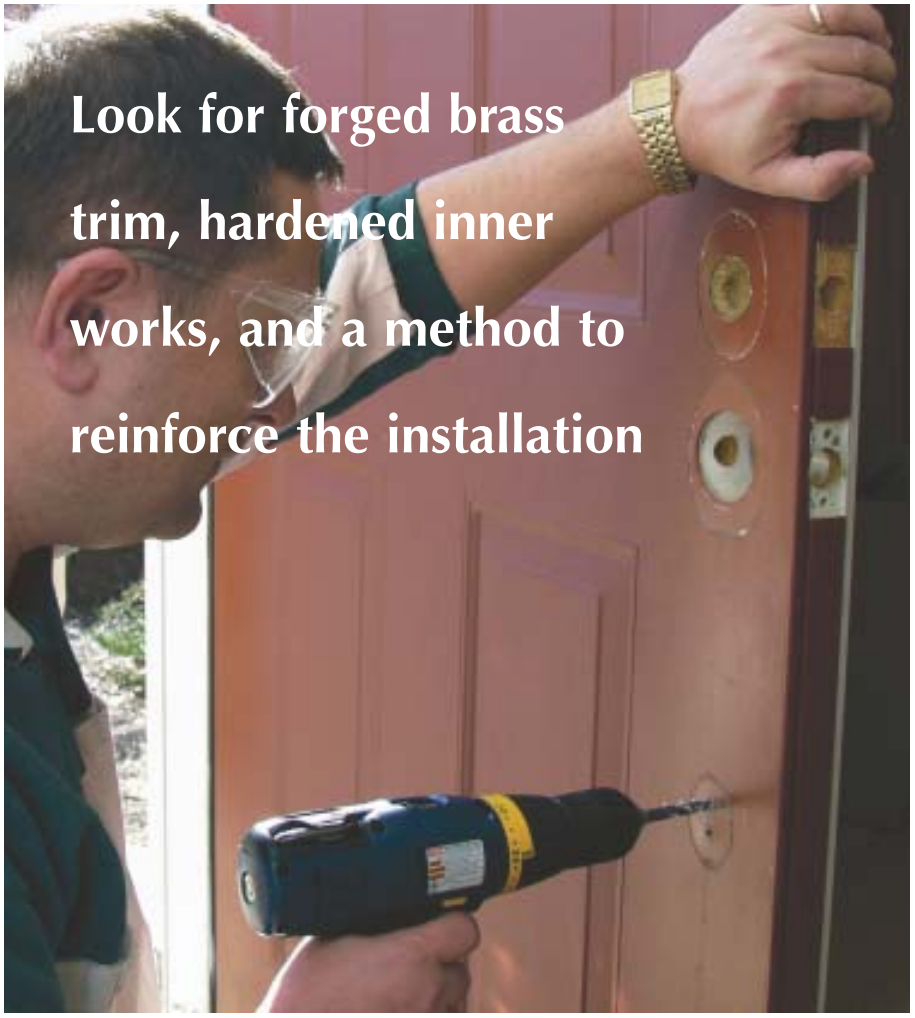
CHOOSING
Entry-Door Hardware

Not all entry doors come complete with locking hardware. And maybe your clients have nothing more specific in mind than something attractive and secure for the front door. You may have figured on grabbing a lockset off the shelf on your next trip to the lumberyard. It's a solution, but maybe not the best one.

by Dave Holbrook



FBI data points to three million burglaries per year. Many are made easy by doors left unlocked or by use of the occupants' "hidden" key — the one under the mat. Deterring those methods doesn't require ingenuity so much as common sense. Assuming that your clients take home security more seriously, we'll look at the specs that make up a good-quality lock. The American National Standards Institute's (ANSI's) certified door hardware standards, intended for commercial application, are established through independent testing at three levels — Grades 1, 2, and 3 — with Grade 1 being the highest security standard. Although Grade 3 is said to be a suitable standard for residential application, it's a qualified one (see chart, next page). Likely as not, Grade 3 is what you'll find in stock at your typical lumberyard.

Forged Components Best

The best lock components are forged rather than cast. In the forging process, a brass rod, or "billet," is heated to cherry-red 1,400°F, then compressed and shaped in a die under tremendous pressure. The resulting component is smooth and dense, with a fine molecular structure that's two and a half times stronger than its rough, die-cast counterpart and vastly superior to the stamped plated-steel components used in low-quality locks. Plus, the smooth, forged surface is key to supporting a high-quality, durable finish.

Inside the lock, look for hardened and corrosion-resistant components, such as phosphor bronze springs and stainless-steel throw bolts. Neither chrome nor brass plating will stand the test of time. As long as the works don't jam, the outer finish is probably of greatest concern to most consumers.

Finishes

Eternally bright brass is the elusive holy grail of the finisher's art. Baldwin's Lifetime, Schlage's Bright Brass, and Weiser's Brilliance offer finish warranties from ten years to life. The Baldwin line has the added allure of various coordinated entry lamps, kickplates, mail slot trims, and other door accessory suites. Warranties on finish aside, Schlage pro-

Lock Grade Testing Standards

		Grade 1	Grade 2	Grade 3
Operational Tests	Lever torque max	28 lbf-in	28 lbf-in	28 lbf-in
	Key torque max	9 lbf-in	9 lbf-in	9 lbf-in
Strength Tests	Torque min, knobs	300 lbf-in	150 lbf-in	120 lbf-in
	Torque min, levers	700 lbf-in	450 lbf-in	225 lbf-in
Cycle Test		800,000	400,000	200,000
Material Evaluation Tests	Unlocked outside knob torque	250 lbf-in	150 lbf-in	120 lbf-in
	Unlocked outside lever torque	450 lbf-in	225 lbf-in	180 lbf-in
Finish Tests	Salt spray — organic coatings on levers, knobs, roses, and escutcheons	96 hours	96 hours	96 hours

Lock grade is established by endurance-testing samples allegedly lifted from the assembly line. Grade 2 hardware provides a high-quality standard for residential applications. (Chart adapted from ANSI/BHMA A156.2-1996, American National Standards Institute / Builders Hardware Manufacturers Association, www.buildershardware.com.)

vides down-to-earth counsel on finish selection, advising consideration of climate and use. Acid rain, humidity, salt air, lawn chemicals, and heavy use can all take a toll on certain finishes, polished brass in particular. Stainless steel, in a bright or satin finish, is recommended for difficult conditions. Alternatively, an oil-rubbed bronze finish is intended to cooperate with natural effects, allowing the hardware to develop a distinctive, wear-burnished patina over time. Although it's almost always best to work with nature, many humans insist on keeping things looking forever new. Take note of manufacturers' cleaning instructions for optimal maintenance of the various finishes.

Cost

Although door locking hardware can range from $15 to $1,500, you should allow at least $60 per exterior door for a Grade 2 keyed entry knob and deadbolt combination, and $250 for a mortise lockset. You're likely to find a Grade 2 deadbolt with "Grade 1 features" advertised on the packaging. You'll find no further clarification, but it's irrelevant — the rating must be for the entire lock. It's in everyone's best interest to exceed minimum standards, so consider adding entry locksets to your list of special-order items.

Tubular Locksets

The key-in-knob lockset, also called a tubular lock after its round installation hole, is the most popular and least secure type of door hardware. Its simple *latch bolt* has a beveled end, is spring loaded, can be retracted either by end pressure or knob rotation, and extends a meager 1/2 inch. A *deadlatch*, also called a dead locking latch bolt, improves slightly on the basic entry latch design (see Figure 1, next page). The deadlatch engages the bolt when the door is closed to prevent *loiding*, or forcible retraction of the bolt by insertion of a credit card or other thin material in the jamb margin. But even a conservative, 1/8-inch margin leaves only 3/8-inch positive latch engagement in the *strike*, the metal jamb plate that catches the bolt. It can take no more than a stout screwdriver or prybar to bow the jamb sufficiently to release the latch. For that reason alone, even the best cylindrical lock should be considered only a secondary, or redundant, means of securing an entry door.

Deadbolt Locks

The deadbolt lock is a fundamental and primary piece of door security hardware. The blunt-ended bolt has a minimum 1-inch throw and can't be retracted by end pressure. To meet ANSI Grades 1, 2, and 3, the bolt material must resist five minutes of continuous metal band-sawing. Hardened steel and one or more free-spinning rod inserts help hack-proof the bolt (Figure 2, next page).

Unlike a lockset with its projecting knob, a good deadbolt has a low locked-side profile to protect the *cylinder*, or lock subassembly, from wrench or hammer attack. After all, if you can twist or hammer the cylinder out of location, withdrawing the bolt becomes a simple screwdriver job. The face of a *recessed cylinder* lies flush with, or below, the outside trim surface. A unifying trim plate that incorporates both lockset and deadbolt further discourages hammering and prying (Figure 3, next page).

Deadbolts are available in single- and double-cylinder configurations. A single-cylinder deadbolt has a key on the exterior and a knob or thumbturn on the interior. Because that configuration is vulnerable to break-ins when glass side-

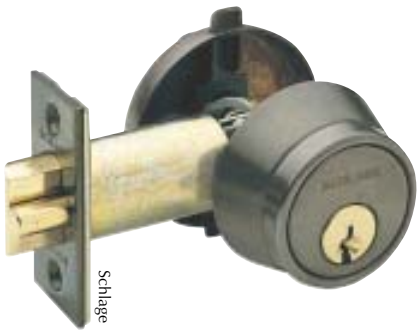


Figure 1. A deadlatch locks a springlatch in the closed position to prevent a "credit card withdrawal."

Figure 2. Hardened-steel reinforcement rods, inserted in the deadbolt, spin freely to frustrate hacksawing attempts.

Figure 3. A recessed lock cylinder and a rugged, unifying face plate help prevent hammer and prying attacks.

lights flank the entry, double-cylinder deadbolts, which are keyed on both sides, are sometimes specified. Be aware, though, that double-cylinder deadbolts may not be permitted by code in many areas, due to the risk of personal entrapment in an emergency. Check local codes before exercising this option.

Mortise Locks

Once a dominant standard, the mortise lock lost its market edge following WWII, when a huge demand for new housing drove the development of less costly, easy-to-install tubular locksets. Now mortise locks are enjoying renewed popularity, not only because of their upscale appearance, but also based on ease of use (not to be confused with ease of installation) and improved security (Figure 4).

Ease of use. You can't beat a lever handle for ergonomic ease of use. Baldwin's levers (or knobs) require only a quarter turn to release the latch, compared to other makes that must be rotated up to a half turn. It's a small thing, but it's often the little considerations that matter.

Stopworks on the edge of the mortise case can be set to freeze the exterior knob or thumbturn, while allowing the interior handle to simultaneously retract the deadlatch and deadbolt — a good emergency exit feature. While that provides "slam-and-go" locking convenience, the deadbolt isn't automatically reengaged. Either a key or a thumbturn must be used to fully secure the door.

Although a key is required to engage the deadbolt from outdoors, turning the key to unlock the deadbolt typically also releases the latch, simplifying entry.

Not every door style is compatible with every hardware type. For example, an insulated metal or fiberglass door may have enough solid wood blocking in the stile area to accept a true, mortise-style lockset. Check before ordering.

Interconnected locks. Like true mortise locks, tubular interconnected locks allow the user to retract both the latch and the deadbolt with an interior knob or lever, or by key from the exterior (Figure 5, next page). Beware of prebored doors, as drilling centers may not match those required by the selected hardware.

Cylinders and Keys

Regardless of make, every lock

Figure 4. A mortise lock combines latch and deadbolt in one package. A steel case protects the internal components from vandalism.

requires a cylinder — a subassembly that, when operated by key or thumbturn, prevents the bolt from retracting. The cylinder contains a *keyway* for activation of a series of spring-loaded pins. In order for the tumbler to rotate and free the bolt, the pins must be positioned in an exact, predetermined configuration. Only a key matching the precise pin and keyway configuration can release the tumbler. The number of possible configurations expands with an increase in pins. A five-pin cylinder is said to allow 100,000 settings, a six-pin cylinder one million, and a seven-pin cylinder ten million possible settings. A better-quality residential lock has a six-pin cylinder, considered extremely difficult, if not impossible, to pick.

While the pin system makes the odds of a coincidental key match-up overwhelmingly slim, key security can be compromised. Copies are as easy as a trip to the hardware store, with either a "borrowed" key in hand or, in some cases, merely the numerical code stamped on the original key.

Construction keying. The construction process can distribute an uncontrolled number of keys to a new home or remodeling job. An easy way around that is to modify the cylinder for construction keying. In the "lost ball" system, the last four pin locations of a six-pin cylinder are drilled for lost-ball application. The drilled holes are smaller in diameter than the tumblers but match the diameter of small ball bearings inserted in the pin chambers to "fur" a construction key and allow the cylinder to turn. The first time a customer key is inserted, however, the bearings are forced into the drilled holes and permanently trapped, rendering the construction keys useless. This method eliminates the need to rekey cylinders once the construction phase is completed.

Aftermarket keys. Duplicate keys can be difficult to insert and turn. The likely culprit is a foreign port of origin, as makers outside the U.S. work in metric metal gauges and produce a slightly heavier blank. The best keys are made of nickel silver for wear resistance. Aftermarket replacement blanks are typically softer brass, so it's best to use only original manufacturer blanks or order extra keys with the original lock purchase.

Key control. High-security key systems can provide an inexpensive upgrade (about $30 per cylinder) to the standard keying system. Schlage's Primus key is specially configured with *side bitting*, which controls a horizontal locking side bar and five-pin set, in addition to the standard six-pin tumbler mechanism (Figure 6). The side-milled key will operate standard cylinders, but standard keys cannot be inserted into a Primus keyway. Primus key blanks are tightly controlled — to obtain a duplicate, the owner must provide an appropriate I.D. card and a verifying signature. The Primus system can be retrofitted into existing Schlage and competitive locks and is available only through company-qualified locksmiths.

One of the methods used to override a deadbolt cylinder is to drill it out, a task made easier by the proliferation of powerful cordless tools. A hardened cylinder, such as Schlage's 20-500 Series UL437 listed cylinder, is made to resist drilling and other forms of attack.

Baldwin

Figure 5. Interconnected locks offer some of the functional convenience of a mortise lock but install like a tubular lock.

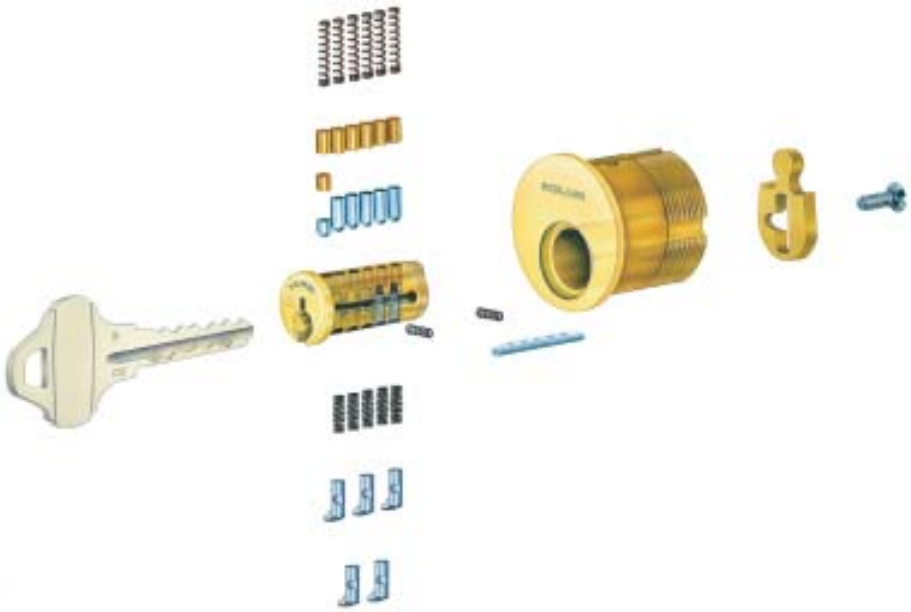


Figure 6. Side bitting controls an additional, horizontal pin array in the lock cylinder, making lock-picking impossible. Schlage's Primus keying system is tightly controlled to eliminate unauthorized key copies.

Electronic Deadbolts

Although we've become accustomed to electronic locks in cars, hotels, bank vaults, and commercial buildings, lock makers have thus far failed to capture the public's attention with a residential version. Apparent sales deterrents include fear of battery or other electrical failure, distrust of electronics in general, and worry of forgetting the code and being locked out. A keypad may also seem somehow less "secure" to many homeowners than a key. Most electronic locks include a key override in case of power or mental failure. Perhaps this is the weakest link in the concept; if you're going to carry a key "just in case," you might as well use it and forget that odd-looking growth on the lock.

Naturally, there are technologically minded clients who like the idea of an electronic door lock. In 1996, Weiser introduced the residential Powerbolt 1000 touchpad electronic deadbolt, which provides entry with a four- to eight-digit access code (Figure 7). Temporary codes can be set to allow access to approved guests and can be changed easily and as often as needed. Schlage is said to be contemplating the release of a residential electronic lock in the not too distant future, following intensive lab and market testing.

Outside Reinforcements

A good-quality lock is really only as good as its installation. An unscrupulous carpenter might skip installing the reinforcement plate that comes with better deadbolt strikes, making the door vulnerable to an easy kick-in. The 3-inch screws provided with the 1/8-inch-thick steel reinforcement plate have been proven to effectively resist determined forced entry attempts.

Although some deadbolt sets include an adapter collar for fitting a typical 2 1/8-inch bore, the collar inset is too slight to resist hammer dislocation (Figure 8). If you can't order a dedicated 1 1/2-inch deadbolt bore, it's best to avoid prebored doors.

A wraparound plate strengthens the face of the door and holds the deadbolt cylinder snugly in position, preventing surface deformation of the door and hammer displacement of the lock cylinder body. Reinforced strikes and wraparound plates are inexpensive upgrades to, but not replacements for, a good-quality, Grade 2 deadbolt lock.

Install a deadbolt, make sure the strike plate is reinforced and tied into the building frame, and look for heavy, forged faceplates and trim, forged knobs or handles, rod-reinforced bolts, and a long-term, warrantied finish. As form tends to follow function, you'll be providing optimal door security along with some nice-looking hardware.

Weiser

Figure 7. Although struggling for popular acceptance, electronic deadbolts provide keyless convenience for those in possession of a changeable, four- to eight-digit access code. A manual key override compensates for battery failure.

Figure 8. Hammering the deadbolt aside provides screwdriver access to retract the bolt. The bore diameter should be specific to the deadbolt cylinder, and the cylinder should insert into the bore to prevent dislocation.

*Thanks to **Jon Fuller**, locksmith, for his help with this article.*

List of Manufacturers

Acorn Manufacturing
800/835-0121
www.acornmfg.com
Forged iron, Schlage "C" keyways

Baldwin Hardware
800/437-7448
www.baldwinhardware.com
Forged brass, Schlage "C" keyways

Mag Security
714/891-5100
www.magsecurity.com
Wraparound plates, reinforced strikes

Medeco Security Locks
800/675-7558
www.medeco.com

Omnia Industries
800/310-7960
www.omniaindustries.com

Schlage
800/847-1864
www.schlagelock.com

Security Door Controls
800/413-8783
www.sdcsecurity.com
High-security commercial and electric locks

Weiser Lock
800/677-5625
www.weiserlock.com