

**BOOK 2**

**INSPECTOR'S GUIDE SERIES**

Practical help for the real estate industry



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## **INTRODUCTION**

The majority of the world's population lives in buildings owned by someone else. The idea of owning one's own home is often just a dream for most people. When people decide to buy their own home the task can be daunting. The purchase of a house is often the largest amount of money they will spend in their lifetime. Usually, the first institutions they will contact will be a real estate office and a bank loan office. Basically, the bank will help them find the money, and the realtor will help them find the house. Yet there are a number of other professionals that will be involved in the process. For the purpose of this book, we are going to focus on the home inspector and, more specifically, on what is discovered in the inspection process.

In the real estate industry, the appraiser is usually called in to provide an estimate on the "monetary value" of the home. They will take a general overview of the size and condition of a home and then find comparable homes sold recently in the general area. However, the most important value is truly set in the mind of the prospective buyer and seller. A seller can set the price they desire for the house, and the buyer will often have a predetermined price range, location and design in mind. A range of factors will affect the decision-making process of the buyer, including location, design, style, materials used, condition of property, school districts, availability of services and general upkeep of the home.

When a buyer decides to buy a house, they will usually make an offer on the price they are willing to pay. When the buyer and seller finally agree to a price, the house will enter into the escrow process. During this time, the prospective buyer will be given a set time for their "due diligence" period. It is during this time that they can have the house inspected and checked for other areas that may be of concern. The time allowed for this process is usually ten to fourteen days for the purchase of a residential property and can be as long as a few months for commercial properties.

The buyer's main concern when hiring a home inspector is to discover any problems or deficiencies found in the house and to learn more about the structure and operational systems. After the inspection is done, the buyer can decide to go on with the purchase, or use the findings as a way to renegotiate price or ask for further repairs. Each state will have its own laws in regard to the inspection process and whether or not the report can be used as a negotiation tool.

To begin this portion of the book, we will cover the five most destructive forces in the building industry and then cover common problems found in the homes of Hawaii.

## **FIRE**

Anyone who has seen a building after a structural fire can attest to its destructive nature. The effects of the fire, heat, and smoke will destroy everything if left burning long enough. Over the years many building

regulations have been focused on limiting the possibility of fire and fire damage. Even a small fire can cause smoke damage throughout the house. Generally speaking, there are not many houses that have been rebuilt after a large fire. If there is no indication of a past fire in the disclosure statement, there is no real way of determining past fire damage, since most of the damaged items will have been repaired or replaced.

## **WEATHER**

When you mention Hawaii, most people think of beaches, palm trees, sun and water. For those who live in Hawaii, there are many other things that come to mind. The moderate climate, beautiful surroundings, and slow pace of living can truly make it a paradise in many people's minds. Yet, when it comes to buildings, there is probably no greater destructive force in Hawaii than water and the sun. Water can turn from a blessing to a curse, especially in the areas of flooding, leaking, and erosion.

A flood quickly demonstrates the destructive force of water. During a flood the water does more than just knock things over and get everything wet. The water can also contain dirt, debris, mud, bacteria, pests, rocks and other unwanted items. When the flow of water becomes strong enough, it can knock buildings off their foundations, shift the building structure and contents, and even move the house to another piece of property! After a flood there is often a large amount of mud and other debris left behind. Even after cleaning everything up and repairing damaged items, the water can cause lingering problems. Mold, insects, decay, and bacterial growth can occur, especially inside the walls and inside enclosed hard-to-reach areas. The problems caused by a flood can continue for months after the initial flooding.

Another problem caused by water and flooding is that of erosion of the soil away from the footings and foundations of a house. When water flows across open soil, it takes part of the soil away with it. The greater the flow of water, the greater the erosion. The more unstable the soil, the greater the erosion.

If there is no feasible way to divert water, a ground cover can be used to protect the soil from erosion. The presence of water near a foundation can attract wood-destroying insects and soften the ground, which increases the likelihood of further soil displacement by animals, nature, and people. If the soil continues to be undermined from the foundation, the building itself can begin to sag, shift, and, if the slope is great enough for movement, even slide.

The most common form of water damage occurs over time. Water from leaking areas, driving rains, plumbing leaks and from roof/gutter problems will often begin to cause problems slowly over time. The plumbing system of a home most commonly uses pipes made of copper, PVC plastic, or galvanized metal. The flow of water away from the house is governed by a drain system made up of either ABS plastic pipe or cast iron pipes.

Most leaks are caused by pipes or fixtures with faulty seams, washers, or physical damage. When these areas leak, the items nearby can become mildly wet or even saturated. When this happens the physical properties of the wet items begin to break down and become a breeding ground to destructive mold, fungus, mildew, plant growth and other unwanted pests.

On the wet sides of Hawaii, it can rain as much as 100 inches or more a year. In the ideal situation, rain is moved away from the house through the roofing and guttering systems and by the presence of paint and other sealants. When roofs, gutters, caulking, stains, and paints become old and worn they allow the water to penetrate the wood and metal underneath. If the leak and water penetration areas are allowed to continue, they will cause many problems, including damage to wood and fixtures, mildew growth, swelling, peeling, dry rot, erosion, rusting, and, eventually, structural damage.

The destructive force of the sun can most readily be seen by looking at its effect on paint and faded carpet areas near windows. The two basic areas of concern to the home owner is exposure to ultraviolet rays and infrared heat. The ultraviolet rays can cause oxidation to finishes and interior items, discoloration and cracking to lumber, and most often will have a dramatic effect on the roof and exposed wall and trim areas. The infrared heat of the sun will also wear on the structure and cause expansion and contraction of wood and metals used in the buildings construction. The application of caulking, sealants and finishes is vital to prolong the life expectancy of exterior items, and the application of tinting to windows is necessary to prolong the life of carpets, furniture, art and other items that turn a house into a home.

## **PESTS**

Most people instantly think of termites when they hear the term “insect damage.” In Hawaii, there are other pests that can cause damage, below is a list of the most common insects and animals that can cause problems with homes in Hawaii.

### **Termites**

“Hawaii’s year-round warm weather has allowed many introduced insect pests to take hold, and the seven species of termite found here are among these immigrants. The most destructive termites are the Formosan subterranean termite and the West Indian dry-wood termite, both of which arrived during the past 100 years and are now common throughout the state. They cause more than \$100 million damage per year to structures. Dry-wood termite colonies typically produce “kick-out holes” on the surface of the wood, from which they expel tiny fecal pellets (frass) that look like fine grains of sand. Sealed kick-out holes may indicate the presence of an active dry-wood termite infestation. Subterranean termites do not make kick-out holes in the wood. Their primary indicator is the

presence of their “mud tubes” along boards, within wall voids, or bridging over masonry between the soil and the wooden parts of a structure. The feeding patterns of the various types of termite also differ. Subterranean termites follow the grain, eating the softer areas along the length of the wood and leaving the harder grain skeleton. In contrast, dry wood and damp wood termites eat across the grain in any direction.”  
*Cooperative Extension Service Household and Structural Pests*  
*Feb. 1999 HSP-1 Hawaii’s Termites—An Identification Guide*  
[www2.ctahr.hawaii.edu/oc/freepubs/pdf/HSP](http://www2.ctahr.hawaii.edu/oc/freepubs/pdf/HSP)

## **Ants**

“...Ants usually nest outside in moist wood or partially decayed wood in that they prefer the “softened wood” to hollow out their nests called “galleries”. These galleries are quite clean and have a sandpaper appearance. Wood which has been damaged by carpenter ants contains no mud-like material, as is the case with termites... It is important to understand that you can have both inside and outside nests. They construct two different kinds of nests: parent colonies which, when mature, contain an egg-laying queen, brood and 2000 or more worker ants, and satellite colonies which may have large numbers of worker ants, but no queen, eggs or larvae. The carpenter ants inside a home may have originated from the parent nests located outdoors in a tree stump, timber or woodpile for example, or from one or more satellite nests hidden behind a wall in the kitchen or bathroom, or perhaps from wood dampened by a roof leak in the attic... Nests are especially common in such places as moist, hollow spaces, like the wall void behind dishwashers. Nests are usually found in areas where water leakage could occur, around bathtubs, sinks, roof leaks, poorly flashed chimneys, or poorly sealed windows or door frames. Outdoor nest can occur in stumps, hollow logs, fence posts or in dead portions of standing trees, however cracks and crevices may be used to start nests in sound wood. Although large colonies can cause structural damage, the damage is not normally as serious as termite damage.”

<http://doityourselftermitecontrol.com/other.htm#carpenterants>

## **Carpenter bees**

“In the late-spring and early summer, homeowners often notice large, black bees hovering around the outside of their homes. These are probably carpenter bees searching for mates and favorable sites to construct their nests. Male carpenter bees are quite aggressive, often hovering in front of people who are around the nests. The males are quite harmless, however, since they lack stingers. Female carpenter bees can inflict a painful sting but seldom will unless they are handled or molested. Carpenter bees tunnel into wood to lay their eggs. Bare, unpainted or weathered softwoods are preferred, especially redwood, cedar, cypress and pine. Painted or pressure-treated wood is much less susceptible to attack. Common nesting

sites include eaves, window trim, fascia boards, siding, wooden shakes, decks and outdoor furniture.” CARPENTER BEES by Mike Potter <http://www.uky.edu/Agriculture/Entomology/entfacts/struct/ef611.htm>

## **Honeybees**

The honeybee will nest and hive inside walls if they have an entry point and a source of water. The two basic ways to remove the hive is to transfer it to another location or to fumigate. It is suggested that you hire a professional to eliminate the hive. Soon after the adult bees have been eliminated, their nest should be removed. If this is not done, the honey and beeswax comb will attract other insects and animals and the odor of decaying and fermenting honey will become quite evident. The honey may also soak into the walls. The walls will become stained and remain moist, which makes them nearly impossible to paint or wallpaper.

## **Rats and Mice**

Rats and mice will chew their way through just about anything that gets in their way. The rat is much more destructive, but both can become problems. Rodents will chew a hole to get into areas and to get out when they are trapped. Rats in particular have been known to chew away the plastic sheathing that protects wires in the attic or walls. Both rats and mice will begin to build their nests and breed if left long enough. The greatest problem to a home is that exposed wires can become fire hazards, as can nests. Both rats and mice can become health hazards because they can be carriers of disease. Rats have also been known to bite animals and people, especially small children and the elderly. Due to their size and chewing tendencies, rats will be the first rodents to be noticed, but both should be eliminated as soon as they are discovered.

## **Dogs and Cats**

Dogs can cause two types of problems. The most obvious is that they will chew and scratch building components, both inside and outside the house. Most often they will chew on the siding and trim areas on the exterior of the house. Another problem has to do with their digging tendencies. A dog left under or near a house long enough can undermine its structural integrity by moving soil away from the piers, footings and foundation systems that support it. Dogs have been known to dig a hole under a sidewalk and then make it their home.

Cats will most often cause problems by scratching at screens and doors. They will also cause problems with their fur and the odor that they can leave in the flooring and furniture.

## **Birds**

Aside from being able to fly, birds are also known for their nesting abilities. The problem with birds is that they will often pick your home as

the location of *their* home. If they decide to enter your attic and build a nest, they will cause problems. Aside from being noisy and bringing in mites, their nests are made of materials that are highly flammable. Mynah birds can create a pile of sticks and other debris that, if left long enough, can reach to the top of the roof peak!

### **DEFERRED MAINTENANCE**

As a former owner of a home repair company, many of my jobs were caused by components that were not maintained properly or often enough. We called these “deferred maintenance items.” There are a number of systems within a house that are highly dependent on one another. The appliances would be pretty worthless without electricity. The plumbing fixtures would not be of much use without the supply of water. Drywall would last for only one storm without the protection of the roof and siding. The flooring would be destroyed quickly without proper foundational support.

As one can see, each part of a house works together to make it into a home. Maintaining a building is probably one of the most important and time-consuming aspects of owning a home or rental property, and of course is often overlooked or put off for too long. With proper cleaning and maintenance, many parts of a house can last well beyond their life expectancy—but of course nothing lasts forever, as we can see by the last item on our list.

### **TIME**

There is a children’s joke that goes something like: “If I throw a clock out the window, can I watch time fly?” Many people have noted that the older they get, the faster time goes by. In the United States a building is considered “old” if it is fifty or more years old. In many countries, a building is “old” when it is above a hundred years old. In some countries, like Egypt, Italy, Greece, and China, a building is considered “old” when it was built a few hundred or even a thousand years ago. Time is somewhat relative when considered from different viewpoints, but time will eventually have the same basic effect on everything on earth. Things begin to break down and wear out, and in the building industry everything has a life expectancy rating.

The life expectancy rating is determined by most manufacturers, with added caveats such as “*under normal conditions,*” or “*with proper maintenance.*” These life expectancies will be determined by a number of factors. The three most important are frequency of use, the quality of materials and workmanship, and the amount of maintenance done. It has been said that, “You get what you pay for”, and the one we tell our children: “If you keep playing with it, you will break it.” These sayings are also true when it comes to the home.

Over time, things wear out and break down, regardless of other factors. Yet, houses that are properly built and maintained can be enjoyed for generations. The question that needs to be determined when buying a home



is whether it was properly built and maintained. A good home inspector can help the buyer determine the factors listed above and provide them with the information necessary to help them in the decision-making process.

## **PROBLEM AREAS**

In the following chapters, we will cover the problems and deficiencies that are common to residential homes in Hawaii. We are not attempting to cover everything that can go wrong in a home or to write another home repair manual, and highly recommend that a good home repair book be used as a complement to this book. Houses are made up of a broad array of system components that will develop problems and need maintenance over time. The items listed below include a general description of major components, common problems identified with them, and a basic list of repair and maintenance suggestions.

### **OVERGROWN LANDSCAPING**

#### **Identification of components**

The diversity of climates and plant life is truly one of the unique things about Hawaii. The problem in Hawaii is that plants grow extremely fast. People will plant species around their house that look fine when they are smaller and easy to manage; only later to find out it takes a tremendous amount of work to maintain them. Landscaping, if done properly, can help beautify and protect the house, but can cause numerous problems if the plants and trees are not maintained or are grown too close to the structure.

#### **Common problems identified**

Due to the heavy rainfall and humidity of Hawaii's climate, it is imperative that houses have a chance to dry out. When plants and trees grow against a house they retain moisture. When trees grow over houses and drop debris, they cause the moisture to stay on the roof, which inhibits the roof from drying out. Leaves and debris can also fill the gutters and cause them to overflow and leak. When plants and trees are allowed to touch the house, they will begin to break down the finish and retain moisture on walls and trim areas. Trees and plants can also lean against power and utility lines, and the roots can cause lifting under driveways, sidewalks and foundations. The overgrowth of plants can also be a breeding ground for unwanted insects and provide entryways for rats and other rodents.

#### **Maintenance and repair recommendations**

It is recommended that plants be maintained at least eighteen to twenty-four inches away from the house. Trees with shallow growing roots should be removed when the roots begin to show signs of uplifting around the foundation and under sidewalks and driveways. Trees that grow over the roof should be trimmed back to limit the amount of foliage dropped on the roof and gutters. It is important to remember that ground cover that is

planted to inhibit erosion should be allowed to do its job and not be removed. As a rule of thumb, no plants should be allowed to touch the house or to inhibit the drying out of all exterior components of the home.

## **ROOFS**

### **Identification of components**

There are many styles and types of roofing systems, but they all fall into two basic categories. The first is the flat (or low-sloped) roof, defined as roofs that are at pitch of two-in-twelve or under (a two inch fall per linear foot). The second is sloped roofs, which are greater than a pitch of three-and-twelve (a three inch fall per linear foot). We will first identify the most commonly used components in flat roofs.

### **FLAT ROOFS**

Built-Up roofs are usually referred to as hot asphalt or coal tar roofs. They are installed by using layers of rolled roofing piles (organic, fiberglass, felt, or non-woven polyester mats) directly imbedded in coats of hot asphalt or tar. The rolled sheets are applied directly over one another with a coat of tar or asphalt between each layer. The finished assemblies are often covered with gravel to protect them from the sun and other unwanted elements. Built-up roofs have an average life expectancy of twelve to thirty years.

#### **Single Ply**

Single ply roofs consist of a single layer of synthetic material, thirty to eighty millimeters thick. They can incorporate a reinforcement layer of polyester or fiberglass, and are often categorized as thermosets, thermoplastics, or plasticizers. They can be installed by fully adhering them with other polymers, mechanically fastening them into place, or by placing them under an extruded polystyrene insulation board as a protected membrane roof. Single ply roofs have an average life expectancy of five to fifteen years.

#### **Modified Bitumen**

Modified bitumen roofs involve traditional materials, but use modern fabrication methods and installation techniques. Modified bitumen roofs are made from prefabricated rolls of modified asphalt (or coal tar) reinforced with a fiberglass or polyester reinforced mat. They come in rolls eighteen to thirty-six inches wide and are normally installed in two or more plies using mopping asphalt, cold adhesives, or torch welding. Plastic-modified asphalt systems have a smooth or granular surface and can be heat welded or laid in cold adhesive. Modified bitumen roofs have an average life expectancy of ten to twenty years.

## **SLOPED ROOFS**

### **Asphalt Shingles**

Asphalt shingles (often called composition shingles) are rectangular strips of heavy felt or synthetic matting with a mineral aggregate adhered to the top. The shingles are to be installed over a plywood base with a layer of lighter roofing felt as a moisture barrier. Each strip will have a layer of asphalt or tar behind each tab that is designed to be heated by the sun which adheres the shingles together. They are installed by laying one piece on top of the other, moving up toward the top of the roof. They are either nailed or stapled into place and have an average life expectancy of ten to thirty years.

### **Metal**

Metal roofs have a long history of use, and are available in a wide variety of configurations, colors, styles, sizes and materials. Metal roofs are usually made of galvanized or treated steel, aluminum, or copper, and occur most commonly as long sheets with corrugated ridges. They are lapped on top of each other on the long edge; on older roofs there are also laps at the horizontal runs. Metal roofs are secured into place using roofing nails or screws with a rubber or lead washer to seal the head. The use of metal flashing is used at walls, ridge lines, valleys and hip areas. Unlike the simple lapped installation used for corrugated sheets, some metal roofs are formed on the job site and have various folding and interlocking joints that create a weatherproof covering. Metal roofs have an average life expectancy of twenty to fifty years.

### **Wood, slate, tile**

Wood shakes and shingles are more common than slate, clay, and concrete tiles because they are less expensive and easier to install. Wood shingle roofs are usually made of cedar or Southern yellow pine with special treatment for boosting fire rating and pest resistance. They are layered over one another and mechanically fastened into place over a heavy sheet of roofing felt. Slate roofs are made of flat pieces of stone slate that are cut to form shingles and are layered on top of one another using mechanical fasteners. Concrete and clay tiles are usually made of colored concrete or clay formed into curved tiles and secured using mortar or concrete. The average life expectancy of shakes and shingles is fifteen to thirty years, while slate, concrete and clay tiles can last from forty to one hundred years.

### **Common problems identified**

Most of the roofs used in Hawaii's homes are made from metal or composition shingle. In regards to leaks in a roof, water will usually flow downward. Yet in Hawaii, wind and heavy rains can cause the water to flow upward, even into apparently impossible areas of penetration. In regards to roof leaks, the most common problem is when there is a penetra-

tion or opening made into the surface, joint, or seam areas.

There are three common reasons for metal roof leaks. The first and most common is leaking from screws and nails. When nails are used they will lift or pop up due to the movement of the roofing material. Screws do not pull up as often as nails, but the rubber gasket that seals the head will give way or the screw will rust through from underneath. When it rains, water will enter into the gaps at these areas and begin to drip into the interior of the house. You can identify the leak by discoloration and mildew growth or by the wet circle that will begin to appear on the ceiling underneath the leak.

The second problem found in metal roofs has to do with the plumbing vent areas and flashing used at walls, valleys, hips and ridge caps. To seal around plumbing vents and flashing areas, a roofer will use aluminum roofing tape, caulking or specially formed vent caps and metal flashing to cover the opening caused by the vent and junction areas. The problem is that the sealant used will become old and brittle and the seam areas will begin to lift and separate and loose the sealant bond. This of course will open up an avenue in which water can penetrate.

The third area of leaking occurs where the metal roof is overlapped at the seams. Over time, and due to improper installation, the seams will begin to lift up and separate from the roofing ridge underneath. When water flows down the roof, it may find one of these gaps and run down the inside of the seam. Then the water will find a nail or screw and begin to flow down the shaft. Over time, the interior of the seam can begin to rust through and leak at these areas. These leaks are often hard to locate because the water may enter into a lifting seam and flow down a few feet before it finds its way into the ceiling. These types of leaks can appear on the ceiling as a wet area or can even form lines of water damage along the ceiling.

Unlike the metal roofing that is used on all sides of the Islands, the composition shingle is most often found on the dryer sides. Asphalt shingles do not hold up so well on the wet sides due to the displacement to the aggregate from heavy rains and amount of heavy mildew growth on the surface. These problems cause accelerated damage to the aggregate coating. This coating is the only real protection the asphalt paper has from the elements. Over time all asphalt shingles will become old and brittle which causes them to crack, split and break. Wind can also cause portions of the tiles to lift, tear and even blow away. Over time, water will begin to enter into these worn and damaged areas. When water leaks through the shingles and roofing felt, it will become trapped and will absorb into the plywood. Over time, this will break down and rot the plywood and attic lumber. At some point of saturation, the water will enter into the ceiling below. Sometimes the leak will go unnoticed until a considerable amount of damage is done.

## **Maintenance and repair recommendations**

It is always recommended that you look into hiring a professional to fix or repair a roof leak. It takes only one little mis-step or small slip to start you on your way down the roof. As most roofs have a steep pitch, the acceleration one attains down the roof and onto the ground causes quite an impact on a human body. So if you have a fear of heights, bad depth perception, uncoordinated or just have a healthy fear of a hard landing, then you had better call in a qualified, licensed, insured roofing contractor.

If you are still determined to fix your roof, the first step in repairing a roof leak is to identify where the leak is coming from. This may sound obvious, but it is often the last thing people try to do. I have seen people seal every nail head on a roof and still miss the roof leak entirely. The best way to determine the location of the leak is to go into the attic during a time of rain. However this may not always be possible due to the limited space in most of Hawaii's pre-manufactured roofing truss system crawl spaces.

The easiest way is to locate the leaking area from the inside of your house by looking for the wet or discolored areas. If you are near a window you can mark your location by looking for a landmark outside the house (ie a tree, telephone pole, rafter tail etc) which you can use to mark the approximate location when you get on the roof . You can also just count the number of your steps as you walk in from the walls to the location of the leak.

Your next step, before you get up on the roof, is to identify the basic location of the leak from the outside. From the ground, look directly above where you think the leak is originating and look for any obvious areas such as a plumbing vent, valley, hip line, lifting nail, raising seam, accumulation of debris etc. After you have found, or think you have found the problem, you can now get your ladder (set it up nearest to the leaking area if possible).

Since most roofing leaks are caused by a lifting or damaged roofing screw/nail/seam or lifting/damaged shingles you will need a good tube of sealant or aluminum flashing tape. The best tubes of sealant I have found for roofing is an elastomeric caulking or a butyl rubber. A silicone caulk is often used, but silicone is not manipulated or smoothed out as easily as other caulking. You can use a product such as a can or tube of asphalt/roofing tar, but these products do not last very long and are extremely messy. Aluminum flashing comes in rolls of three, four, six, nine, twelve and thirty six inches wide. The tape is made of a top layer of heavy aluminum foil with a sticky tar base on the bottom. This product is best used for raising seams, larger rusting areas or faulty joint areas. Elastomeric caulking or Butyl Rubber come in tubes and are dispensed by using a caulking gun.

If a nail or screw is lifting up then it is best to remove it and replace it with a stainless steel roofing screw. If all the fasteners directly above the leaking area appear to be well set , then I always recommend you cover the entire head of each fastener at least six feet around the apparent leaking

area. Even if I find an obvious lifting or damaged fastener, I still seal all remaining fasteners around the effected area. It is also important that the caulking you use be applied liberally and cover about one half an inch of the metal roofing and not just sit on top of the fastener. It is important to note that most sealants will not stick on wet surfaces.

If the leak is from a seam or flashing area, it is recommended that an aluminum metal flashing tape be used. The roof must first be clean and dry for the flashing tape to seal. Use a light bleach and water solution to clean the area if there is mildew growth. You must also remove all the oxidized/discolored paint by cleaning it with a damp cloth or old rag. If you are in a hurry you can use a small propane torch to heat the area to be sealed to help drive out the moisture. The tape should be applied to cover the top of both ridges on faulty corrugated seams, and run the entire length of the seam (from the ridge cap to the roof edge. Four inch tape is the best size since it covers the tops of each ridge. I have tried to seal lifting seams with different caulking compounds but have never found it to be a successful method of sealing seams.

If there is a rusted hole in the roof, the rust must first be cleaned and treated with a rust converter before it is sealed. It is also important that the flashing tape cover well beyond the rusted area. After the tape is applied, it can be heated with a propane torch and smoothed over to help it adhere to the surface. The dimpled form (looks like golf ball dimples) of aluminum flashing tape is easier to bend and can also be painted.

The good thing about a metal roof is that they can be painted. You can use any color you want even though the reds and blues will fade faster than other colors. The first step before you paint a roof is to have it cleaned. If there is heavy mildew growth you can use a mixture of water, bleach and mildecide. The use of a pressure washer is often the fastest way to clean a roof. If you use a bleach solution be sure to clean it and wash it a few times to remove the residue that bleach leaves behind. If there are any rusted areas I recommend that they be treated with a good rust converter. If there are any damaged areas or lifted fasteners than they must be sealed with a good elastomeric caulk or aluminum flashing tape. After you have cleaned and repaired any damaged areas it is time to apply the paint.

I recommend that a good industrial grade water based paint be used. Some water based paints will not adhere well to the pre-painted enamel used with a mildecide added into the paint. Note: a mildecide should never be used on a water catchment system roof. On new roofs ask the paint dealer if the paint you use needs a primer base. You can either roll or brush the paint on, or you can rent a airless sprayer system from any rental company. When you purchase a roller buy the largest knap you can find (a inch an a half seems to work best). A good quality wide paint brush should also be used near siding and other areas you do not want painted. When painting you may have to thin the paint out a little if it gets too thick.

The airless sprayer is by far the fastest way to paint and is basically used

like a large can of spray paint. You must use even strokes with the head of the spray wand about a foot or two from the surface. You must always remember that when you release the handle it still sprays for a second. Therefore you must release the handle a moment before you reach the area where you want to stop. The other important thing to remember is that an airless sprayer you will tend to have over-spray, so remove all cars and items you do not want painted.

On corrugated roofs you must start at one point and walk backwards as you paint so as not to step on wet paint. When you apply the second coat start at the opposite end of your first coat and walk backward the other way. This way you spray or roll out each side of the ridge from a different angle each time. If you keep the same pattern each coat than one side will have too much paint and the other side too little.

When it comes to composition shingle roofs there is no real maintenance other than a periodic cleaning and replacement of areas blown off during storms. These roofs, however, are not easy to clean due to the fact that the top coating of the shingles will wear off while cleaning. Another problem with replacing shingles is that the new shingle will not match the older roofing color. It is also important to note that shingles are layered on top of each other with the upper shingle running above the lower shingle. So if any shingles are to be replaced remember that water flows downward and there should be no area where it can flow into. So make sure the shingles lay on top of each other properly.

Composition shingle roof leaks are not as easy to identify as those of metal roofing. A leak can be repaired by applying roofing cement or flashing tape over the damaged area or by installing new shingles. Butyl rubber and Elastomeric caulking can be used but are often incompatible with the felts used with composition shingles. However, if the roof is old enough to develop leaks, it is probably time to think of re-roofing the house. These roofs can typically have up to three layers of shingles applied before they have to be removed completely.

## **GUTTERS**

### **Identification of components**

Before machines were invented to roll out gutters on site, older gutters were manufactured in lengths of approximately ten feet and were round and made of redwood, copper, aluminum or galvanized metal. The newer gutters are now more square and most often made of aluminum or plastic,

For residential use the best gutter is called a seamless aluminum gutter. These are milled on site and will have joints only at the corners and down spout areas. Plastic gutters are also common but have seams every ten feet and at the corners and down spout areas. Aluminum gutters are mounted to the fascia or rafter tails using spikes and ferrels (spikes are 7" nails and ferrels are small aluminum/plastic tubes that support the inside of the gutter). Plastic (PVC) gutters are hung using special plastic support clips.

The linear joints, corner joints and downspout connectors are larger than the standard support clips and all include rubber gaskets that help seal these joint areas. Each of these mounting clips are either screwed or nailed into place.

Down spouts are installed to channel the water away from the roof and to the ground. All gutters must slope slightly towards these downspouts. They are either made of square aluminum and/or plastic drain lines, or standard three-inch PVC drain pipe. The down spouts should be securely fastened to the siding or trim of the house. It is also extremely important that the end of the downspout be directed away from the house and toward an area that will naturally flow the water in a safe direction.

### **Common problems identified**

Most people are not aware that much of the damage to siding and trim is often caused by faulty gutters and downspouts. I have seen a number of houses with foundation problems and flooding inside the house directly caused by gutters draining massive amounts of water into the house. The problem with plastic gutters is that each joint has a tendency to leak, and because they are held up by plastic clips they tend to be less strong and have a tendency to sag. Aluminum gutters also have joints at the corners and these will often leak.

Down spouts can cause numerous problems as well. A properly installed downspout should always angle downwards from the connection from the gutter to the wall. The elbow joints should feed into each other so that water flows into each pipe and not out of the seams. The end of the gutter should drain the water away from the house and channel the water at least eighteen inches from the siding and foundation.

One of the most common and dangerous problems comes from debris build up within the gutters and downspouts. When gutters become full of debris and other items they inhibiting the flow of water and cause the water to accumulate and build up in the gutter and downspouts. Because gutters are fastened to wooden fascias and at the ends of wooden rafters these junction areas are susceptible to water penetration and dry rot from leaking joints and overflowing areas.

If you see moss or mildew at the elbows and seams then usually there is water penetration at these areas. If you see sagging, disconnected areas and signs of water running down the outside of downspouts, you will usually find that the siding, rafters, fascia, posts, piers and foundations may have areas of water penetration, damaged sealant, heavy mildew growth, dry rot and other forms of damage.

### **Maintenance and repair recommendations**

The down spout drain opening should be periodically checked to remove any items that block the flow of water. If the drain line is clogged, you can usually run a water hose down the pipe and let the water pressure



remove the clog. The down spouts must be firmly secured where they are attached to the house. All down spout joints must have the upper portion of the joints enter into the inside of the pipe below, so that the water flows inside the pipes only. The bottom portion of all down spout drain lines should be checked periodically to ensure they move the water away from the structure.

## **WORN PAINT, STAIN AND CAULKING**

### **Identification of components**

Paints and wood stains are applied to many areas both inside and outside of a home. The use of paint and stains for walls, doors, trim, roofs, drywall, cabinets, decks, floors and many other areas is a common practice all over the world. Most liquid forms of sealants are broken down into two basic types — oil-based and water-based. In the past, oil based paint used boiled linseed oil, but today an alkyd oil is used derived from soybean or safflower oil. Acrylic water borne paints (latex) use synthetic resins carried in water as a base. With the increase in durability, sheen and bonding power of water based paints, the use of oil based paints today is typically reserved for use on metal and as a primer.

Paint is usually identified for its decorative qualities since it comes in a variety of colors and sheens. Yet the real purpose of paint and wood stain is to protect and seal the materials they coat. The difference between the two is that paint adheres to the top portion of wood, while stains penetrate deeper into the grain. Paint is also used to protect metal from oxidization and corrosion.

Most sealants come in a number of sheens denoted in descending order, starting from high gloss, to gloss, semi-gloss, satin, and flat. Other common forms of sealants are identified as caulking (distributed in tubes), putties, glazing, wood fillers and a number of other natural or synthetic sealants and repair compounds. All of these substances are used to help protect joints and seams and to fill or smooth out rough and damaged areas. It is important to remember that the preparation of a surface is vital for proper coverage and adhesion of sealants. The use of putties and caulking to seal holes, dents, seams, joints and other areas is vital since paints and stains are not designed to fill in gaps or holes.

### **Common problems identified**

The most common problem with paint, stains and other sealants is that they do not wear evenly. The sealants used on the weathered side of the house wear out much quicker than on the protected sides. Caulking and other fillers also wear unevenly, especially where there is movement to the components covered. This movement will cause cracking and separation at joints and seams. When paint is used to cover over metal such as construction straps and interior corner drywall beads, rust may cause the paint and drywall to swell and bubble underneath.

One unique building style common in Hawaii is the use of what is known as a single walled home. The use of redwood, fir and cedar tongue and groove siding was used extensively in Hawaii from the turn of the century and used somewhat today. The common lumber size used was a single strip of wood one inch thick and approximately six inches wide. These pieces of wood have a milled lip on one side and a groove in the other (called tongue and groove). The walls are basically pieced together like a jig saw puzzle with each piece of wood toe-nailed into place at the floor and ceiling. After the walls were put up a piece of trim was nailed into place on the floor and the ceiling to help secure the wall in place. There was often (but not always) another piece of wood that was secured into place around the mid section of the walls.

The other building style is called double walled construction. Today this is the most common form of building. Double walled construction is made up of two by four lumber which is put together to form up the walls. After a house is framed in and the roof and windows are put on the interior and exterior of the wood framing must be then covered.

The most common interior material used is drywall. The most common exterior material used to cover walls is T-1-11 (a form of plywood with a rough finish and vertical lines). Other forms of exterior siding used including fibrous boards, cement style boards, vinyl or aluminum siding, wood lap siding and stucco. One of the least used building style for homes is concrete blocks (called hallow-tile in Hawaii.) These concrete blocks have two hallow cells in the middle of each block. These hallow areas are filled with concrete and metal rebar which provides the structural stability of the walls. Each of these surfaces need to be sealed to protect them from the elements .

Below is a short list of common problems found with these building materials. When T-1-11 becomes old and/or exposed, it will begin to show small surface cracks that will become more noticeable as the surface and sealant ages. Fibrous siding will begin to swell when moisture enters through direct penetration and when the finish wears out. Vinyl siding will become brittle with age and will crack and split when given a direct blow. Aluminum siding wears well, but will corrode, especially when it is exposed to salt in the air. (When aluminum corrodes, it will form a white chalky power residue). Concrete block walls hold up well but must be sealed with a waterproof sealant due to their porous nature, and will crack under tension or compression. Tongue and groove lumber also holds up well, but will split and break when impacted hard enough and will also be susceptible to insect damage. Stucco will develop cracks and open seams caused by structural movement and will become damaged if water is allowed to enter (most prominently at window and wall trim areas.)

## **Maintenance and repair recommendations**

When it comes to carpentry and repair work, I always recommend using people who are familiar with the process of repair and remodeling work. For the average home owner the skills necessary to perform structural work is usually insufficient. If your house has gotten to the point beyond regular maintenance tasks than it is probably a good time to look for outside help. However, there are a few steps that can be taken to protect the integrity of the structural components of your home. The most often overlooked maintenance task is in the area of cleaning, keeping plant growth away from the house and painting.

All surfaces need to be cleaned periodically. When cleaning a paint or colored stain finish it is recommended that a mixture of bleach and mildew-side be used to remove mold and mildew. For general cleaning, a mixture of Tri-Sodium Phosphate (TSP) and water, or a general cleaning detergent can be used. A broom or scrub brush can be used to help physically remove dirt, moss, mildew and other debris. A pressure washer can also help physically clean the surface (great care should be taken to not damage building materials and to avoid forcing moisture into the interior of the structure). A pressure washer can remove loose and peeling paint, but it is recommended that heavily damaged and peeling paint be manually scraped prior to cleaning.

After a surface is cleaned, all bare areas should be primed before they are painted. All gaps and damaged areas, especially at window and wall trim, should be sealed or filled (paint will not seal most cracks, holes, and other damaged areas). The use of a good wood filler is recommended for larger damaged or gaping areas. Joints and seams can be filled and sealed with a good quality painters caulk. All areas subject to water penetration should be sealed before they are painted, especially exposed stairs, decks and rails.

A good water-based paint is typically recommended for most surfaces. I have personally experimented with the use of many sealants. I have found that mold and mildew will grow more rapidly when oil-based or elastomeric sealants are used. The use of stains is also good for wooden surfaces since they penetrate further into the surface. A good spar grade (sometimes called marine grade) polyurethane or varnish is also recommended for both interior and exterior use. A minimum of two top coats, with a mildewcide additive, is recommended for all exterior areas, bathrooms and kitchens. However when a roof is painted where water catchments system is in place, then a mildew side must not be used or it will contaminate the water supply.

You may need to paint the weathered sides and trim areas more often than the rest of the house due to their increased exposure to the elements. The only real problem with painting partial areas is that the paint color will not match because the older painted areas will fade over time. You can usually take a sample of the intact faded areas and have it matched at most hardware stores to paint heavily worn areas.

## PLUMBING

### Identification of components

The plumbing system of a residential property is made up of the supply lines, drain lines, venting and septic systems. The supply line (material used can be copper, plastic, or galvanized metal) portion includes the line from the municipal or private system feeding the home and will run through a regulator (used to lower the water pressure) and main shut off valve, and then to a conditioning or filter system where applicable. From there it splits into two lines. The first runs to all the cold water supply and the second runs to the hot water heater. The materials used for the supply lines are most often copper, with galvanized pipe on older homes. Plastic lines are used for exterior and cold water use only (except for specifically designed plastic piping most commonly called CPVC).

The drain and vent lines are typically made of black plastic (called ABS) or metal (cast iron or galvanized steel.) The job of the drain line is to carry the wastewater to the sewage system. The drain lines will have a series of vent systems which allow for proper water drainage and to help release of septic odors. These vents are the ones that you see sticking up from the roof at various areas. Each drain line will have a 'P' trap (the u-shaped pipes under sinks) installed that traps and holds water to limit the entrance of septic gasses, vermin and other unwanted pests into the fixtures.

The drain lines will then channel all the wastewater into the septic system. Septic systems are typically of three designs. The first, found mostly in heavily populated areas and cities, is the municipal system (some houses will have a private sump pump that pumps the waste to the municipal system). The second type is the septic tank. The septic tank is a large plastic storage tank that holds the solid waste in the main storage area. From the main tank the liquid wastewater will drain into a series of perforated pipes called the drain or leach field. Septic tanks will have two to three plastic capped pipes (usually exposed) for maintenance and inspection. The third type of septic system is the cesspool.

The cesspool is a common system in Hawaii and is basically a large hole in the ground with a concrete cover placed over the top. A cesspool must be in a location with good drainage for it to work properly. Most often there will be no record of where the cesspool is located. The septic system will often be approximately fifteen feet away from the house, and should be located near the direction that the drain lines flow (if they are visible).

### Common problems identified

The most common problem found in the plumbing systems is leaking plumbing fixtures, supply, and drain lines. Leaking fixtures will be the most evident problem, but will cause the least amount of physical damage. The water bill, however, may cause a huge damage to the pocket book, and the largest bill is usually caused by a leaking toilet. Most toilets have ten to

eleven specific areas that can leak. I have known people who had to pay a three to four hundred dollar water bill due to a running toilet. Yet most municipal water companies will send out a notification if your water usage leaps, and some companies will even take one-half off a high water bill after the leak is fixed.

A leaking drain or supply line will most often cause the most problems. Many times they are not identified until after physical damage is noted. Drain and feed lines usually leak at the seams and connection areas. The damage caused by leaking drain and feed line includes damage to cabinets, walls, flooring, and ceilings, and if left long enough, can even damage the foundation. A leaking water line is not as common as a leak in the drain lines, though both can cause a great deal of damage.

A problem with the septic system is not very common, but can be a real nuisance when it happens. Most municipal sources are designed to not back up under normal circumstances. Cesspools or septic tanks will back up when they become full and if the bacteria that break down solids to form a sludge are killed. The use of bleach and other cleaners, as well as coffee grounds and other acidic substances, can kill the bacteria needed to make the system function properly.

## **MAINTENANCE AND REPAIR RECOMMENDATIONS**

### **Leaking supply lines**

To locate a leak in the main supply line you can first start by looking into the main shutoff box (usually located at the roadway). There will be a small meter that the utility uses to check your water consumption, and it will have a small dial that will spin when water flows through the meter. If everything is shut off at the house and this meter is spinning, then there is a leak in one of the supply lines (or from a toilet).

Leaking supply lines are not always easy to find, but if you look carefully you may find signs of moisture in the building, under the house, or in wet spots in the yard or by driveways and sidewalks. If the problem is due to the age of the piping, then the entire leaking line should be replaced. If the leak is from mechanical damage, then the line must be both repaired and protected from further damage.

### **Leaking sinks**

Sinks that drip at the faucet are easy to fix and do not cause much damage. Most leaking fixtures can be repaired fairly easily with the replacement of the rubber or plastic washers on the valve stems (the metal/plastic) shaft under the handle of a fixture that opens and closes to allow water to flow through it. Before you replace the washer, you must turn off the water supply lines to the fixture. After you turn off the water supply valve (located under the sink), you must turn the faucet on to make sure the water is off completely and to relieve the water pressure. After this is done, you can remove the fixture handle by removing its mounting screw. After

the handle is off there will be a mounting nut at the top of the fixture base that holds the valve stem in place.

Sometimes the valve stem is one whole piece and the entire valve stem will come out as you turn the top mounting nut. After you remove the valve stem, look for the washers (either on the end of the metal stem or inside the faucet body). When you replace the washer, make sure the replacement washer is the same size as the original and that the washer mounting screw is screwed down firmly.

When a faucet leaks from under the handle, the water may run under the faucet body and cause damage underneath the sink. These leaks are usually easy to fix by removing the handle and tightening the top nut of the valve stem and then replacing the handle.

The other area where fixtures may leak is at the shutoff valve and supply lines under sinks and behind toilets. These leaks can be identified by using a flashlight and spending a few minutes looking for the leak. When you find the leak, try drying out the area every so often and watch closely to determine exactly where the water is coming from. The leak can originate at the ends of the supply lines where they attach to the valve or faucet, or from the joints found at the shutoff valve, or even from under the base of the fixture above.

If the leak is from the supply lines that feed the fixture, then you can often tighten the mounting nuts that attach directly to the fixture itself. If this does not work you can replace the washers or the entire supply line itself. If the leak is from the handle area of the shutoff valve, first open the valve all the way to seal the leak, or try tightening the top nut under the handle. If the shutoff valve continues to leak, then you have to turn off the main water supply to the house and install a new shutoff valve. If the leak comes from the base of the faucet, then the mounting nuts that are found under the sink must be tightened to secure the fixture to the sink.

When a drain line leaks under a sink directly from the bottom of the pipe, then it is either corroded at the bottom or is leaking at a loose or faulty joint area. If the pipe is corroded and leaking, it must be replaced. If the problem is a joint area leak, then you can most often tighten the slip joint nut to stop the leak. A slip joint nut is a plastic or metal nut located at the top of each joint. If the leak persists, then you can remove the leaking pipe and install a new set of washers and slip nuts, which are very inexpensive and easy to find. Make sure that you install the beveled edge of the plastic washer towards the natural flow of the water.

## **Garbage disposals**

The garbage disposal will often stop working because debris has lodged against the grinding blade and stopped the blade from spinning. Underneath all disposals is a small red button that will pop out to protect the motor. The first thing to do is to reset (push in) this little button, then try to turn the unit on. If you hear it trip again or hear a small humming noise, then the

grinding blade needs to be freed up. Under all disposals is a small hole directly in the center of the disposal base. This small hole allows for an allen wrench to be inserted directly into the bottom of the grinding blade assembly. If you insert the proper allen wrench, you can manually turn the grinding blade to free up or loosen the lodged item. After you remove the allen wrench, try to turn the unit on and off quickly, to expel the item. If this does not work, then you must get a flashlight and a pair of long needle-nosed pliers and remove the items by hand. If none of this works, it's probably time for a new disposal.

### **Leaking showers and tubs**

A shower or tub fixture drip is usually due to a faulty washer. These can be replaced just like a kitchen faucet. Sometimes the tub or shower surround itself is cracked. Small cracks and damaged areas can often be repaired with a simple patch. Larger cracks (especially on the bottoms of tubs) will often indicate the tub needs to be replaced.

Great care must be taken if the shower floor is made of ceramic tile. All tile grout lines joints and seams need to be completely sealed or water will penetrate these areas and cause considerable damage to the shower base. You can seal larger gaps with grout but we recommend using caulking due to its flexibility and adhesive qualities. On plastic, fiberglass or glass shower surrounds and tubs all joints and seams should be sealed with a good mildew proof tub and tile caulking. It is recommended that all areas be sealed including the outside walls and flooring of all tubs and showers.

### **Leaking toilets**

Toilets that run are usually caused by an old flapper, sticking handle, or a faulty water level. If a toilet runs, it is usually recommended that a new flapper be installed and the handle be replaced if it sticks or is damaged. The ball cock assembly is the unit that shuts the water on and off as the tank fills. The water level can be changed by adjusting the small nut at the top shaft that attaches to the ball float or by sliding the float arm up or down if the float is located on the ball cock assembly. If the toilet leaks where the tank attaches to the bowl, then the tank needs to be removed and a new bottom flange gasket and mounting bolt assembly be installed. If the toilet leaks at the base, then it needs to be removed and a new wax ring and mounting bolts installed. Make sure the base of the toilet is caulked to stop the entry of water under the toilet during times of cleaning the floor (or when the toilet overflows).

### **Septic systems**

Septic tanks need to be pumped every three to seven years, depending on their size and amount of usage. Cesspools may also back up when sludge builds up and fills the cavities that allow for drainage. To clean a cesspool, a number of options are used in Hawaii.

The first method is to have the cesspool pumped and then cleaned with a pressure washer to help clear the drainage areas. You can also pour a few barrels of caustic soda into the system, which breaks up the sludge and allows for drainage. Some people drop a half stick of dynamite into the cesspool to free up the drainage areas (this can cause the system to collapse and is NOT recommended). The best alternative is to not allow destructive substances to be poured down the drains, and to pour a small packet of cesspool additive down the toilet every few months or as indicated on the additive packet or box.

## **ELECTRICAL ISSUES**

### **Identification of components**

The electrical system within a house has a more standard design than many other operating systems. The standards that apply to the electrical system have not varied much over the past thirty to forty years. The only real changes have been the use of copper as the standard medium for main house wiring, the use of breakers instead of fuses, and an increase from a standard of sixty amps to one hundred amps for normal service. Today all houses have circuit breakers (which turn off automatically if the amperage runs higher than the size of the wires will allow). Single-family homes are supplied with a 120/240 volt grounded system with the standard service feed of 100 amps. Light switches, plugs, GFCI protectors, plastic sheathed wiring, junction boxes and other electrical components have pretty much stayed the same for many years. The only real noticeable change in the electrical system of a home has been to the physical design of fixtures and appliances.

### **Common problems identified**

The most common problems in Hawaii have to do with moisture damage to electrical systems and improper wiring jobs done during remodeling. The most common problem from water is due to leaking mastheads and corrosion of main disconnect and junction boxes. Problems with improper wiring are often caused by the wrong size wires, not covering or supporting wires, using improper junction methods, and not understanding proper grounding and polarity issues.

### **Maintenance and repair recommendations**

It is beyond the expertise of most homeowners to do any electrical work themselves, due to the dangers associated with electricity. It is highly recommended that a licensed electrician do the work, even if it appears to be minor. If one should attempt to do the work ones self, they should



obtain a basic voltage sniffer (a pen-like device that indicates if the wiring is hot). One may also want to pick up a plug-in line tester for the outlets and an amp meter for basic diagnostic purposes. Make sure that you have the proper breaker turned off and that all 220/240 breakers are clipped together and that both breaker switches are turned off. If you must attempt to work on the electrical system yourself, it would be a good idea to buy a good book covering residential wiring and electricity fundamentals.

## **DECKS AND STAIRS**

### **Identification of components**

Decks are widely used in Hawaii due to the mild climate and consistency of the weather. They are commonly made of traditional post and pier style or concrete slabs. Most decks are made independent from the original foundation. A post and pier foundation both for the house and the deck is most commonly made up of concrete blocks that rest on the ground and support vertical 4x4 or 4x6 posts. The supporting structure is secured to these posts using either 2x6 or 4x6 beams and joists. The decking material is then attached to these beams and joists and can be made up of anything from 1x6, 2x4 or 2x6 lumber (or synthetic boards), or plywood sheeting.

When a deck is built, it may or may not include a cover. If the deck is part of the original house design, then the cover will be an extension of the house roof. When decks are added to a house, the roof will often be attached directly to the house and supported at the outer end with 4x4 posts and 4x6 beams. Since many decks are elevated off the ground, they will need a set of stairs, a railing system, and a landing at the top and bottom of the stairs. The railing system is usually supported as an extension of the foundation with 2x4 or 2x6 top rails and a series of balusters. Balusters are vertical rails that run from the top handrail to a support rail underneath. The stair treads are supported by a set of stringers (the pieces of lumber that run on both sides of the stairs at an approximate 45-degree angle from the base to the top of the deck). All stairways must have a consistent stair height and depth. Each stair tread rises between seven to eight inches and the depth must be at least nine inches. The height of each step should be consistent and not change more than 3/8" in height between each step.

### **Common problems identified**

The most prevalent problem with decks and stairs is that they often lack sufficient protection from the weather. Most decks are not cleaned or sealed regularly and their covers do not extend far enough to properly protect the structure from the sun and rain. You will often find water damage to the

lower stair treads, bottoms of stringers, and at the top of the handrails. Many times water will have penetrated into the deck and joist system, causing damage and dry rot (a fungus growth that decays the wood as it grows). Over time, the damage to the decking system will affect the railing structure and integrity of the deck.

Another problem is that many covers are not secured properly at the house structure and the roofing rafters are not attached properly to the main support beam. If the wind is strong enough, the improperly attached deck and covering system can be lifted, damaged and removed from the house. If the deck is made of a concrete slab poured separately from the foundation, it may lack proper reinforcement, moisture barriers, or proper back fill. One problem with concrete decks is that they often crack and settle. If a structural addition (such as a family room, den, etc.) is added to the slab, then the additional weight of the structure may pose problems due to a lack of footings or proper reinforcements.

### **Maintenance and repair recommendations**

All decks, stairways, and rail systems need to be sealed and painted regularly. The use of caulking at all seams, joints, and around the post bases should be applied liberally to inhibit moisture penetration (the gaps in stairs and flooring however should not be sealed since they are there to provide proper drainage). If the deck or rail system is not covered properly, it is recommended that a cover be added or extended at least two feet beyond the end of the deck. All soil, plant growth, and standing water must be kept away from the stringers and posts at all times. Metal straps should be installed on beams, posts, top of stairs, and the deck itself must be bolted/securely attached to the main structure.

## **FOUNDATION AND EROSION PROBLEMS**

### **Identification of components**

Every home is built from the bottom up. A stable house must have a stable foundation. The post and pier style of home is built basically the same way as the deck described above. The only difference is that the main support beams and floor joists are larger and they will often have shear walls installed (bracing mostly on the corners and outer walls that help stabilize the home from side to side shifting and movement). Older homes will have the posts resting freely on the pier blocks without straps (some homes use the natural rock formations as a foundation for the posts). Newer homes will have metal straps mounted directly into the concrete

piers and footings. The posts are then nailed directly into these straps to secure the posts to the piers.

Concrete foundations in Hawaii are usually of a monolithic slab design (concrete poured as one complete unit). The site work done before the slab is poured will include: footings for exterior walls, back fill and compacting of the base soil, a moisture barrier (lapped plastic sheets), metal wire mesh and rebar for support, and the installation of plumbing, gas and other utility lines. In newer construction, strapping ties will be installed in the concrete slab to attach the bottom wall plates into place.

### **Common problems identified**

Most problems with foundations across the country have to do with movement caused by expansion and contraction of soils most often during the freezing and thawing of water in the soil. Concrete foundations in Hawaii will most often develop problems if the site work requirements or reinforcement standards were not adhered to. Also, if the foundation is poured on hilly areas or where erosion is common, the instability of the soil may cause settling, lifting, or cracking. This problem is not as prevalent as in other regions, but has been known to happen periodically in Hawaii.

Post and pier foundation systems will often develop problems not so much due to the builder's deficiency, but because of common drainage and soil settlement conditions. Erosion under pier blocks is most often caused by gutter downspouts channeling water toward the foundation. Sometimes water from roadways and from improper landscaping will direct the water toward the foundation. When water is allowed to flow under a house, it will either cause the soil supporting the foundation to settle, or will carry the soil away. When the piers are no longer supporting the post above, the load of the house will be shifted to other members of the foundation. Over time, the beams that the posts support will begin to sag and bend, and the house will begin to sag in these areas.

When homes are built on a hill, a cone of compression (a forty five degree angled slope of the soil) must be maintained. If erosion or soil displacement is allowed to cut into this slope, then the soil above will begin to slide. This will eventually affect the structure above, even causing major movement to the entire structure.

### **Maintenance and repair recommendations**

The only real maintenance to a foundation is of a preventative nature. Anything that causes settling, lifting, or movement to the foundation should

be addressed. Gutter downspouts should be installed to direct the water away from the structure. Trees with shallow roots should be removed. Eroding soils should be replaced and an appropriate ground cover installed to inhibit further movement of soil. Drainage lines should be cleaned and serviced to allow them to move water away from the structure. If the piers or footings have eroding areas, then back fill or concrete should be installed to help support the piers and footings. If the pier blocks are not fully supporting the post above, shims should be installed under the posts. If the post is rotted or damaged, it should be replaced. Wood items should not be stored directly on the soil and the soil should not be allowed to build up around the wood portions of the foundations.

## **INTERIOR**

### **Identification of components**

A number of books could be written to fully identify the components that make up the interior of a house. Many things can go wrong with the interior, but most problems occur from basic wear and tear problems. The items that receive little attention when it comes to regular maintenance include doors, windows, cabinets, and appliances. The doors on the interior of a home are usually pre-hung hollow core doors, while the exterior doors are most often pre-hung solid core, french doors, or sliding glass doors. There are a wide variety of windows used today, including: wood and glass louvers, aluminum sliding windows, vinyl windows, double hung windows, wood sliding windows, hinged windows, and bay windows. The most common, of course, are glass louver and standard slider styles of windows. Common appliances include stove, hot water heater, range, washer and dryer, but may also include: dish washers, trash compactors, water filter systems, central vacuums, hood vents, etc. The kitchen and bathroom cabinets are often the most expensive items in the interior of the home and can cost anywhere from eighty to one hundred and fifty dollars per linear foot (and that does not include counter tops).

### **Common problems identified**

Problems found with doors are usually due to loose hinges, swelling to the door and jamb, and the door rubbing on the floors. Many times doors that stick or rub on flooring will be left unattended until the veneer begins to peel and the door will split at the door handle or jam areas. With windows, a common problem is sticking. Most people never think about lubricating their windows until they are impossible to open or close. By this time the rollers are usually corroded, the handles are loose or broken, and

the frames have considerable worn areas and separation at the frames.

It will become evident very quickly when an appliance does not work. Most often people will have their refrigerator, hot water heater, range, and other appliances repaired or replaced soon after a problem arises. The most common problem with the stove is damaged heating elements. The refrigerator will often have damaged and stiff seals at the doors, which cause the unit to work harder to keep itself cool as well as cause condensation on the outside of the box. Dishwashers will often have damaged racks and cleaning jets and most often stop working altogether due to a nonfunctional pump system. The hot water heater will begin to work improperly due to either a damaged heating element, faulty thermostat control, and sometimes when a circuit breaker is turned off. The washing machine will most often have the motor wear out, and leaking plumbing. Dryers will usually stop because of broken belts or clogged or blocked lint vents.

With cabinets and counter tops, the biggest damage culprit is water, broken hinges, and broken drawer guides. You will often find that seams in the counter tops, backsplash, and the small lip behind a sink will have swollen and damaged areas due to water penetration. The cabinet base under the sink may also be damaged due to spilt cleaning materials and leaking plumbing. When the finish on the cabinet fronts and face frames becomes worn, the wood will absorb oils, dirt, soil and other substances that will cause stains in the wood. Cabinets made of press-board will sag and break down faster than those made of wood or plywood.

### **Maintenance and repair recommendations**

Everything in the house that slides, hinges, swivels, and is designed to move must be cleaned and lubricated often. Wood can be lubricated using wax or graphite power. Rollers can be lubricated by silicone, Teflon or oil-based lubricants. Most sliding windows and doors can be lifted up and out of their tracks and have the rollers replaced if they cannot be freed up with lubrication. When a door rubs on a carpet, you will often find that its hinges are loose. If the hinges are not the problem, then the door should be shaved or cut down where the rubbing occurs. Make sure that the shaved or cut areas are well sealed to inhibit moisture or mechanical damage. When there is peeling on the veneer, you can cut the peeling portion out and have that area resealed to help limit continued peeling or lifting.

The problem with appliance repair is not so much the repair itself, but the wide variety of manufacturers and models. The availability of a part will often be the determining factor in whether you replace the part or the whole appliance itself. The cost of purchasing a water pump for a dish-

washer is often more than the cost of the appliance itself. But the cost of replacing a single burner or stove element is usually much less than replacing the whole unit. The best method, of course, is to have the appliance cleaned and protected from physical damage before the problem arises.

Ovens and stovetops should be cleaned often and the elements should not become loose or dirty. Hot water heaters have a valve at the bottom so they can be drained every year or two (by attaching a water hose to this drain and running the hose outside to drain the tank). The lint traps and seals around dryers should be cleaned regularly and the vent lines on the back should be removed and cleaned every year. The refrigerator seals should be kept clean and flexible for proper sealing to occur; the heat discharge fins on the back or underneath should also be cleaned regularly. The washing machine supply and drain lines should be checked to prevent crimping and bending. When a dryer or washing machine begins to squeal, the belt will need to be tightened or replaced. Most belts are tightened by loosening the mounting bolts on the motor, and moving the motor away from the pulley in order to put pressure on the belt. The washing machine should also not be overfilled, or used for numerous loads without allowing the motor to cool.

Cabinets and counter tops should be cleaned regularly. All seam and joint areas on counter tops should be sealed with a good quality caulk to prevent moisture penetration. When the finish on cabinets becomes worn, you can either keep them oiled with good furniture oil, or you can have them refinished. Most cabinets are sealed with a lacquer-based finish, which will allow only a lacquer-based product to be put over it. You should seal one area that is not highly noticeable and then check in a few weeks to make sure the finish is not peeling, bubbling, cracking or showing any other signs of incompatibility. The cabinets should be cleaned and sanded with a very fine grit sand paper before you apply the finish. Before you apply the last coat, it is recommended that you smooth the previous coats with the finest steel wool available.

## **CONCLUSION**

This book has been designed to provide a basic overview of common problems found in Hawaii's homes. We have not attempted to cover every problem nor provide every solution available. We hope this book helps realtors better understand the operational systems and problems developed in a home. We also hope this book helps the home owner or renter better understand their home and how to perform proper maintenance and repair items.