

ESSENTIAL KNOWLEDGE

Door technology has evolved with window technology, making similar improvements. Thermal performance had long been unexamined because it was of little significance relative to the entire house envelope. Solid wood panel doors, although opaque, typically have an R-value equal to an insulated window, but appearance, durability, and infiltration remain the driving forces in selection. The technology of repairing existing doors has not evolved dramatically. A wood door is repaired as per traditional woodworking methods. Doors of materials such as steel and fiberglass can be repaired with proven methods practiced by other industries such as auto and marine repair.

The most cost-effective means of repair is often the replacement of damaged components. The difficulty of modifying doors favors replacement with a pre-hung unit. The benefits of a new or replacement unit include lower maintenance and durability. New materials and assemblies also provide the opportunity to increase comfort and security. A restored conventional solid wood panel door will not add comfort because of its poor thermal performance, and the panels may easily be breached to gain access. As discussed below, there are several options available to repair existing exterior doors, or to take advantage of new technologies in replacement units. Weatherstripping and security hardware are discussed in later sections.

The introduction of steel, fiberglass, and, most recently, carbon, has raised the standard for all doors. Manufacturers such as Marvin now produce doors with large areas of glazing, such as patio and French doors. There is a convergence of window and door technologies, where new materials or assemblies are used in each. Door security requirements and the dimensional stability of doors, however, mean that such materials as vinyl are typically used in combination with other materials. Fiberglass, which is equivalent in strength to aluminum, is now used by at least one manufacturer to produce structural rails and stiles that are then clad with wood veneer. Manufacturers are readily adopting multiple materials to improve performance. For example, at their perimeter, steel doors might use wood because it is easy to modify. Or steel might have a stainable vinyl film with wood-grain texture on top of its skin, laminated over a rigid foam core.

Manufacturers make an effort to simulate wood and traditional door styles with new materials and assemblies. Wood doors have also advanced technologically with such features as fiberboard cores, or finger-jointed stock to provide solid sections with dimensional stability. Such new assemblies, in combination with new protective finishes, have greatly improved durability and performance. Wood doors now also use rigid insulated cores of either expanded polystyrene or polyurethane. The majority of these cores is manufactured of polyurethane, which has an initial R-value almost twice that of expanded polystyrene. However, some manufacturing processes emit ozone-depleting CFCs and R-values deteriorate over time. The frames of steel exterior doors typically employ thermal breaks to reduce conduction and minimize condensation at the perimeter. NFRC U-factor ratings are a means of providing a comparable standard for evaluating the overall energy performance ratings among manufacturers participating in the NFRC Certification Program.

Exterior doors with large glazing areas have also improved performance. Developments in window technology have made this door type possible even in cold climates, as these doors utilize many of the same technologies used in high performance windows. However, fully glazed doors also require the security available in conventional doors. Manufacturers have begun to address these concerns with such

features as multi-point locking systems, reinforced frames and stiles, and new track designs.

There are essentially three types of doors suitable for replacement (other than an entirely new unit): a knock-down frame, a pre-hung insert, and a split jamb. Each offers ease of installation with the benefits of a new door. The determining factor is often whether these replacement units are available in the style of door desired. A knock-down door, also known as a prefit, is delivered as separate jamb and head pieces with attached casings that interlock. An insert door is pre-hung within its own frame and can be inserted into an existing door frame. The profile of the secondary frame (often of steel) is narrow; however, a door often has little width to spare, especially if the existing opening is out-of-square and requires shimming. A split-jamb door is pre-hung and available with attached trim. The door is inserted in the existing rough opening and joined along the length of the jamb at the stop. This method allows the preservation of the full door width but requires removal of the entire unit. Finally, a new door unit provides the greatest variety of options.

TECHNIQUES, MATERIALS, TOOLS

1. REPAIR EXISTING DOOR WITH TRADITIONAL MATERIALS.

The repair of existing doors may be achieved as would the repair of a window frame. See discussion of window frame repair and products.

ADVANTAGES: The most economical solution.

DISADVANTAGES: The end result of repair is often a poorly performing door. The proper repair of a door will generally require a high level of skill, which may be costly relative to the option of replacement, which will provide better performance.

2. REPLACE EXISTING DOOR WITH NEW DOOR SLAB.

The replacement of the door slab itself is possible if the frame is in good condition and square.

ADVANTAGES: Replacement of the slab will provide the opportunity to select from a wide variety of options. The replacement of slab and weather-stripping may address a lead hazard or be desirable to change the appearance.

DISADVANTAGES: A door is often only as good as its frame. This is particularly true for security and fire resistance. Entrance doors typically come pre-assembled with a frame at relatively little additional cost. The perimeter condition goes unexamined and installation of hardware and locks become complicated when adjusting for existing conditions. Weather-stripping, critical to ultimate performance, must be field applied.

3. REPLACE EXISTING DOOR WITH SECONDARY FRAME DOOR.

Steel frames, due to their inherent strength, permit thin jamb profiles, which minimize narrowing of the opening and provide the opportunity to use a steel door with higher insulative and security properties. The Benchmark Adjusta-Trim® product with integral trim is designed to encase the existing door frame and any associated lead paint (Fig. 1).

ADVANTAGES: A secondary frame allows simple installation and preservation of interior casings (Fig. 2). Replacement of the frame provides opportunity to improve the whole unit performance.

DISADVANTAGES: Reduces opening size, may not be allowed by code. Replacement requires sound condition of adjacent framing and secure attachment. This method will not improve perimeter infiltration or allow examination of existing conditions, which may also require rehab.

4. REPLACE EXISTING DOOR WITH A NEW PREHUNG DOOR.

Exterior doors are commonly available prehung, with ancillary components such as sidelights. A prehung door is no assurance that all the components have been manufactured or are warranted by the same manufacturer. It is important to determine specifically what components will be used in the assembly of the entire door unit.

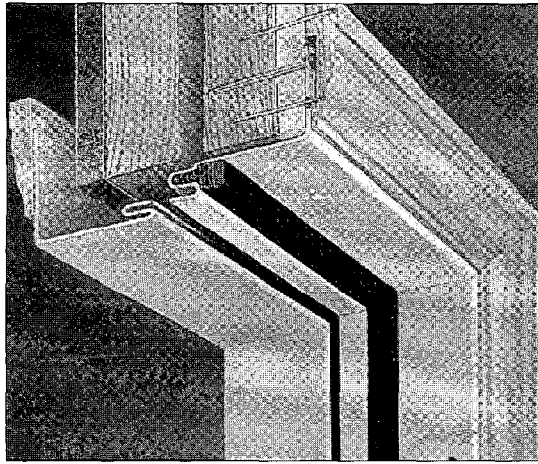


FIGURE 1

SPLIT-JAMB STEEL DOOR FRAME AVAILABLE WITH PRE-FORMED TRIM PROFILE OF FLUSH AS SHOWN. BENCHMARK® AS MANUFACTURED BY GENERAL PRODUCTS CO., INC.

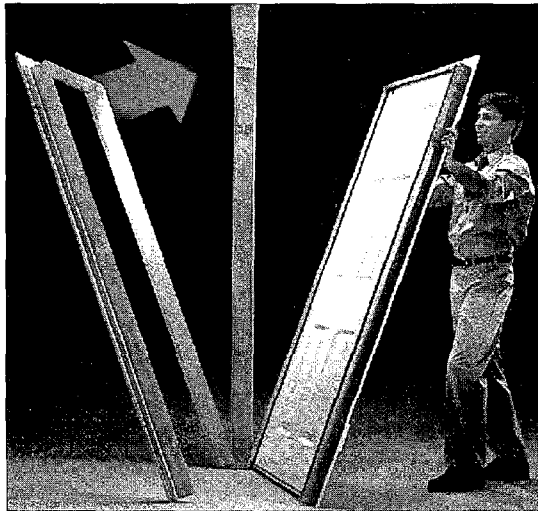


FIGURE 2

INSTALLATION OF A SPLIT-JAMB DOOR UNIT

ADVANTAGES: Replacement with a pre-hung unit provides the opportunity to assure that the existing conditions and all components are designed to provide optimum performance. This and convenience of installation is available for little to no additional cost when skilled labor is employed.

DISADVANTAGES: A prehung unit may use undesirable components not recommended by the manufacturer. Some new doors utilize construction methods, such as integrally glazed lites, that do not lend themselves readily to repair.

FURTHER READING

"Choosing a Front Door," Rich Ziegner, *Fine Homebuilding*, August/September 1994, pp.40-45.

"Door Prize," Christine Fishburn, *Remodeling Magazine*, December 1997, p.78.

"How to Fix Old Doors," Jonathan Poore, *The Old-House Journal*, June 1986, pp.222- 227.

"New Break-In Resistant Exterior Doors," Bill Phillips, *Today's Homeowner Magazine*, www.todayshomeowner.com.

"Ordering and Installing Prehung Doors," Steve Kearns, *Fine Homebuilding*, April/May 1992, pp. 62-65.

PRODUCT INFORMATION

Acadia Windows & Doors, 9611 Pulaski Park Drive, Baltimore, MD 21220; 800-638-6084 (vinyl doors).

Benchmark, General Products Company, Inc., P.O. Box 7387, Fredricksburg, VA 22404; 540-898-570 (pre-hung, knocked-down, split jamb, and replacement system steel doors and frames).

FrameSaver™, BMS, P.O. Box 631247, 1124 Bennet Clark Rd., Nacogdoches, TX 75963; 409-569-8211 (composite wood frame material).

GRK Canada Ltd., R.R. #1-1499 Rosslyn Rd., Thunder Bay, Ontario P7C 4T9; 800 263 0463 (fasteners).

Jeld-Wen (Challenge, IWP, Nord), 3303 Lakeport Blvd., Klamath Falls, OR 97601; 800-877-9482 (wood, steel, and fiberglass doors).

Morgan Manufacturing, 601 Oregon St., Oshkosh, WI 54903; 800-766-1992 (wood doors).

Peachtree Doors, Inc., 4350 Peachtree Industrial Blvd., Norcross, GA 30071; 404-497-2000; www.pease-doors.com (steel, fiberglass, and carbon doors).

Pease Industries, 7100 Dixie Highway, Fairfield, OH 45014-8001; 800-543-1180 (wood, steel, and fiberglass doors).

Simpson Door Co., P.O. Box 210, McCleary, WA 98557; 800-952-4057 (wood doors).

Stanley Door Systems, 1225 East Maple Road, Troy, MI 48083; 810-528-1400 (steel and fiberglass doors).

Therma-Tru Corp., P.O. Box 8780, Maumee, OH 43537; 800-537-8827 (steel and fiberglass doors).

Weather Shield Manufacturing, Inc., 1 Weather Shield Plaza, Medford, WI 54451; 715-748-2100 (steel and wood doors).

7.2

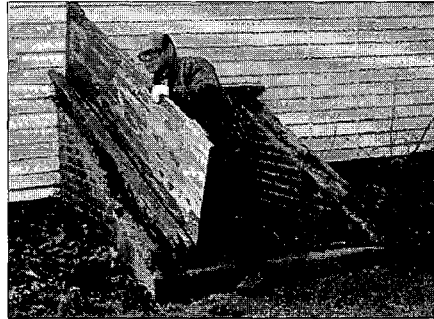
GARAGE AND BULKHEAD DOORS

ESSENTIAL KNOWLEDGE

Traditional garage doors, which either swung or slid open, have evolved into a unique door type now utilizing many of the same materials and assemblies found in entrance doors. Modern garage doors operate as a series of track-mounted panel sections or a single panel that pivots, with both stowed overhead. Improvements to these mechanisms have evolved to address safety and security. Sectional doors have been designed to prevent trapping one's fingers in the closing panels. Spring mechanisms have been redesigned to provide for easier tensioning and have an integral cable that prevents broken springs from taking flight. The failure of garage doors in high wind events exposes the building to a large breach, which can set off a chain reaction of envelope failures. Manufacturers have responded to these concerns with reinforced steel tracks and panel girders.

Of all the doors in a home, garage doors are perhaps the most vulnerable to security breaches due to their electronic control devices, which are subject to decryption by electronic scanners. New motorized door devices use a different code each time they operate to foil thieves. Because of their size and weight, automatic doors also pose a safety concern for children. Automatic door controls are required to have a reversing mechanism to detect objects in the door path.

Bulkhead doors, also referred to as basement doors, are a common feature (Fig. 3). Previously made of wood, which was subject to rot and abuse, bulkhead doors are available of steel, manufactured by Bilco and others. Such doors are subject to rust, as condensation often forms between cool basements and a warm exterior. Bulkhead doors of fiberglass with spring assisted hinges have recently been introduced to address these problems.



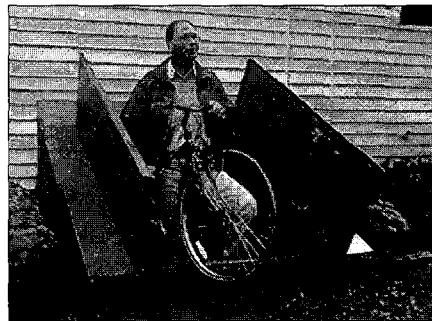
REMOVE OLD DOORS



INSTALL SILL



CHECK SQUARENESS



COMPLETE INSTALLATION

FIGURE 3

REPLACEMENT BULKHEAD DOORS

TECHNIQUES, MATERIALS, TOOLS

1. REPAIR EXISTING BULKHEAD OR GARAGE DOOR.

Conventional doors may be repaired by traditional methods as discussed in the window frame section. Any cause of damage should be corrected prior to repair or replacement.

ADVANTAGES: Typically the most economical solution, depending on the level of deterioration. Maintains the original appearance of the door.

DISADVANTAGES: Traditional materials such as wood and steel do not fare well in low slope applications such as bulkhead doors or where cold air from the basement causes condensation on the door surface.

2. REPLACE BULKHEAD OR GARAGE DOOR.

New door products offer greater convenience, security, and durability.

ADVANTAGES: New materials and hardware provide for lighter, stronger, and rot-resistant doors. These doors have improved functions and are available with storm-resistant construction and safety devices.

DISADVANTAGES: New materials are not available in all styles or sizes.

FURTHER READING

"Fiberglass Bulkhead Door," *Fine Homebuilding*

"Safer, More Secure Garage Doors," Jim Koscos, *Today's Homeowner Magazine*, <http://index.today-homeowner.com/todayarticles/door/11.95.16.html>.

PRODUCT INFORMATION

GARAGE DOORS

Clopay Corp., 312 Walnut St., Suite 1600, Cincinnati, OH 45202; 800-2CLOPAY; www.clopaydoor.com.

Designer Doors, Inc., 283 Troy Street, River Falls, WI 54002; 800-241-0525; www.designerdoors.com (traditional appearance doors).

General American Door Co. 5050 Baseline Rd., Montgomery, IL 60538; 800-323-0813.

Martin Door Manufacturing, P.O. Box 27437, Salt Lake City, UT 84127-0437; www.martindoor.com.

Overhead Door Corp., 6750 LBJ Fwy., Suite 1200, Dallas, TX 75240; 800-929-DOOR.

Raynor Garage Doors, 1101 E. River Rd., Dixon, IL 61021-0448; 800-4RA-YNOR; www.raynor.com.

Stanley Door Systems, 1225 E. Maple, Troy, MI 48083; 313-528-1400.

BULKHEAD DOORS

The Bilco Company, P.O. Box 1203, New Haven, CT 06505; 203-934-6363; www.bilco.com.

The Gordon Corp., 170 Spring St., Southington, CT 06489; 800-333-4564; www.gordoncelladoor.com.

Palmer River Products, Inc., 97 Common Road, Bristol, RI 02809; 401-254-0490.

7.3

STORM & SCREEN DOORS

ESSENTIAL KNOWLEDGE

A storm door is generally the most cost effective solution to a poorly performing primary entry door. The repetitive use and abuse of storm doors requires a product of sufficient strength and durability. Although available in wood and vinyl, storm doors made of aluminum or aluminum clad materials are popular for these reasons. An insulating air space between the storm door and the primary door off-sets the poor thermal quality of aluminum. The storm door also protects the primary door as a first barrier from weather. A storm door may trap moisture and heat within the intermediary space, which is detrimental to the primary door and weatherstripping. The finish and material of a primary door may not tolerate these elevated temperature conditions. Some primary door manufacturers require the use of a ventilated storm door to preserve their warranty. Combination storm doors incorporate a glass and screen panel that may be interchanged on a seasonal basis. Screen inserts are also available as an option for most storm door units (see Section 5 for discussion of screen materials). A new product, by the name of Hid-N-Screen, employs a conventional roll screen mechanism as a door where the door swing or obscured view is otherwise undesirable. Existing storm doors may also be repaired, depending on age and condition.

TECHNIQUES, MATERIALS, TOOLS

1. REPAIR EXISTING STORM DOOR UNIT.

Storm doors are typically subject to significant abuse in a home and correspondingly often require regular maintenance and/or repair. Fortunately, many components of a storm door are modular in nature and may simply be replaced with little effort. Common problems include malfunctioning latches and pneumatic closers, and broken screen or glazing panels (see respective glazing and screen sections for discussion of these materials). Common maintenance includes replacement of weatherstripping (see Section 11) and adjustment of latch and closer. The frame itself may be repaired as per methods described in Section 4.

ADVANTAGES: New units are very durable and resistant to abuse and the small effort required for maintenance or repair will achieve a long, useful lifespan.

DISADVANTAGES: An existing door that does not accommodate ventilation may contribute to primary door damage as well as increased thermal gains to the home in hot weather. Newer materials, such as vinyl and aluminum, are not subject to warping (unlike wood storm doors) and in humid or exposed areas should be considered.

2. REPLACE EXISTING STORM DOOR UNIT.

The traditional stock storm door has changed dramatically to provide greater durability with new materials as well as a wide variety of styles to match most homes. Storm doors can also provide some degree of resistance to forced entry.

ADVANTAGES: New storm doors provide a wide variety of options to suit most homes and can dramatically improve the energy performance of the primary door. New doors are now more durable than ever, requiring a minimum of repair and maintenance.

DISADVANTAGES: Careful selection of a door is required to assure it will perform well in relation to the primary door. Older homes might have custom built wood storm doors, which are costly to replicate with a degree of authenticity.

FURTHER READING

Screen Manufacturers Assn., 2850 South Ocean Blvd., #114, Palm Beach, Fl, 33480; 561-533-0991.

PRODUCT INFORMATION

Cole Sewell Corporation, 2288 University Avenue, St. Paul, MN 55114; 800-328-6596.

Gerkin Windows and Doors, P.O. Box 3203, Sioux City, IA 51102; 800-475-5061; www.gerkin.com.

Hid-N-Screen Inc., 131 Golden Days Drive, Casselberry, FL 32707; 407-810-9688; www.hidnscreen.com.

Installer's Choice™ Storm and Screen Doors, P.O. Box 853, Des Moines, Iowa 50304-0853; 800-777-3626.

Larson Manufacturing Company, Brookings, SD; 800-411-5277; www.larsondoors.com.

Maclanburg-Duncan, 4041 North Santa Fe, Oklahoma City, OK 73118; 800-654-8454 (screen and storm window components).

ESSENTIAL KNOWLEDGE

Interior doors help define spaces in a house, and provide visual and acoustical privacy. A door between a common space and a hall may have translucent glazing to allow light from perimeter rooms to penetrate interior spaces and also permit the return of conditioned air by means of an undercut door or transfer grille. Closet doors are typically opaque for visual screening, but louvers are desirable for air circulation.

Interior doors are often distinguished by their operation or function: sliding, pocket, by-pass, privacy, passage, or closet (Fig. 4). Interior doors do not have sills and rarely have thresholds, except where floor levels or materials change. Pocket doors are conventional door slabs that slide on a track and do not seal tightly. By-pass doors have a double track with a guide attached to the floor. Bi-fold doors operate on a top track.

Common interior door slabs are also distinguished by their method of construction: flush (either hollow or solid), panel, sash, and louvered. Hollow core flush panel doors are the most popular for interior applications. Their low cost is due to their ease of construction and engineered materials. The least expensive doors are composed of either particle board or jointed wood rail and stiles with a honeycomb core of cardboard and a hardboard skin material. Popular variations of panel doors include wood veneers and formed hardboard panels that simulate raised panel construction. These panels are available pre-finished with simulated wood grain. Hollow core doors are poor sound insulators, as the core air space functions like a soundboard. Solid core doors, using a variety of core materials, have better acoustical properties. Core materials are often particle board, solid jointed wood material (known as a stave core), or mineral cores.

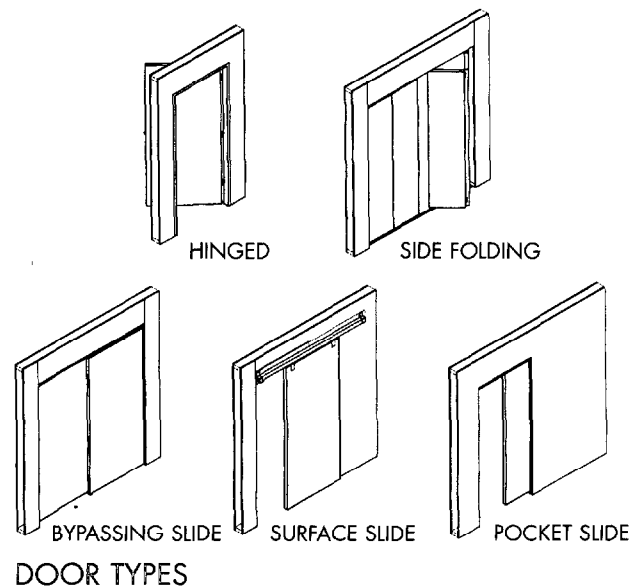


FIGURE 4

TECHNIQUES, MATERIALS, TOOLS

1. REPAIR EXISTING INTERIOR DOORS.

The repair of existing interior doors, almost exclusively constructed of wood, may be achieved by conventional methods as discussed in Section 4.

ADVANTAGES: Repairs of cosmetic blemishes may be made with minimal effort. Doors may be stripped of lead-based paints at time of repair to reduce potential contamination.

DISADVANTAGES: Repair of out-of-alignment doors, although typically utilizing traditional skills, may require a degree of sophistication.

2. REPLACE EXISTING INTERIOR DOORS.

Interior doors rarely require replacement but this may be desirable to redefine the relationship between rooms, by introducing either light, ventilation, or privacy. New prehung, secondary frame, and split-jamb doors require significantly less effort and skill than traditional door hanging methods.

ADVANTAGES: A change of interior doors may dramatically improve a space. New door materials such as engineered wood products and fiberglass are not as vulnerable to swelling and can prove more resistant to damage. A new unit will assure removal of a source of airborne lead contamination.

DISADVANTAGES: Doors in older homes were often custom fabricated and are difficult if not very costly to replicate. Door replacement requires disturbing existing trim, significantly increasing the degree of effort and can be a source of lead contamination.

FURTHER READING

"Open Door Policy - Troubleshooting Interior Doors," John Leeke, *Old House Journal*, January/February 1997, pp. 40-43.

"Silent Woods," William Borel, *Doors and Hardware*, August 1997, pp. 43-44.

PRODUCT INFORMATION

International Paper (Craftmaster), Masonite Division, Molded Product Group, One South Wacker Drive, Chicago, IL 60606; 800-446-1649; www.builderonline.com/~craftmaster.

Jeld-Wen, Inc. (Bend, Doorcraft, Elite, Klamath, Nord, Yakima,.) P.O. Box 10266, Portland, OR 97210-9879; 800-877-9482.

Kaylien, P.O. Box 711599, Santee, CA 92072; 800-748-5627; www.kayliendoors.com (fiberglass interior).

Madawaska Doors, P. O. Box 938, Barry's Bay, Ontario, Canada, KOJ 1B0; 800-263-2358; www.madawaska-doors.com.

Morgan Manufacturing, 601 Oregon St., Oshkosh, WI 54903; 800-766-1992 (wood doors).

New Tech Doors, Phoenix Moulding & Door Supply (New-Tech Doors), 2682 Walnut Ave., Tustin, CA 92780; 800-622-0688.