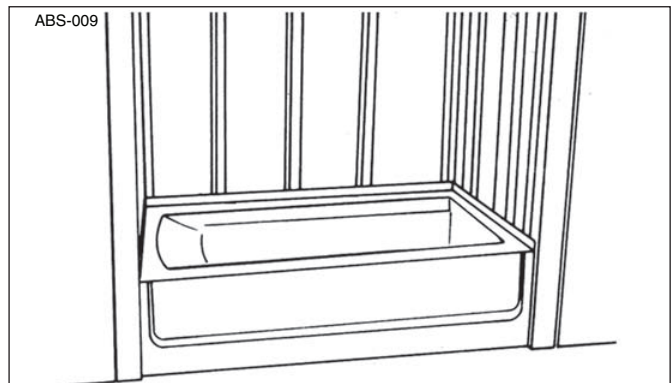


Note: For more information on building the alcove bathtub wall pocket, refer to the Bootz Bathtub Installation Manual.

2. Trial fit the bathtub in the stud pocket, making sure that the stud pocket walls fit the bathtub flange properly.
3. Rough-in all plumbing supply, overflow, and drain lines in accordance with the plumbing manufacturer's instructions and all local building codes. The filler spout and valve should be located within the vertical area shown below.

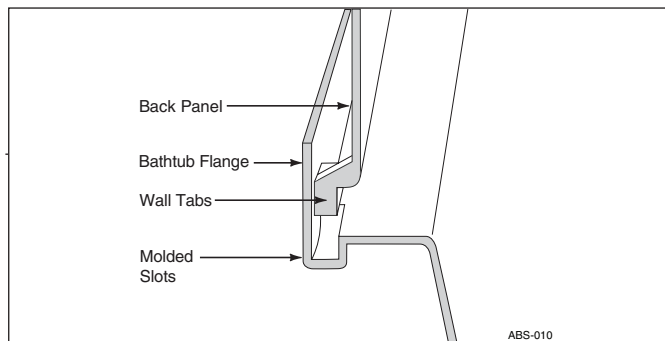


4. Install the bathtub in the stud pocket following all instructions in the installation manual supplied with the Bootz Bathtub or other bathtub.



Install the Alcove Bathtub Wall Panels

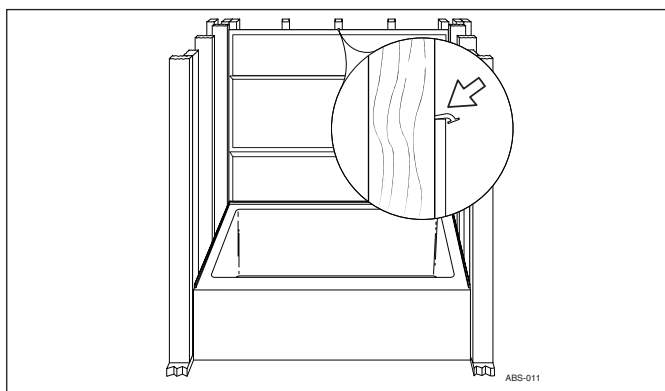
1. Set the back panel into place on the bathtub ledge. Make sure the wall tabs located along the bottom edge of the back panel fit into the molded slots in the bathtub ledge. The back panel must fit firmly down against the tub ledge.



IMPORTANT NOTICE

While the Alcove Bathtub Wall Kit is specifically designed to fit the Bootz Bathtub, it can be installed over other manufacturer's bathtubs, if they are equipped with a nailing/tiling flange on the back and sides of the tub. In that case, before setting the back wall panel into place, it will be necessary to remove the wall tabs located on the bottom of the back panel and sand the rough edges smooth. This procedure is to be done **ONLY** if you are fitting the Alcove Bathtub Wall Kit to a bathtub other than the Bootz Bathtub.

2. To hold the back panel in position during sidewall assembly, temporarily drive a nail in one stud just above the top of the back panel. Bend the nail over the top flange of the back panel to secure it in place.

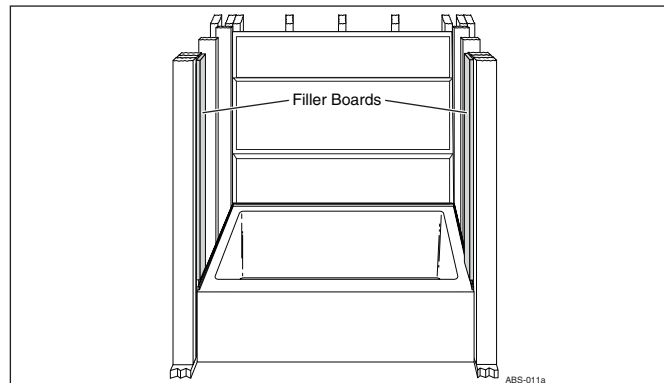


IMPORTANT NOTICE

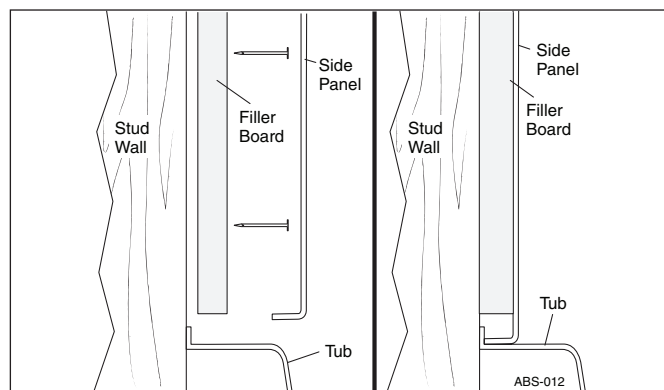
If shower doors will be installed, filler boards, such as 3/4" plywood or 1" x 4" strapping, must be installed on the stud wall **BEFORE** side panel installation. These filler boards are necessary to provide solid backing to prevent deforming and damage to the side panels. It is good practice to install the filler boards now in case shower doors would be added at some later date.

The filler boards must be nailed or screwed to the studs located at the front edge of the tub. The thickness of the filler boards should be sized to take up the space between the wall studs and the backside of the side panel and must extend the full inside height of the side panel.

3. Install the vertical filler boards next to the front flange of **BOTH** side panels to provide a solid mounting surface for the shower doors. Measure the inside depth and height of the side panel and attach appropriate size filler boards to the wall studs near the front edge of the tub.



Filler Board Location on Vertical Studs.



Cut-a-way Side View of Filler Board Installation

4. Select either the right or left side panel, whichever one **DOES NOT** require plumbing access holes.

IMPORTANT NOTICE

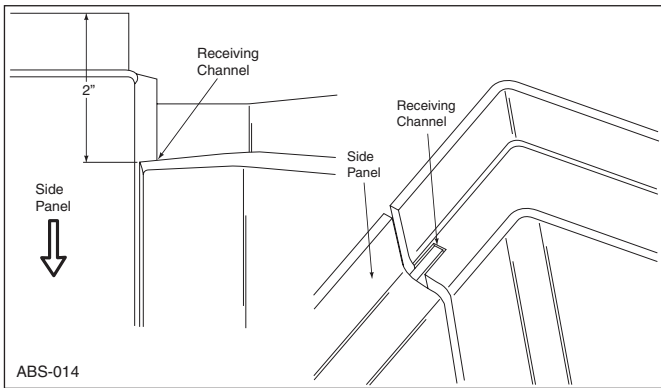
The Bathtub Alcove System is designed so that the use of silicone caulk is not necessary. As a precautionary measure, to help prevent leaking due to unlevel installation or excessive water being forced against the front threshold area of the bathtub, silicone caulking may be applied prior to side panel installation.

Note: If silicone caulking of seams is desired, refer to the Optional Caulking section in this manual **BEFORE** installing the side panel.

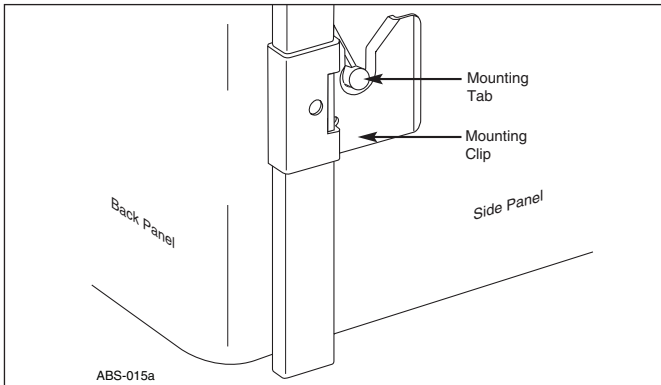
5. Raise the side panel approximately two inches higher than the back panel, and slide the side panel down into the receiving channel.

Note: Each side panel has three panel mounting tabs which interlock with the companion factory installed back panel mounting clips. The side panel must be positioned so that the mounting tabs slide into and interlock with the back panel mounting clips.

Bathtub Alcove Installation Procedure

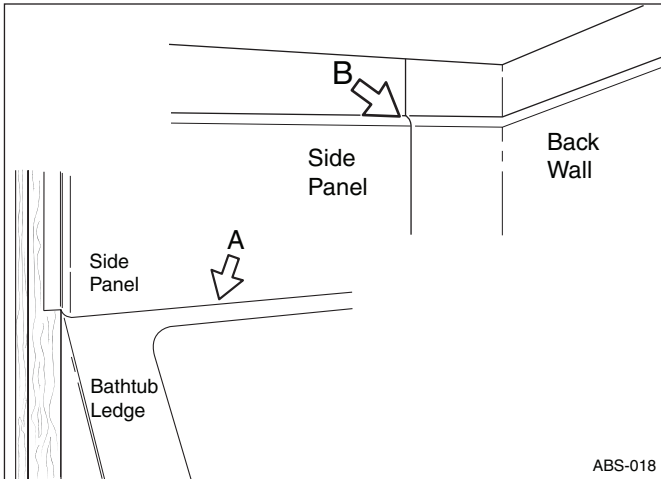


6. Push down firmly to lock the panel mounting tabs into the mounting clips on the back panel.

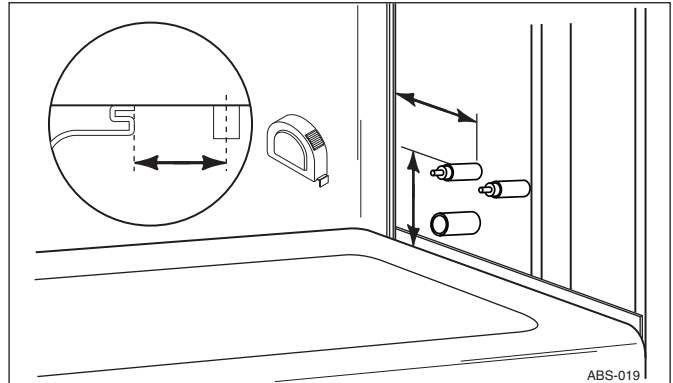


Viewed from Back Side of Panels

7. The bottom of the side panel must fit flush against the ledge of bathtub (A) and should extend to the outside edge of the bathtub. Make sure the upper flange on the side panel and back panel align (B).

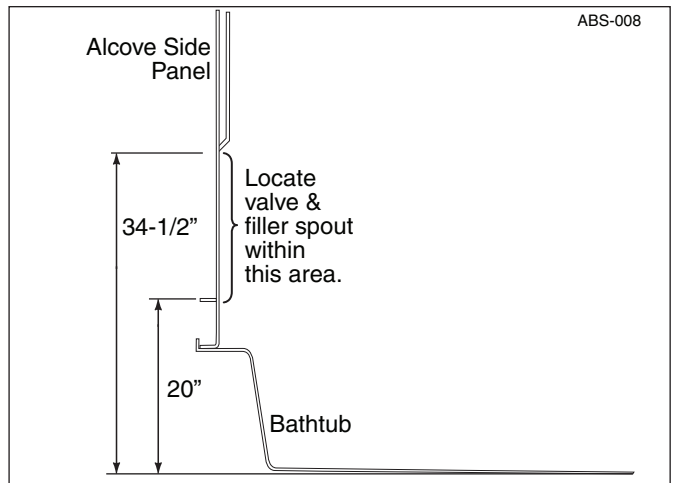


8. Measure the location of the plumbing outlets (valves, tub spout, and/or shower head). Measure from the receiving channel edge of the back panel and measure up from the top ledge of the bathtub.



9. Use the measurements to make a cardboard template in order to check for proper fit around the plumbing outlets. Trial fit the cardboard template, and adjust as necessary.
10. Transfer the template measurements to the remaining side panel to be installed over the plumbing outlets.

Note: The filler spout and valve should be located within the vertical area (20 to 34-1/2") shown in the cut-a-way drawing.



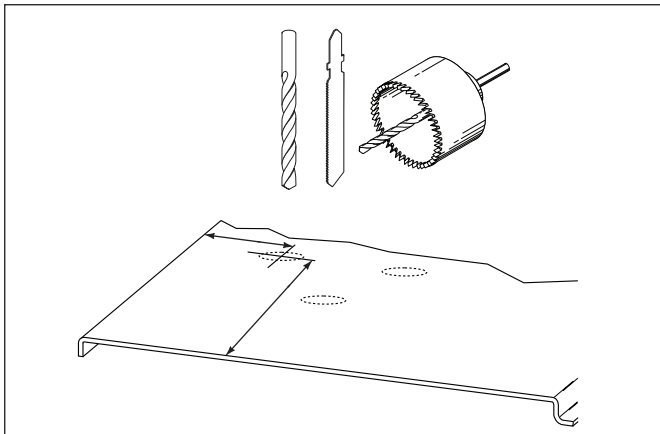
! WARNING

Dust Hazard: When cutting or drilling, use a dust collection method which prevents dust particles from going into the air. Always work in a well-ventilated area. To keep the area well-ventilated, open windows and use exhaust fans. Always use an OSHA approved dust mask when cutting, drilling, or sanding products.

IMPORTANT NOTICE

Any cutout should have rounded corners (sharp corners can promote stress cracks).

11. Cut the clearance holes using a router, saber saw, or hole saw. Drill or cut holes 1/2 inch larger than the diameter of the plumbing outlets, from the finished side of the panel. For best results, when drilling, place a scrap of wood beneath the hole to ensure a clean cut.

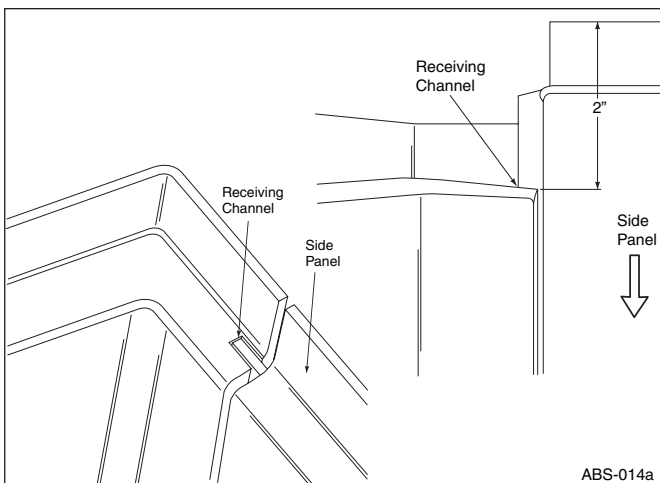


12. Trial fit the panel, and make any necessary adjustments.

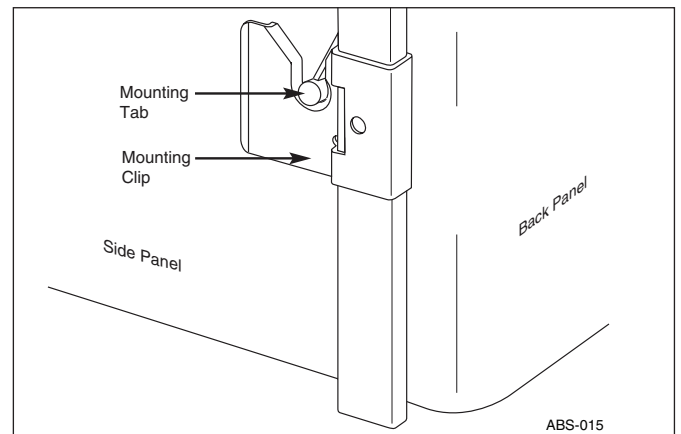
Note: If silicone caulking of seams is desired, refer to the Optional Caulking section in this manual BEFORE installing the side panel.

13. Raise the side panel approximately two inches higher than the back panel, and slide the side panel down into the receiving channel. If necessary, pull out slightly on the side panel to fit over the roughed in plumbing outlets.

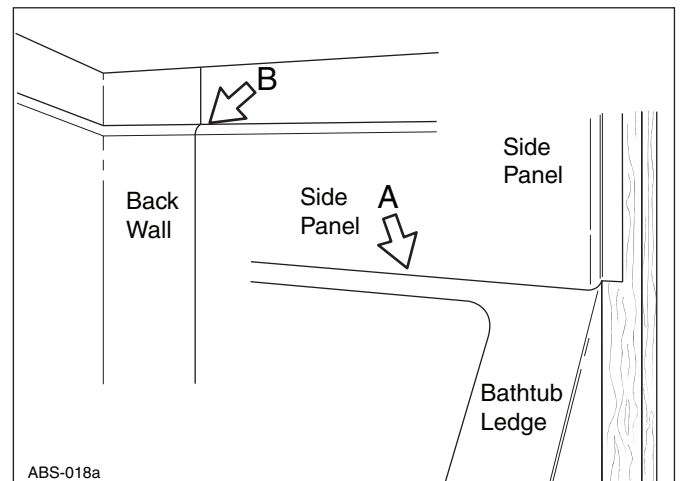
Note: Each side panel has three panel mounting tabs which interlock with the companion factory installed back panel mounting clips. The side panel must be positioned so that the mounting tabs slide into and interlock with the back panel mounting clips.



14. Push down firmly to lock the wall mounting tabs into the mounting clips on the back panel.



15. The bottom of the side panel must fit flush against the ledge of bathtub (A) and should extend to the outside edge of the bathtub. Make sure the upper flange on the side panel and back panel align (B).



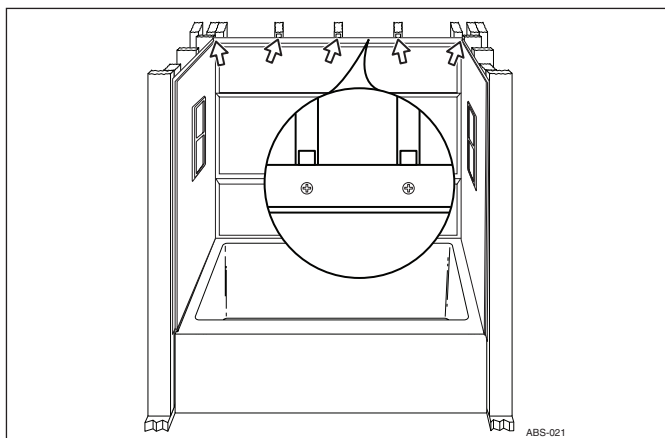
16. Make sure to remove the nail which was bent over the back panel top flange in Step 2.

Final Fit

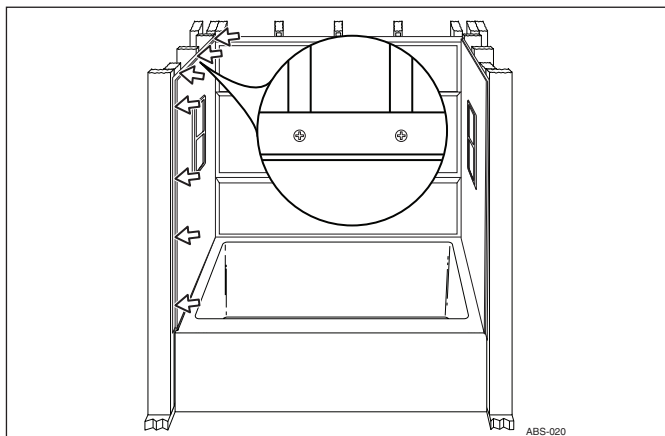
DO NOT deform the alcove panel attachment flange to achieve a tight fit to the wall studs. If necessary, install tapered shims between the attachment flange and wall stud before securing the alcove panel with roofing nails or galvanized drywall screws.

1. Anchor the top flange on the back panel by drilling 3/16" pilot holes through the horizontal flange at each wall stud. Use galvanized roofing nails or drywall screws to secure the back panel to the studs.

Note: Moisture resistant wallboard will be installed over the alcove panel flanges. For best results, when using galvanized drywall screws, drill a shallow countersink at each pilot hole to allow the screw head to fit flush with the surface of the flange.



2. Anchor the top and side flanges of a side panel. Drill a 3/16" pilot hole through the horizontal flange at each wall stud and every 12 inches through the vertical flange. Use roofing nails or galvanized drywall screws to secure the side panels to the studs.



3. Repeat Step 2 to anchor the flanges of the remaining side panel.
4. Install the bathtub plumbing fixtures and install greenboard, cementboard, or other moisture resistant material to cover the exposed wall studs, overlapping and covering the alcove wall flanges.

IMPORTANT NOTICE

The Bathtub Alcove System is designed so that the use of silicone caulk is not necessary. As a precautionary measure, if desired, silicone caulking may be applied to alcove panel seams after installation.

Note: If silicone caulking of seams is desired, refer to the Optional Caulking section in this manual.

The Alcove Bathtub Wall Kit installation is now complete. DO NOT discard these installation instructions. PLEASE LEAVE THEM WITH THE HOMEOWNER.

Care and Cleaning

Bootz products are stain and abrasion resistant; however, the finish requires reasonable care.

IMPORTANT NOTICE

Because cleaning products change over time, always check the manufacturer's instructions to make sure it is compatible with fiberglass reinforced polyester. **DO NOT** use a cleaner if the label indicates it should not be used on fiberglass reinforced polyester. **DO NOT** use spray-on cleaners that require daily use without immediately rinsing with water to stop the chemical cleaning reaction because damage will result and void the warranty.

Day-To-Day Cleanup

Wash regularly with warm water. Use a soft cloth with a mild detergent such as Handy Andy, Mr. Clean, Top Job, Tough Act, Ajax Liquid Cleaner, or Lestoil. Always rinse off cleaners within five minutes of application. Scratch-free pads made of nylon, saran, or polyethylene may be used.

IMPORTANT NOTICE

NEVER use abrasive scouring powders, cleansers, or scouring pads to clean the tub enclosure. They will scratch and dull the finish. Dry cleaning agents and solvents will damage the surface. Burning cigarettes will damage and discolor the finish.

Caulked Joints

Alcove wall panels do not require silicone caulk, but if caulk was applied, inspect caulked joints monthly for damage or any signs of separation from the mating surface. Reapply caulking to any joint showing signs of wear or cracking.

Warranty

If a product covered by this warranty is found to be defective in materials or workmanship, after inspection by an authorized Bootz representative, we will repair, or at our option, exchange the product for a similar model. This warranty extends for a designated period of time, so long as it remains in use in its original place of installation.

This warranty covers products installed in accordance with the Bootz installation instructions, used as recommended, and not damaged due to misuse, abuse, or improper installation. It does not apply to any seams or changes made to the product by professional tradesmen or fabricators.

The manufacturer's option to repair or exchange the products under this warranty does not cover any labor or other costs of removal or installation, nor shall the manufacturer be responsible for any other incidental or consequential damages attributable to a product defect or to the repair or exchange of a defective product.

Residential Limited Lifetime Warranty

The warranty applies only to the original purchaser and installation of these products in residential applications. It does not apply to commercial applications.

Commercial 5-Year Limited Warranty

The warranty applies only to the original purchaser and installation of these products in commercial applications.



