

BAND TECHNICAL PUBLICATIONS



HOUSE REPAIRS AND MAINTENANCE

September 1982

E78.C2
B35
no. HS-1
c.1



Indian and Northern
Affairs Canada

Affaires indiennes
et du Nord Canada

Canada

HOUSE REPAIRS AND MAINTENANCE

Table of Contents

1.0	INTRODUCTION
1.1	Purpose
1.2	Intended Users
2.0	GENERAL MAINTENANCE CALENDAR
2.1	Spring
2.2	Fall
2.3	Winter
3.0	PAINTING
3.1	Paint types
3.1.1	Latex
3.1.2	Alkyd
3.1.3	Oil
3.1.4	Epoxy
3.1.5	Urethane and Polyurethane
3.2	Paint Applicators
3.2.1	Brushes
3.2	Rollers
3.2.3	Paint Pads
3.3	Preparing the Surface for Painting
3.3.1	General Remarks
3.3.2	Interior Surfaces
3.3.3	Exterior Surfaces

- 3.4 Getting Ready for Painting and Cleaning Up Afterwards
- 3.5 Painting Various Surfaces
 - 3.5.1 Exterior
 - 3.5.2 Interior
- 3.6 The Proper and Safe Way to Use a Ladder

- 4.0 PLUMBING
 - 4.1 Emergencies
 - 4.2 Repairing Leaks Temporarily
 - 4.2.1 Taping
 - 4.2.2 Hose Clamp and Rubber
 - 4.2.3 Clamp, Wood Block, and Rubber
 - 4.3 Making Joints in Copper Tubing
 - 4.3.1 Compression Fittings
 - 4.3.2 Flare Fittings
 - 4.3.3 Sweat Fitting (Soldered)
 - 4.4 Replacing or Repairing Leaking Joints and Pipes
 - 4.4.1 Galvanized Steel Pipes
 - 4.4.2 Compression and Flare Fittings On Flexible Copper Tubing
 - 4.4.3 Sweat Joints on Flexible or Rigid Copper Tubing
 - 4.5 Thawing Frozen Water Pipes
 - 4.6 Repairing Faucets
 - 4.6.1 Compression Faucets
 - 4.6.2 Single Lever Faucets
 - 4.6.3 Replacing Faucets
 - 4.6.4 Adjusting Basin Pop-ups
 - 4.7 Unclogging Drains
 - 4.7.1 Fixture Drains
 - 4.7.2 Main Drain or Building Drain
 - 4.7.3 Building Sewer
 - 4.8 Repairing Flush Tanks

- 5.0 ELECTRICAL REPAIRS
 - 5.1 Safety Rules
 - 5.2 Use of Warranties, Owners Manuals, and Service Manuals
 - 5.3 Grounded Electrical System
 - 5.4 Fuses and Circuit Breakers
 - 5.4.1 General Information
 - 5.4.2 Types of Fuses
 - 5.4.3 Replacing Blown Fuses
 - 5.5 Repairing and Replacing Wires, Plugs, Switches, and Outlets
 - 5.5.1 Making Wire Connections
 - 5.5.2 Replacing a Plug
 - 5.5.3 Replacing a Light Switch
 - 5.5.4 Replacing a Lamp Switch
 - 5.5.5 Replacing a Receptacle/Outlet
 - 5.5.6 Three and Four-way Switches
- 6.0 APPLIANCES
 - 6.1 Use and Care of Irons
 - 6.2 Use and Care of Vacuums
 - 6.3 Maintenance of Ranges
 - 6.3.1 General Use and Care
 - 6.3.2 Replacing a Surface Heating Element
 - 6.3.3 Replacing a Broil or Bake Heating Element
 - 6.4 Use and Care of Refrigerators
 - 6.4.1 Defrosting
 - 6.4.2 Adjusting Doors
 - 6.4.3 Cleaning and Adjusting the Drain Pan and Hose
 - 6.4.4 Cleaning Condenser Coils
 - 6.5 Use and Care of Washers and Dryers
- 7.0 HEATING
 - 7.1 Gas-fired Furnaces
 - 7.1.1 Restarting a Pilot Light
 - 7.1.2 Checking Propane Tanks for Refilling
 - 7.2 Oil-fired Furnaces
 - 7.2.1 Common Problems that the House Owner can Solve
 - 7.2.2 Servicing the Furnace
 - 7.3 Baseboard Heaters
 - 7.4 Space Heaters
 - 7.4.1 General Information
 - 7.4.2 Flooded Space Heaters
 - 7.5 Wood Burning Heaters
 - 7.5.1 General Information
 - 7.5.2 Wood Burning Safety
 - 7.5.3 Creosote

- 7.5.4 How to Put Out a Chimney Fire
- 7.5.5 Insurance for Houses with Wood Burning Appliances
- 7.6 Forced Air Furnaces

- 8.0 WALLS AND CEILINGS

- 8.1 Repairing Gypsum Board
- 8.1.1 Setting Popped Nails
- 8.1.2 Repairing or Replacing Loose Joint Tape
- 8.1.3 Patching Small Holes
- 8.1.4 Patching Large Holes
- 8.2 Replacing a Damaged Ceiling Tile
- 8.3 Removing Toggle Bolts, Expanding Anchors and Plugs

- 8.4 Repairing Wallpaper
- 8.4.1 Air Bubble Repairs
- 8.4.2 Repairing Holes and Tears
- 8.4.3 Cleaning Soiled or Stained Wallpaper
- 8.5 Repairing Bathtub Enclosures
- 8.5.1 Replacing Ceramic Tile
- 8.5.2 Sealing Bathubs

- 9.0 DOORS AND WINDOWS

- 9.1 Correcting Sticking Windows
- 9.2 Stopping Rattling Windows
- 9.2.1 Double Hung Windows
- 9.2.2 Sashless Windows
- 9.3 Replacing a Broken Pane
- 9.3.1 Wooden Windows
- 9.3.2 Aluminum Windows
- 9.4 Repairing Doors that Bind
- 9.5 Preventing Swelled Wood
- 9.6 Straightening Bowed and Warped Doors
- 9.7 Tightening Loose Screws
- 9.8 Repairing Binding Doors
- 9.9 Repairing Strike Plates

- 10.0 FLOORING

- 10.1 Care and Maintenance
- 10.1.1 Wood Floors
- 10.1.2 Linoleum
- 10.1.3 Tile Floors: Asphalt, Rubber and Vinyl Asbestos

- 10.1.4 Sheet Vinyl Flooring
- 10.1.5 Concrete Floors
- 10.2 Repairing Sagging Floors
- 10.3 Repairing Squeaking Floors
- 10.4 Patching Floors
 - 10.4.1 Wood Floors
 - 10.4.2 Tile Flooring
 - 10.4.3 Sheet Flooring

- 11.0 RUGS AND CARPETS
 - 11.1 Regular Maintenance
 - 11.2 Stain Removal
 - 11.2.1 General Remarks
 - 11.3 Carpet Repairs
 - 11.3.1 Repairing Large Damaged Areas
 - 11.3.2 Repairing Tears
 - 11.3.3 Repairing Split Seams
 - 11.3.4 Repairing Burns
 - 11.3.5 Ripples and Humidity
 - 11.3.6 Static Electricity

- 12.0 EXTERIOR SIDING
 - 12.1 Brick, Block, and Stone
 - 12.2 Bevel Siding
 - 12.3 Cedar Shakes and Shingles
 - 12.4 Plywood Siding
 - 12.5 Hardwood Siding
 - 12.6 Aluminum Siding

- 13.0 ROOFS
 - 13.1 General Remarks
 - 13.2 Checking a Roof and Spotting Leaks
 - 13.3 Repairing Roofs
 - 13.3.1 Wood Shingles and Shakes
 - 13.3.2 Asphalt Shingles
 - 13.3.3 Roll Roofing
 - 13.4 Care and Repair of Flashings
 - 13.5 Cleaning Chimneys and Flues
 - 13.6 Repairing Chimneys
 - 13.7 Providing Adequate Venting of Roof Spaces
 - 13.8 Emergency Repairs to Roofs

14.0	GUTTERS AND DRAINAGE
14.1	Wood Gutters
14.2	Steel Gutters
14.3	Aluminum Gutters
14.4	Plastic Gutters
14.5	Gutter and Downspout Maintenance
14.6	Repairing a Leaking Gutter
14.7	Repairing Leaking Downspouts
14.8	Splash Pads
14.9	Dry Wells
15.0	SANITATION
15.1	Drinking Water: General Recommendations
15.2	Batch Chlorination of Drinking Water
16.0	FIRE
16.1	Emergency Procedures
16.2	Fire Prevention
17.0	REFERENCE LIST

HOUSE REPAIRS AND MAINTENANCE

1.0 INTRODUCTION

1.1 Purpose

This publication provides information for those who wish to undertake the more common household repairs and maintenance tasks. Regular maintenance and prompt repairs will make the house safe, more comfortable to live in, and longer-lasting.

1.2 Intended Users

This publication is intended for occupants of houses on Indian reserves.

2.0 GENERAL MAINTENANCE CALENDAR

Many maintenance jobs should be done on a seasonal basis. Here are some examples.

2.1 Spring

- a. a general cleanup of winter debris;
- b. a clean-up of dead grass and leaves when the ground is hard enough;
- c. a check and cleaning of window screens before installing;
- d. inspection and servicing of the heating system (this is best done by a specialist); if the house has a forced-air heating system, lifting of air registers from the floor and vacuuming of ducts and grating to removed trapped dust and lint;

- e. checking of basement walls and floors for cracks and damp areas.

2.2 Fall

- a. draining of all outside pipes and faucets, draining of garden hose and storage in the basement or some other safe, warm area;
- b. inspection of skirting and frost boards to ensure that they are in good condition.

2.3 Winter

- a. removal of icicles before they build up, fall and do damage
- b. removal of ice and snow from steps, porches and walks. Sprinkle rock salt or sand lightly on icy areas.

3.0 PAINTING

3.1 Paint Types

Over a hundred types of paint are on the market today, each manufactured to fulfil a specific purpose. The average consumer can easily be confused when trying to choose an appropriate paint for his particular job. Luckily, most home painting requirements can be filled by a few basic types normally available. They are described briefly here.

3.1.1 Latex

While less durable and washable than alkyd-based paints, latex, which is water-based, is widely used and easily applied. It is popular for its quick-drying ability and easy soap and water clean-up. Latex adheres to all but very slick surfaces and is moisture-resistant.

When applying latex over an oil-based painted surface or over wood, metal, or wallpaper, prime the surface first with a latex or alkyd primer.

3.1.2 Alkyd

Alkyd paints, made from a synthetic resin formula, are also widely used for their tough surface and superior hiding power. They dry more slowly than latex and require solvents for thinning and clean-up--not water.

The surface must be prepared with an alkyd primer. Fresh alkyd paint has a slightly stronger odour than latex.

3.1.3 Oil

Oil paint is no longer in wide use. It is based on a natural resin formula, must be thinned with turpentine, and dries very slowly. It emits strong flammable fumes and does not stand up as well as alkyd.

3.1.4 Epoxy

Epoxy paint is one of the toughest and more expensive types. It must be mixed with a hardening agent before use. It is usually solvent-thinned, but check the label. It can be applied over non-porous surfaces such as glass and tile, but will not adhere well to previously painted surfaces.

3.1.5 Urethane and Polyurethane

These are plastic-based paints for use on any porous surface or existing finish. They resist grease, dirt and abrasion, and are extremely durable. Check the label for thinning with solvents. These paints must be carefully applied.

3.2 Paint Applicators

3.2.1 Brushes

3.2.1.1 Types

There are several kinds of paint brushes on the market, but basically they are either natural or synthetic bristle. Natural bristle brushes are made from animal hairs (e.g. hog bristle) and synthetic bristle brushes are usually made of nylon. A good rule of thumb is: use a natural bristle brush with oil-based paints and a synthetic bristle brush in water-thinned paints.

Both types of bristle are flagged, which means that the ends are split or fuzzy. The more flags the better, as they help retain the paint.

To select a good quality brush:

- a. spread the bristles and inspect the tips: the more flags the better;
- b. rap the bristles on a counter: a cheap brush will lose more bristles than a good quality brush; and
- c. check the metal band around the bristles: it should hold the bristles tightly and neatly around the brush and securely to the handle.

Choose the brush for your particular job--150 mm (6 in.) wide for outside walls and masonry 100 mm (4 in.) wide for walls, and 18 mm (3/4 in.), 25 mm (1 in.) or 38 mm (1-1/2 in.) round, bevelled or flat for trim and sash. Choose the handle for your particular job: beaver tail to grip a wide brush in the palm of your hand, pencil or flat to allow greater finger tip control, or kaiser to allow good control and easy grip. See Figure 3-1.

The size and style of brush are affected by the area to be painted and the type of paint: Calcimine brushes with long, tough, elastic bristles are best for applying water-thinned paints to large areas. Flat and chisel-shaped brushes allow smoother flow and prevent lap marks when used with alkyd paints or lacquers. For rough stucco and masonry, use a brush 100-150 mm (4-6 in.) wide with very tough fibre or nylon bristles. See Figure 3-1.

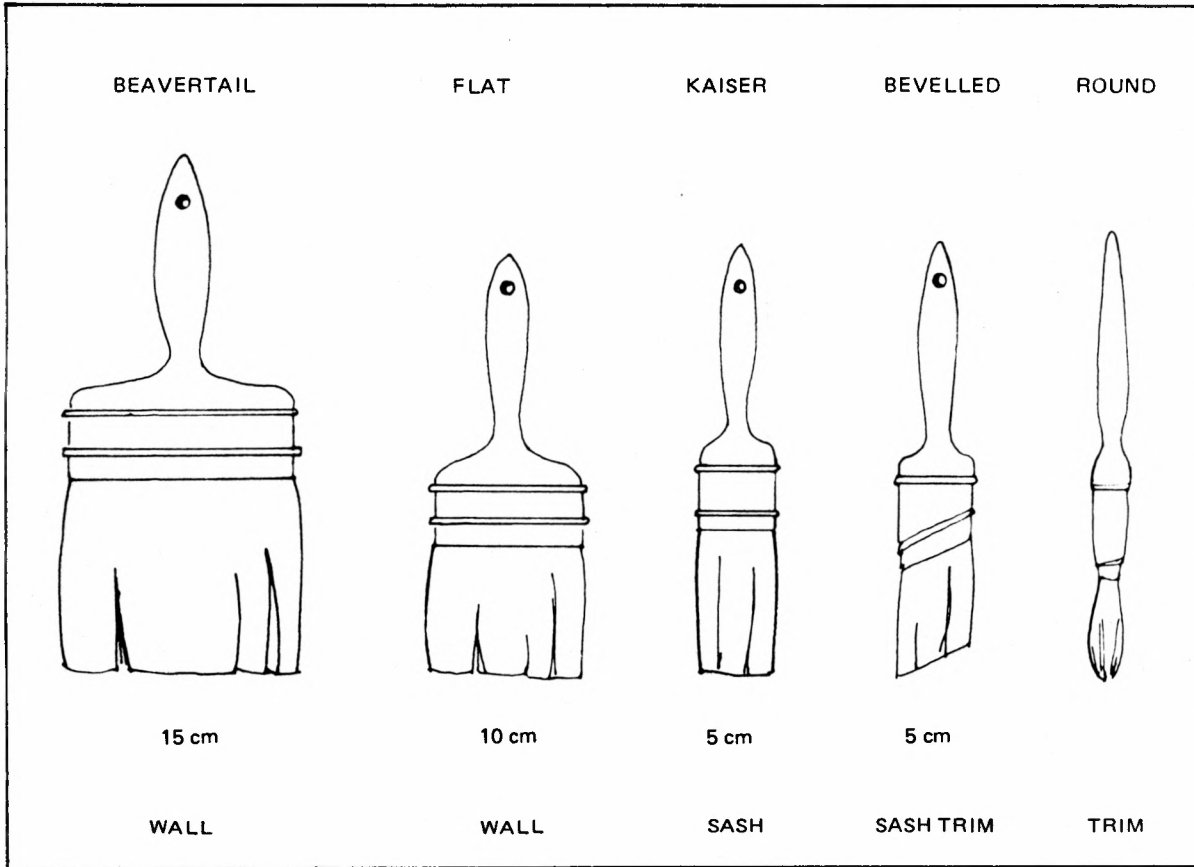


FIG. 3-1 PAINTBRUSH TYPES

3.2.1.2 Tips for Use

- a. Before you use a brush for the first time, rap it against the edge of a table or counter a few times. This removes loose bristles.
- b. Work the bristles against a rough surface, such as brick, to soften the flags.
- c. Soak a natural bristle brush in a solvent for 24 hours to condition it.
- d. Remove any stray or bent bristles.
- e. When painting, dip the brush one-third of the way into the paint. Hold it there briefly to let the bristles soak up the paint.
- f. Squeeze excess paint from the bristles by pressing them lightly against the side of the container as you remove the brush.
- g. Hold small brushes with the thumb and index finger.
- h. For larger brushes use the palm grip.
- i. If work is interrupted for a short period, hang the brush in the paint so that the bristles are covered.
- j. For longer interruptions, wrap the brush in tin foil or plastic and store it in the freezer.

- k. Clean the brush by stroking the paint out onto a newspaper. Cut any paint with the appropriate thinner, wash the brush in soap and water, shape the bristles, let the brush dry, and wrap it in a paper towel.

3.2.2 Rollers

3.2.2.1 Types

Once you learn to use a roller properly, it can save you a lot of time when painting.

There are many different-shaped rollers--those for flat areas vary from 4 in. to 18 in. wide and special trim rollers are v-shaped, cone-shaped and donut-shaped in order to paint inside corners, around door and window casings and moulding.

The type of roller cover you use is determined by the type of paint you use:

- a. lamb's wool, for solvent-thinned paint such as latex or alkyd. Do not use with enamel.
- b. mohair, for enamel, varnish and gloss finishes, and with any flat paint which produces a smooth finish.
- c. dynel, acetate and polyurethane, for all paints. Most covers list the type of paint the roller cover may be used with on the label. The length of the nap on the roller can vary substantially [i.e., from 1.5 mm (1/16 in.) to 40 mm (1 1/2 in.)]. Long naps are used for rough surfaces, short naps for smooth surfaces. A design can be left on the surface

as the paint is rolled on. A stippling cover is used to do this. Be sure not to overlap the previous roller strokes as they will show up in the end product.

3.2.2.2 Tips for Use

- a. Load the roller cover with paint by rolling paint at the shallow end of the roller tray.
- b. Do not work the roller too quickly, as paint will be thrown off.
- c. When painting a wall, first paint the corners with a brush, then use the roller for the main areas. Do not try to paint every inch of wall or ceiling with a roller.
- d. Rollers tend to slide when too much pressure is used. Sliding makes tracks in the paint, so be careful.
- e. When using a roller on raised panel doors, paint the recesses first, then finish the flush surfaces.
- f. Clean the roller as soon as possible after use. Roll all the excess paint onto an old newspaper, then take the roller cover off the handle and wash it in the appropriate thinner. Work the nap to get all the paint out. Wring the excess liquid out and dry it on a clean cloth. Wrap the cover in foil or plastic to keep it clean.

3.2.3 Paint Pads

3.2.3.1 General Remarks

Paint pads are a fairly recent innovation. They consist of a plastic foam or carpet-like material in a holder. You can use paint pads in the same places you would use rollers or brushes, but they are particularly good on fences, screening, and wall covers.

3.2.3.2 Tips for Use

Use pads as you use rollers. Clean the pad by squeezing as much paint as possible out onto a newspaper. Remove the pad from the handle and wash it out in the appropriate thinner or solvent. When most of the paint has been removed, wash the pad in soap and water, rinse well, squeeze out all the water, and leave it to dry. Wrap the pad in foil or plastic to keep it clean.

3.3 Preparing the Surface for Painting

3.3.1 General Remarks

Preparing the surface for painting is just as important as actually doing the painting. Proper preparation means a better, professional-looking and longer-lasting paint surface.

3.3.2 Interior Surfaces

- a. Check walls and ceilings for hairline cracks, runs, or ridges in the old paint. Sand any runs or ridges smooth and fill any cracks with wall filler, then sand when dry.

- b. Check all woodwork at windows, doors, and baseboards and fill cracks with wall filler or wood putty. Sand any runs that you find.
- c. Wash or dust ceilings and walls thoroughly. Be sure tops of baseboards, windows, and doors are clean.
- d. Wash the woodwork, walls, and ceiling in bathrooms and kitchens with soap and water.
- e. Allow the surfaces to dry thoroughly. Use sandpaper to feather the edges of any chips in the paint.
- f. Prime any bare spots with a primer appropriate to the surface and the paint you intend to use.
- g. Reset any nails that have popped or let go, then fill and sand the nail holes.
- h. Remove the hardware from doors and windows and the cover plates from electrical switches and receptacles, and loosen any lighting fixtures or cover them with plastic bags.
- i. Sand the rust from any metal surfaces and prime the surface.
- j. You can paint over clean sound wallpaper, but it is best to strip it.

3.3.3 Exterior Surfaces

- a. Use a wire brush to remove all dirt and scaling paint. Use a scraper to remove blistered or flaking paint.

- b. Smooth or feather the edges of paint blisters with sandpaper. Brush all particles of dust away.
- c. Reset any loose or popped nails. Drive them in below the surface, then fill and sand the nail holes.
- d. Nail loose boards in place.
- e. Remove all cracked or loose putty and caulking, prime the surface, and apply new putty and caulking.
- f. Seal all open joints at doors and windows and around chimneys with caulking compound.
- g. Wash the walls with clean water and if necessary a very mild detergent. Make sure the detergent is thoroughly rinsed off and let the wall dry completely.
- h. Remove any outdoor lights or cover them with plastic bags.
- i. Remove other electrical hardware, letter boxes, name plates, and house numbers.
- j. Remove screen doors, window screens, and shutters. Paint these separately.
- k. Apply a primer to any bare spots. The primer should be compatible with the surface and type of paint.
- l. Knots are resinous and will "bleed" through paint unless they are sealed. Aluminum paint, shellac, and vinyl sealer are good knot sealers.

3.4 Getting Ready for Painting and Cleaning Up Afterwards

Painting can be a long drawn-out affair without proper planning. A few minutes spent before you begin can cut the total time by an hour or more depending on the size of the job. Here are a few tips to make the job easier and save time:

- a. There are different paints especially designed for different locations (outdoor walls, outside trim, living room walls, kitchens, bathrooms, porches, floors, and rusty metal surfaces). Take time to read labels and select the right paint. For example, never apply a masonry paint on interior trim just because it happens to be left over. Most interior paints will weather quickly if used outdoors.
- b. If you plan to paint a rough surface such as concrete block, stucco, brickwork or circular block, be sure to apply an emulsion type block filler. This will save you a lot of paint as it prevents the paint from being sucked into the porous surface.
- c. Always prime-coat unpainted iron and wood before applying the finish coat.
- d. Use dropcloths to cover anything you don't want paint on--furniture, carpet, flowerbeds, shrubs, counters, appliances, etc. Fireplaces, concrete, and brickwork especially should be covered as they soak up paint splatters and are almost impossible to clean.

CAUTION: Plastic dropcloths are slippery on certain surfaces, tape them in place to prevent an accident.

- e. Before painting a room, remove all rugs, drapes, and small pieces of furniture. A better, faster job can be done if there is a lot of room to move around.
- f. Rub a hand lotion on your hands before you start; paint will be easier to clean off later.
- g. Open the can with a screwdriver. Pry up at several points around the rim rather than at one spot. The latter bends the lid and causes an air leak when the lid is replaced.
- h. To mix paint, first pour half into a clean, empty can. Stir each half thoroughly. Pour the paint back and forth until the contents of both cans are of equal consistency. Never paint or mix from a full can.
- i. Paint should have the consistency of cream. Use thinners recommended by the manufacturer and printed on the label. Add a few drops at a time so the paint does not accidentally become too thin.
- j. When painting indoors, keep the windows open to speed drying and to get rid of harmful vapours.
- k. Use a piece of cardboard to protect surfaces you do not want to paint, such as brick, carpet, trim, etc. Move it as the painting progresses.

- l. Put masking tape down if you want to paint a straight line or protect an edge, but remove it when paint is tacky, otherwise it will be hard to remove.

- m. Clean up spills or spatters immediately. To clean up spills of water-thinned paints, use warm water, soap, and a soft cloth to remove the paint. If the paint is solvent-thinned, use the proper thinner (usually mineral spirits) and a soft cloth to clean up spills. Wash the area later with soap and water.

- n. If a freshly painted wall is scuffed, wait four weeks before you wash the scuff marks. The paint may be dry, but it has not cured.

- o. Move window sashes up and down three or four times when the paint is drying to keep them from sticking.

- p. Chip off dried paint drops with a scraper or putty knife.

- q. use a razor blade scraper to trim paint from window panes.

- r. If a small amount of paint is left over, keep it in an air-tight jar. If a larger amount is left, keep it in the original container.

- s. All paints (except water-based paints), oils and thinners are flammable and can cause fires and explosions. Paint-soaked rags can flare up spontaneously. Do not throw them in a corner. Instead, store them in a metal container until you can throw them away. Never store paint near an open flame.

- t. Store paint in a cool, dry place where the can will not rust.

3.5 Painting Various Surfaces

When painting a house or room, there are sequences to follow that make the overall job easier. Follow these tips to ease your work:

3.5.1 Exterior

- a. Paint surfaces in this order:
 - (1) gables and dormers;
 - (2) shingles;
 - (3) siding;
 - (4) window and door trim;
 - (5) decks and porches; and
 - (6) screens, shutters, storm windows and doors.
- b. Put the proper primer on all bare spots and surfaces.
- c. Paint large surfaces first.
- d. Start at the top, working all the way across a wall, then do a lower section all the way across.
- e. Paint during spring or fall when the leaves are off the trees and the sun is not strong.
- f. Start painting on a portion of wall that has just become shaded and stay in the shade when painting around your home.

3.5.2 Interior

- a. Paint surfaces in this order:
- (1) ceilings,
 - (2) walls,
 - (3) window and door trim,
 - (4) doors,
 - (5) baseboards,
 - (6) built-in cabinet trim, and
 - (7) floors
- b. Put the proper primer on all bare spots and surfaces.
- c. Paint large surfaces first.
- d. When using a latex paint and rollers, brush a narrow strip around the perimeter of the work and then fill in the framed area.
- e. When using an alkyd paint, work along the narrowest dimension so that you are always working with a wet edge of paint. Try not to work with a strip more than two feet wide--dried edges show lap marks.
- f. When using a gloss or semi-gloss paint, apply paint in vertical strokes to sections .6 m x 1 m (2 ft. x 3 ft.) Paint these sections in sequence from top to bottom, moving across the wall. See Figure 3-2.
- g. Work from confined areas to open areas around windows.

- h. Brush out sags and runs immediately.
- i. When painting flush doors, start at the top and work downward.
- j. When painting panel doors, paint panels first then follow with rails and stiles. See Figure 3-3.
- k. When painting casement windows, paint muntins (vertical bars) first, then follow with horizontal bars, rails, sill and frame. See Figure 3-4.
- l. When painting double hung windows, paint meeting rail first, then follow with the muntins, horizontal bars, the upper and lower sash, sill and frame. See Figure 3-5.
- m. Begin painting cabinets at their least accessible points and work outwards. Do inside edges first, then outside edges.

3.6 The Proper and Safe Way to Use a Ladder

- a. Avoid using a makeshift ladder nailed together with boards and other materials at hand.
- b. Never place a ladder in front of a closed door: it may be opened when there is someone on the ladder.
- c. Non-slip feet on a ladder may become slippery on a newly waxed floor.
- d. Make sure the ladder is on firm, level ground before you climb it.
- e. Keep the rungs and your shoes free from oil, grease, mud, snow and ice.

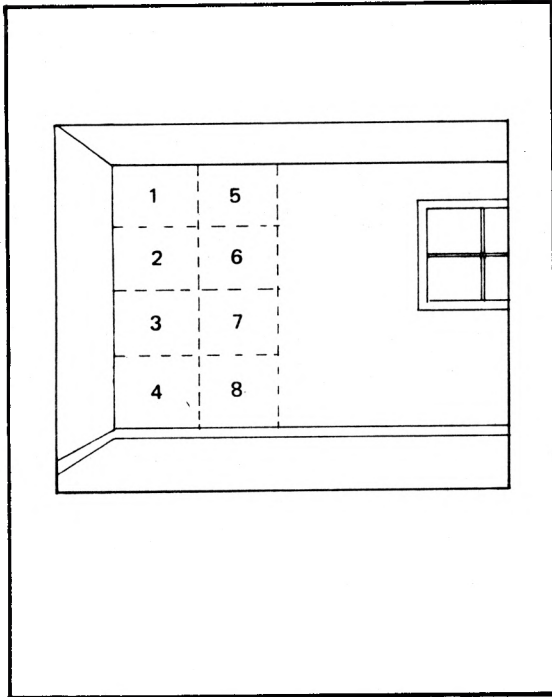


FIG. 3-2 PAINTING .6m X 1.0m (2ft X 3ft) SECTIONS WHEN USING A GLOSS OR SEMI-GLOSS PAINT. NUMBERS INDICATE PAINTING SEQUENCE OF SECTIONS: FROM TOP TO BOTTOM MOVING ACROSS THE WALL.

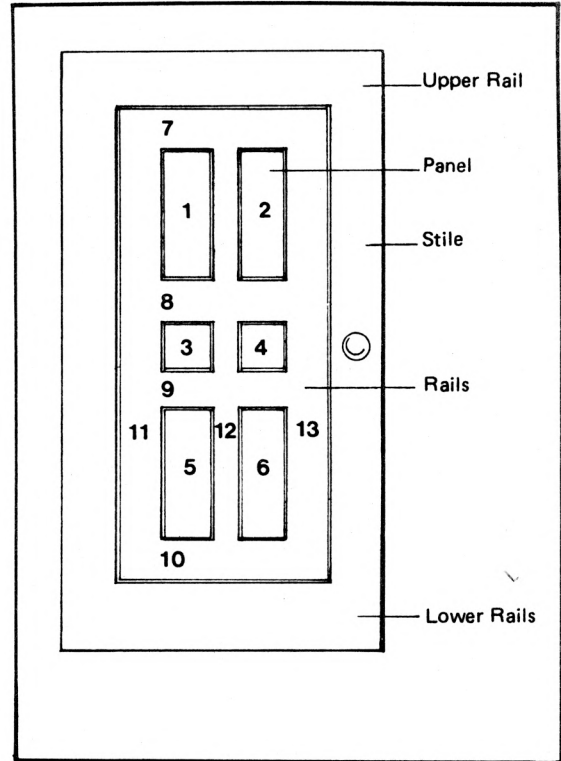


FIG. 3-3 SEQUENCE IN PAINTING PANEL DOORS

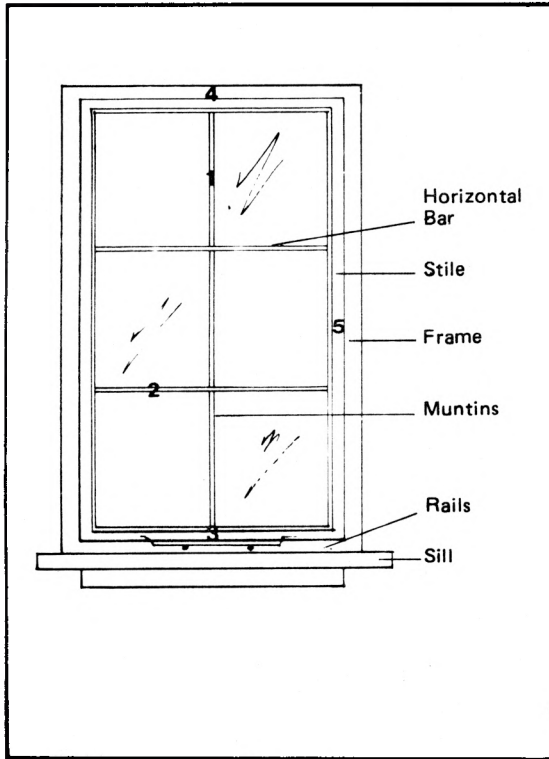


FIG. 3-4 SEQUENCE IN PAINTING CASEMENT WINDOWS

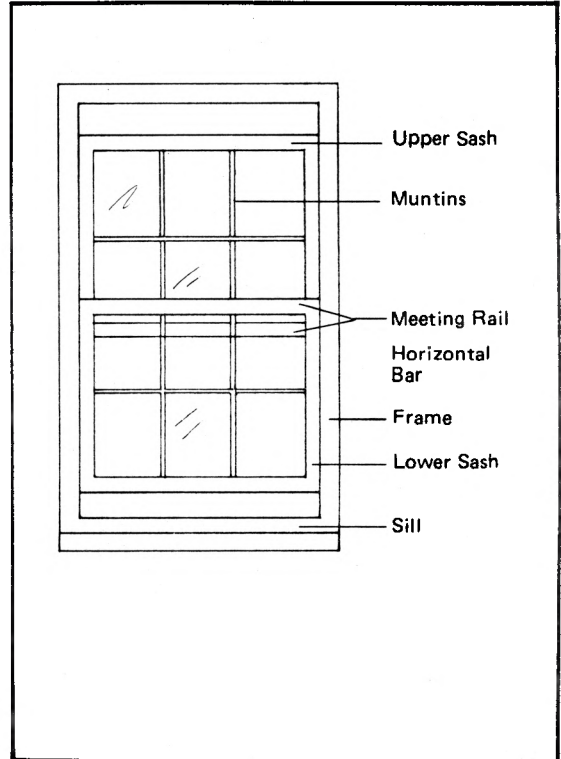
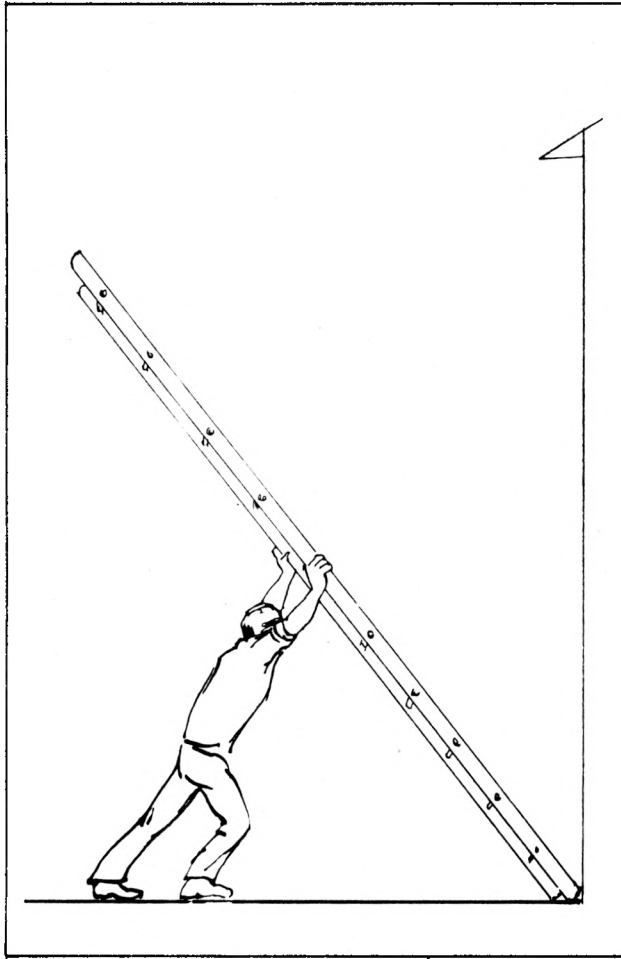
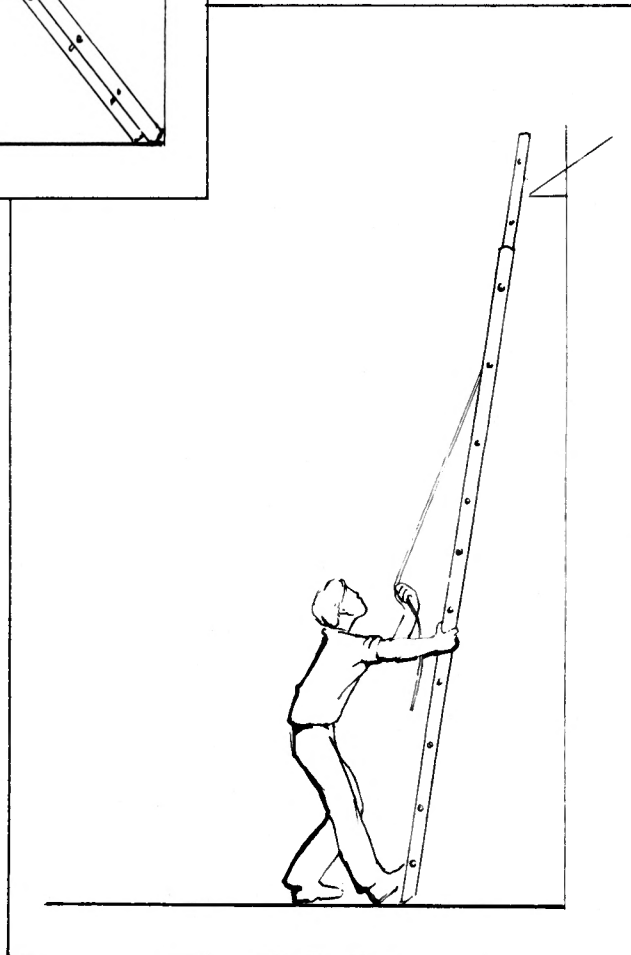


FIG. 3-5 SEQUENCE IN PAINTING DOUBLE HUNG WINDOWS

- f. Wear hard-soled shoes on a ladder: runners are very slippery when wet.
- g. If you are working at any great height, have a helper hold the bottom of the ladder to prevent it from slipping.
- h. Never climb over the top of the ladder onto a roof: Be sure the ladder extends 1 m above the roof's edge.
- i. Always secure the top of the ladder in place with rope or wire.
- j. Keep your hips between the rails of the ladder, and reach out only a comfortable distance, never stretch.
- k. Do not use aluminum ladders when doing electrical work or repairs.
- l. To raise an extension ladder alone, brace one end against a house and position yourself at the other end. Holding the end of the ladder above your head, raise the ladder rung by rung as you walk toward the house until it leans against the house. Adjust the bottom out from the wall. Then use the rope to adjust it to the proper height. See Figure 3-6.
- m. Use an extension ladder properly. An 11 m (36-ft.) ladder should have at least a 1 m (3-ft.) overlap--more if you are robust.



**FIG. 3-6 RAISING AN EXTENSION
LADDER BY YOURSELF**



4.0 PLUMBING

4.1 Emergencies

Leaks and clogged drains in the plumbing system should be attended to immediately. A neglected leak can change a minor plumbing problem into a costly structural problem. Remedies are relatively simple and usually inexpensive.

The first step in any plumbing repair is to shut off the water supply to the break. Most plumbing systems provide a number of shut-off valves throughout the system, and they are usually located just underneath the fixture. Generally the water supply to the whole house can be shut off next to the water meter. Be sure you know how to shut off the water to the house so you can do it quickly when the need arises. See Figures 4-1 to 4-4.

Emergency repairs can range from stop-gaps while waiting for the plumber to major projects that will last a lifetime. All leaks, major or minor, should be repaired immediately to prevent damage to plaster, wallpaper, and ceiling tiles and to eliminate hazards.

4.2 Repairing Leaks Temporarily

The following are different methods of making a temporary repair.

4.2.1 Taping

- a. Shut off the water supply to the leaking pipe.
- b. Dry the pipe completely with a cloth.

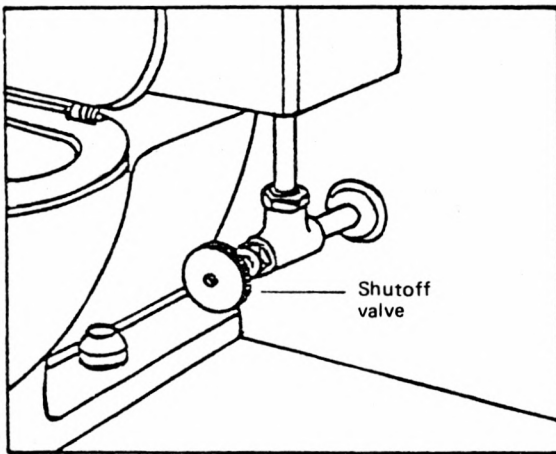


FIG. 4-1 SHUT-OFF VALVE AT WATER CLOSET

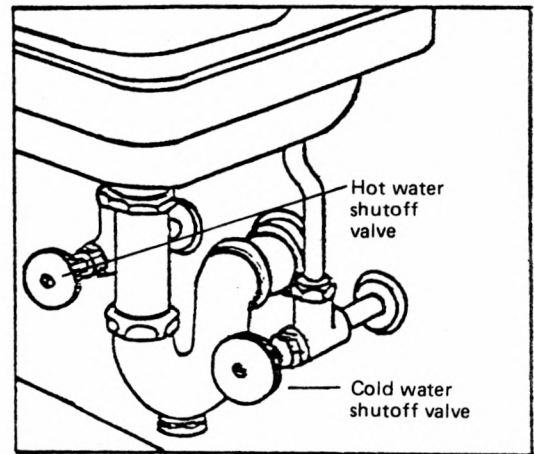


FIG. 4-2 SHUT-OFF VALVE AT BASIN

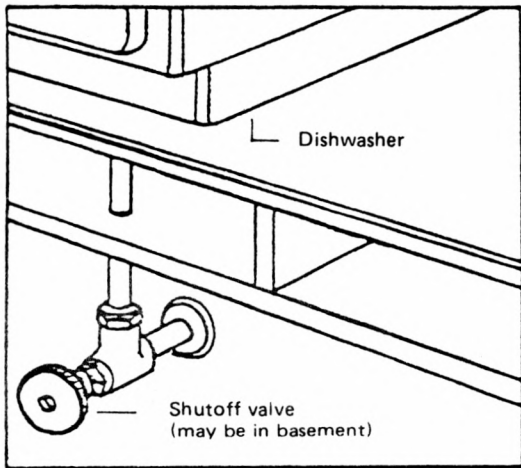


FIG. 4-3 SHUT-OFF VALVE AT APPLIANCE

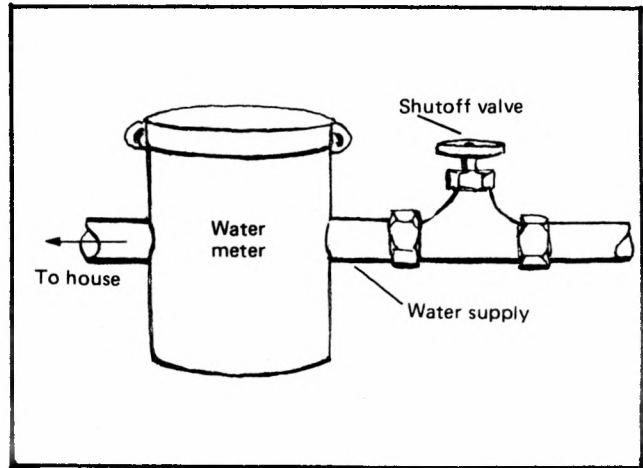


FIG. 4-4 SHUT-OFF VALVE FOR HOUSE LOCATED AT METER

- c. Wrap plastic electrical tape tightly around the pipe, overlapping each turn with half the next turn. Apply tape 75 mm (3 in.) on each side of the leak and wrap until the leak is covered with three layers of tape. See Figure 4-5.

4.2.2 Hose Clamp and Rubber

- a. Shut off the water supply to the leaking pipe.
- b. Dry the pipe with a cloth.
- c. Cut a piece of rubber large enough to cover the leak (use an old bicycle inner tube, rubber glove, or bicycle tire repair kit).
- d. Place the rubber over the leak and tighten a hose clamp over the rubber. See Figure 4-6.

4.2.3 Clamp, Wood Block, and Rubber

- a. Shut off the water supply to the leaking pipe.
- b. Dry the pipe with a cloth.
- c. Cut a piece of rubber large enough to cover the leak (use an old bicycle inner tube, rubber glove, or bicycle tire repair kit).
- d. Place the rubber over the leak. Cover with the wood block, and tighten in place with a C-Clamp. See Figure 4-7.

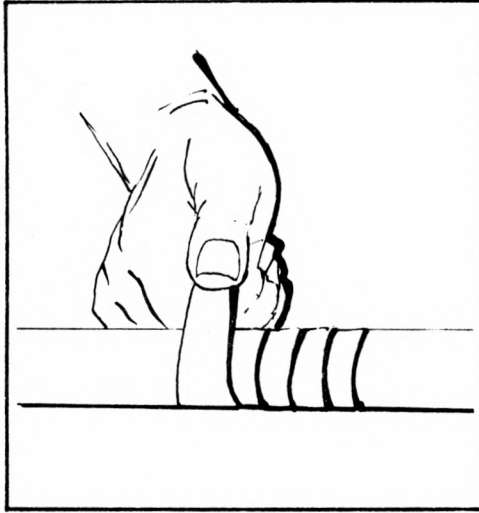


FIG. 4-5 TAPING A LEAK

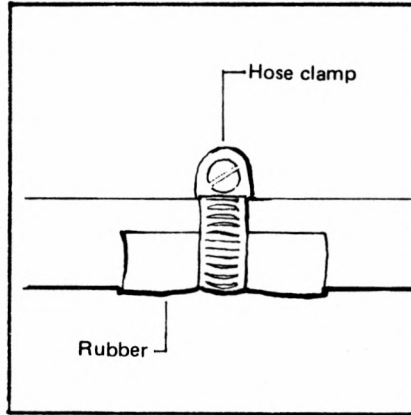


FIG. 4-6 HOSE CLAMP & RUBBER TO STOP LEAK

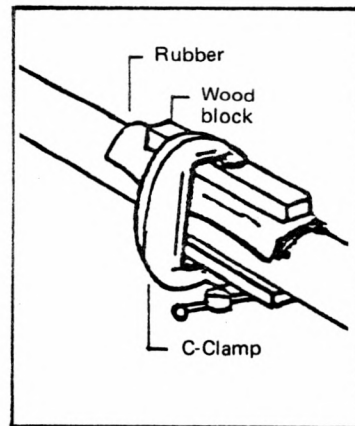


FIG. 4-7 CLAMP, WOOD BLOCK AND RUBBER TO STOP LEAK

4.3 Making Joints in Copper Tubing

4.3.1 Compression Fittings

Only flexible copper tubing can be used to make a compression fitting.

- a. Cut the flexible tubing to the proper length and as square as possible, using a hack-saw or tube cutter. Approximately 13 mm (1/2 in.) of tubing will be inside the fitting when completed.
- b. Remove any burrs from the cut end, but do not clean the outside of the pipe with sandpaper.
- c. Slide the nut onto the tube followed by the levelled compression ring (sometimes called a "furl").
- d. Place the end of the tubing into the fitting and tighten the nut to the fitting.
- e. After assembly, test the joints under pressure. If they leak, tighten the nut carefully before unscrewing the joint. See Figure 4-8.

4.3.2 Flare Fittings

Only flexible copper tubing can be used to make a flare fitting.

- a. Cut the flexible tubing to the proper length and as square as possible, using a hack-saw or tube cutter.
- b. Remove any burrs from the cut end, using a knife or tube cutter reamer. Removing the burrs ensures a watertight joint.
- c. Slip the flare nut onto the tube.
- d. Using a flaring tool and hammer, carefully tap the flaring tool into the end of the tube.

- e. Slide the nut onto the flared end and tighten it to the flare fitting.
- f. Test the joint under pressure. If it leaks, try tightening the nut further before taking the joint apart. See Figure 4-9.

4.3.3 Sweat Fitting (Soldered)

Soldered fittings can be used on either flexible or rigid type copper tubing.

- a. Cut the tubing to the proper length and as square as possible using a hack saw or tube cutter.
- b. burrs from the cut end using a knife or tube cutter reamer. This ensures a watertight joint.
- c. Surfaces to be joined should be smooth, clean and shiny. Use a piece of fine sandpaper or steel wool to polish the inside of the fitting and the outside of the pipe. Do not use a file as it will scar the pipe. Be sure the pipe is clean before proceeding.
- d. Apply a layer of paste-type soldering flux to the inside of the fitting and the outside of the copper tube. Do not use acid as a pipe soldering flux.
- e. Insert the pipe into the fitting as far as it can be pushed and give the pipe one complete turn to spread the flux evenly over the contact surfaces.
- f. Adjust the direction of the fitting.

FIG. 4-8 MAKING A COMPRESSION FITTING

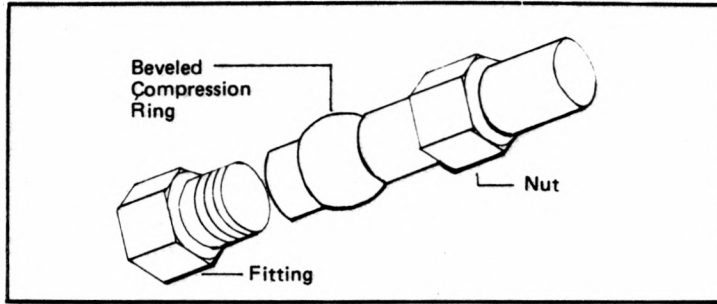
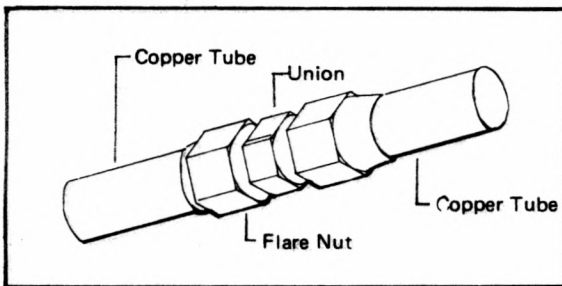
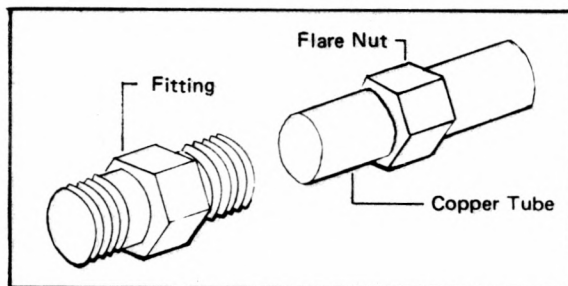


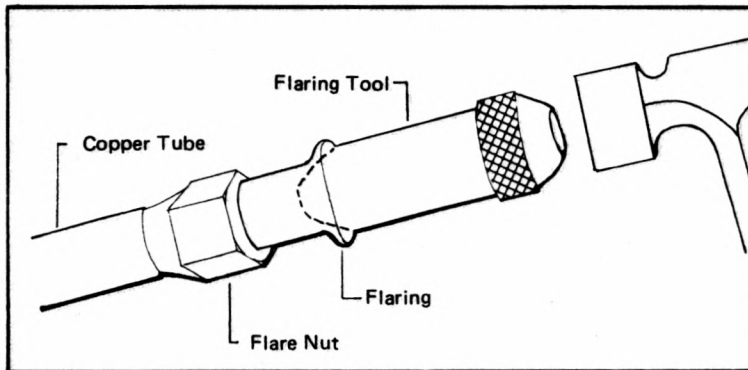
FIG. 4-9 SEQUENCE IN MAKING A FLARE FITTING



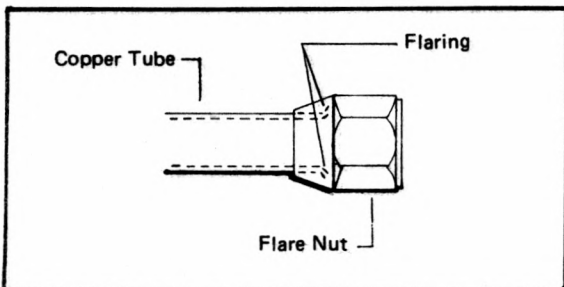
4-9.1 CUT COPPER TUBING AS STRAIGHT AS POSSIBLE



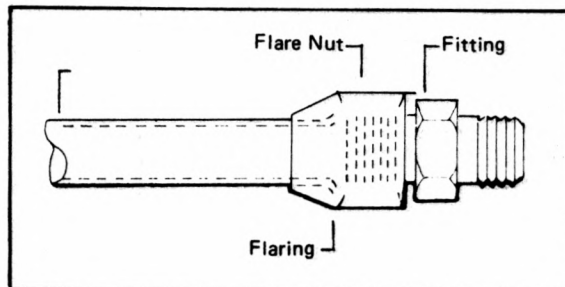
4-9.2 SLIP FLARE NUT ONTO PIPE



4-9.3 USE HAMMER & FLARING TOOL TO FLARE PIPE END



4-9.4 SLIP FLARE NUT BACK TO PIPE END TO TEST IF FLARE IS SUFFICIENT

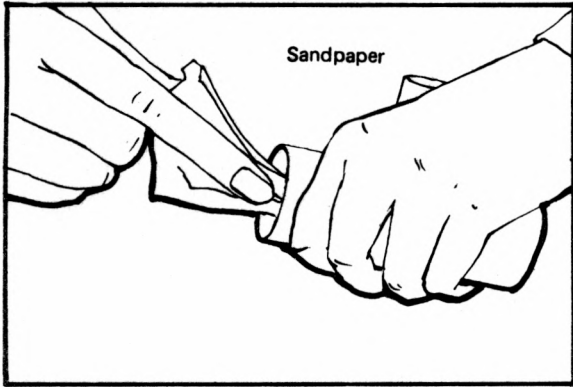


4-9.5 USE TWO WRENCHES TO CONNECT FLARE NUT TO FITTING

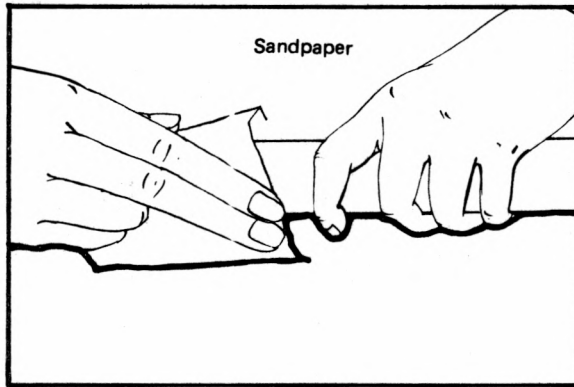
- g. Heat the fitting with a propane torch. Do not overheat the fitting or the solder will not flow properly.
- h. When the joint is hot enough, touch it with 50/50 solid-core solder. Touch the fitting with solder at one point only: it will melt and flow into the fitting by capillary action. Apply the solder until a narrow band appears all around the fitting. Use approximately 25 mm (1 in.) of solder from the coil for each joint.
- i. To put in a long section of pipe with several joints or bends, cut and put the pieces together first, then solder them all in one process.
- j. If you are going to make a solder joint to a fitting that already has other soldered joints, wrap a wet cloth around the finished joints to prevent them from melting and coming apart. See Figure 4-10.

CAUTION:

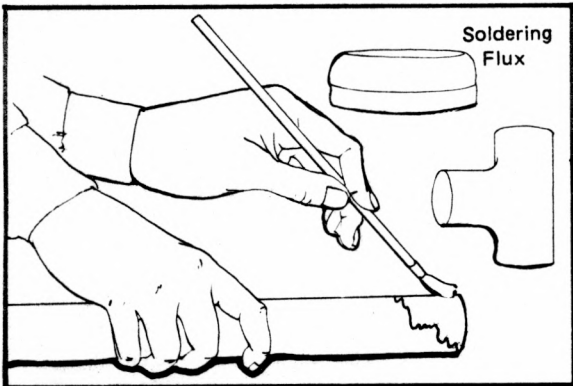
When using a propane torch near wood or other combustible material, place a piece of asbestos board, a flattened metal can, or a piece of metal between the combustible materials and the piping that is to be soldered. Always use a flame spreader on the propane torch and have a means of putting a fire out at hand. - either a fire extinguisher, a pail of water, or a damp cloth.



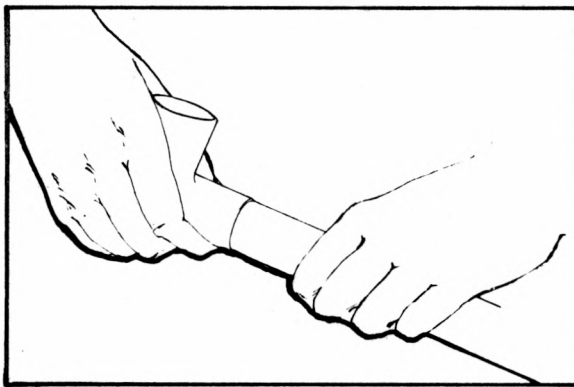
4-10.1 CLEAN INSIDE OF FITTING WITH SANDPAPER, STEEL WOOL OR EMERY CLOTH



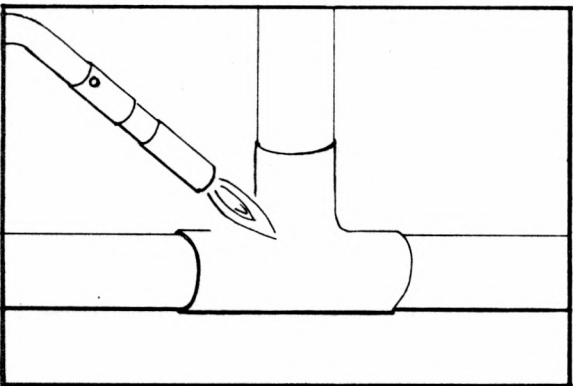
4-10.2 CLEAN OUTSIDE OF PIPE JOINT



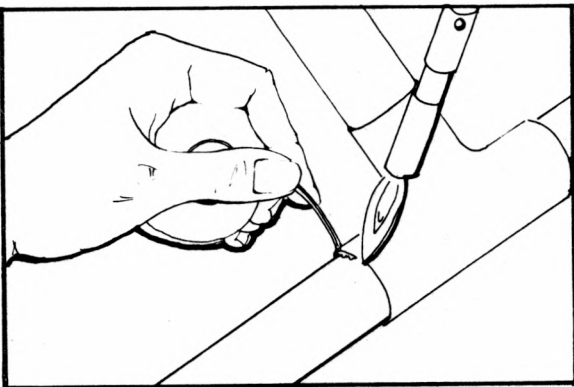
4-10.3 APPLY SOLDERING FLUX TO INSIDE OF FITTING AND OUTSIDE OF PIPE AT JOINT



4-10.4 PLACE FITTING ON PIPE, TWIST, AND ALIGN



4-10.5 HEAT FITTING



4-10.6 APPLY SOLDER

FIG. 4-10 SEQUENCE IN MAKING A SOLDERED PIPE CONNECTION

4.4 Replacing or Repairing Leaking Joints And Pipes

4.4.1 Galvanized Steel Pipe

- a. If the pipe is leaking at a joint, tighten the connection first to try to stop the leak.
- b. If the joint still leaks, unthread it, add joint compound to the male threads, then reassemble the joint.
- c. If the pipe leaks along its run, stop the leak with a temporary patch as detailed in 4.2, then call a plumber. Only experienced persons with specialized equipment should attempt this type of repair.

4.4.2 Compression and Flare Fittings On Flexible Copper Tubing

- a. Should a leak occur with compression or flare fittings, first tighten the connection a bit to stop the leak.
- b. If the joint still leaks, unthread it and disassemble. Cut a small section off the leaking end of the tubing and assemble the joint again as detailed in 4.3.1 and 4.3.2.
- c. If the tubing leaks along its run, unthread both ends and replace the tubing. Details for making compression and flare connections are given in 4.3.1 and 4.3.2.

4.4.3 Sweat Joints on Flexible or Rigid Copper Tubing

- a. Leaks occur at sweat joints due to movement of the pipe or improper soldering. To repair a sweat joint, heat the connection with a propane torch and disassemble it. Clean and prepare the joint, then resolder it as detailed in 4.3.3.

- b. If the leak occurs along the pipe run, remove the leaking section with a hack-saw or tube cutter and replace it with a new section. Instructions for soldering the slip-ring or coupling are detailed in 4.3.3.

4.5 Thawing Frozen Water Pipes

When pipes are frozen in a basement or crawl space, they will gradually thaw when heat is applied. However, in places where there is little ventilation or poor heating, it may be necessary to use one of a few simple methods to speed up the melting process. But be careful, no matter which method you use, always open a faucet nearest the frozen section and work from the faucet to the frozen section. This will ensure that water and steam are allowed to escape from the pipe and are not allowed to build up and burst the pipe.

CAUTION:

Overheating can produce enough pressure to burst the pipe. Never heat a pipe so much that you cannot hold it. Always use a flame spreader with a propane torch.

Several methods of thawing frozen water pipes are:

- a. Wrap rags around the pipe and pour hot water on them.
- b. Heat the pipe slowly with a propane torch (Be sure there is no combustible material touching the pipe that will start a fire).
- c. Blow warm air at the pipe with a hair dryer.
- d. Prop a portable electric heater close to the pipes. See Figure 4-11.

CAUTION:

When using a propane torch near wood or other combustible material, place a piece of asbestos board, a flattened metal can, or a piece of metal between the combustible materials and the piping that is to be soldered. Always use a flame spreader on the propane torch and have a means of putting a fire out at hand. - either a fire extinguisher, a pail of water, or a damp cloth.

There are many other methods that work just as well. Remember it is easier to insulate water pipes than to thaw frozen ones.

4.6 Repairing Faucets

4.6.1 Compression Faucets

Most bathroom or kitchen faucets leak for one reason--the washer is worn. There are normally two parts in a faucet that require replacement, the seat washer and the packing washer or o-ring.

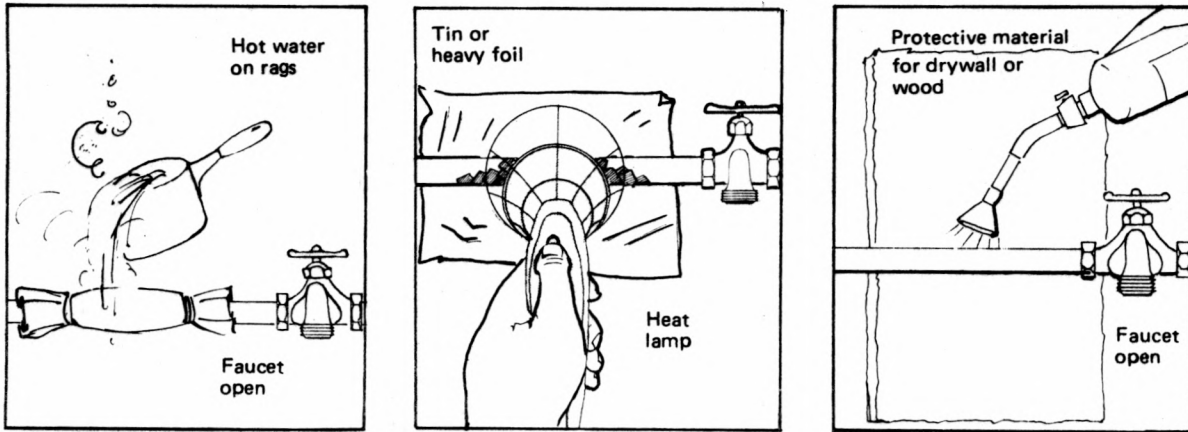


FIG. 4-11 THAWING FROZEN WATER PIPES BY HOT WATER ON RAGS, HEAT LAMP, AND PROPANE TORCH.

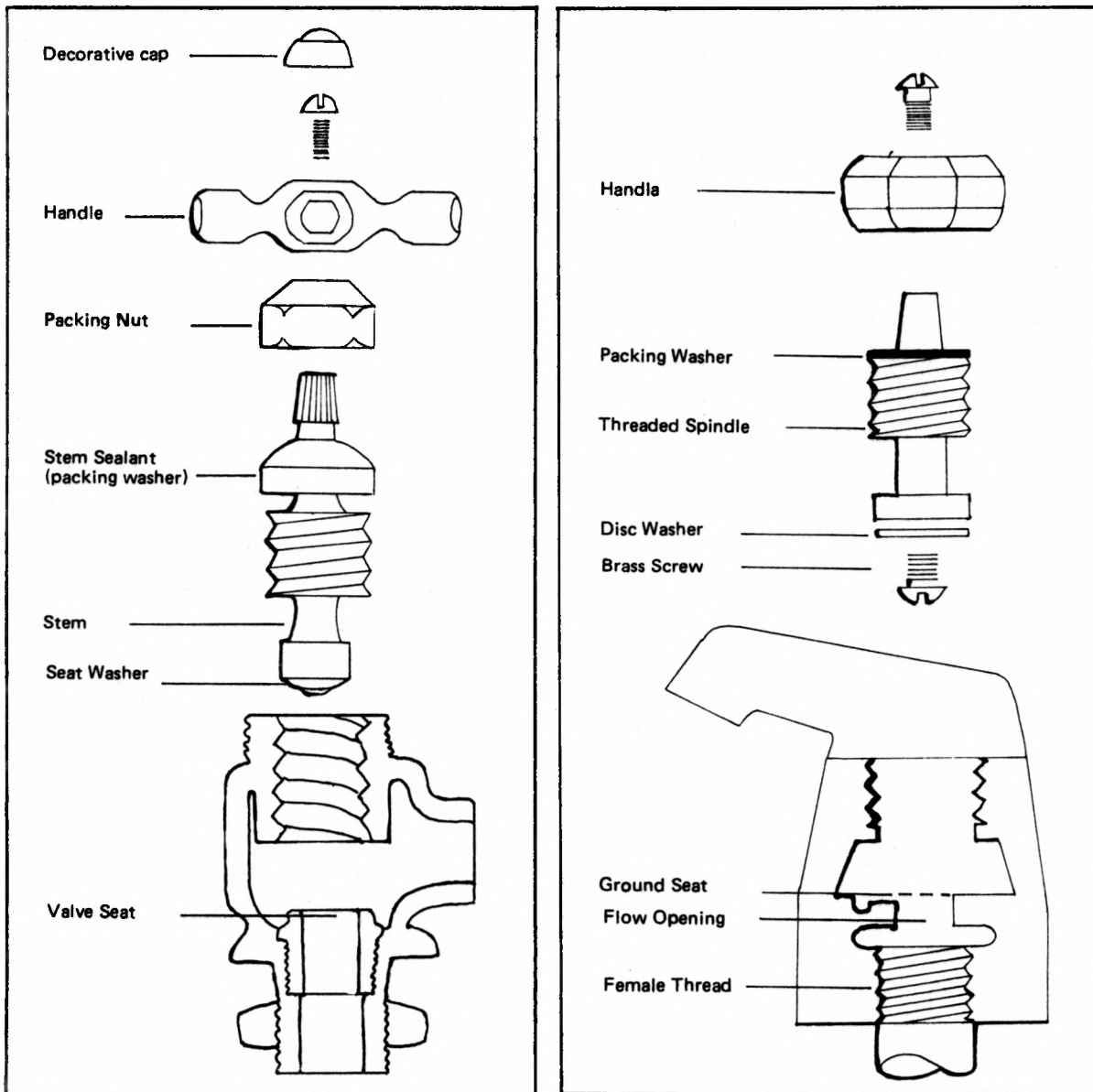


FIG. 4-12 COMPRESSION FAUCETS

If the faucet leaks at the spout, the seat washer is worn or the seat is worn. Follow these steps to solve the problem:

- a. Shut off the water supply to the faucet.
- b. Remove the snap-in or screw-in cap that hides the screw holding the handle in place. See Figure 4-12.
- c. Remove the screw, and take the handle off the faucet.
- d. Unscrew and remove the packing nut with a wrench.
- e. Place the handle back on the stem and unscrew the stem from the faucet housing.
- f. Remove the brass screw at the base of the stem and remove the worn black washer. The worn washer will be uneven and hard. Place the new washer in the holder and use the brass screw to hold it in place. Always use a brass screw to install a washer as other types of metal screws will rust fast and cause other problems.
- g. Assemble the spindle and handle as it was in the beginning.
- h. If the faucet still leaks after the washer is changed, the valve seat should be dressed. An inexpensive seat dressing tool can be purchased at a hardware store. See Figure 4-13.
- i. To use the tool, place the faucet's packing nut over the tool stem and screw the nut back onto the faucet. The tool's cutter should fit onto the valve seat. Turn the handle of the cutter back and forth two or three times with a little downward pressure and flush the grindings away. Replace the stem and handle on the faucet as it was at the start.

FIG. 4-13 SEAT-DRESSING TOOL

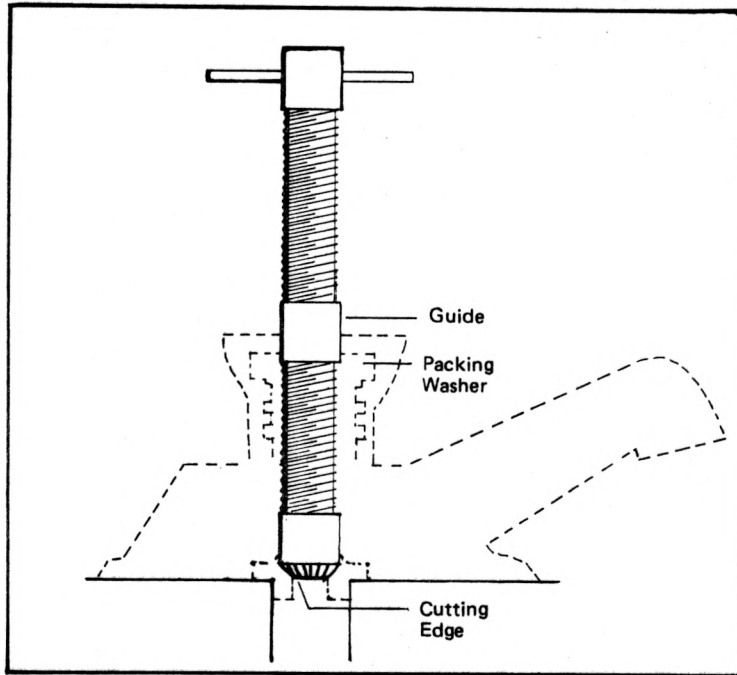
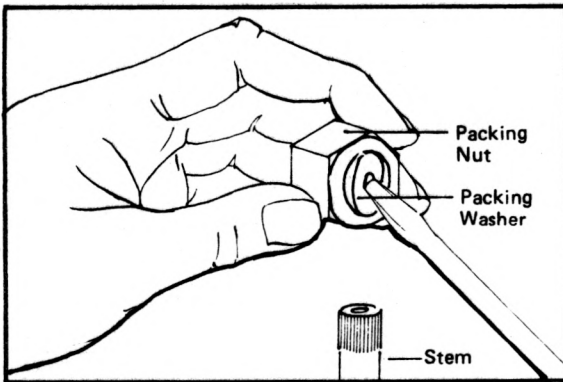
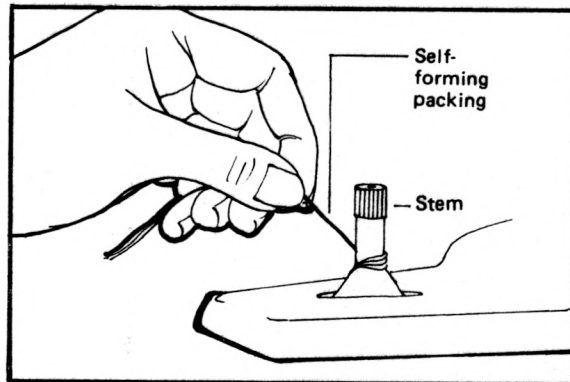


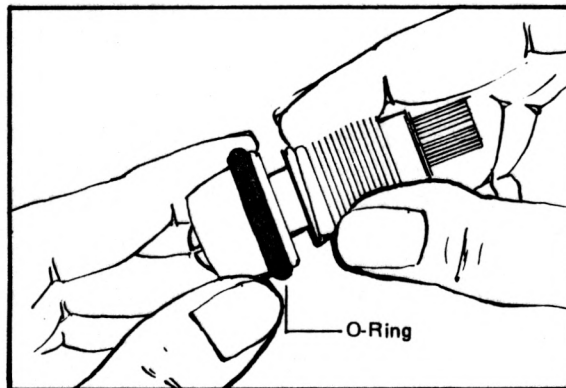
FIG. 4-14 VARIOUS TYPES OF FAUCET WASHERS



4-14.1 FAUCET WITH PACKING WASHER



4-14.2 FAUCET WITH SELF-FORMING PACKING



4-14.3 FAUCET WITH O-RING

j. If the faucet leaks at the handle, the packing washer, self-forcing packing, or o-ring requires replacement. See Figure 4-14. Follow these steps to solve this problem:

- (1) If the faucet has a packing washer, remove the handle as detailed in 4.6.1 and try tightening the packing nut slightly to stop the leak. If this does not work, remove the packing nut, pry out the packing washer, and replace it. Reassemble the faucet.
- (2) If the faucet uses self-forming packing, remove the packing unit and add a few turns of new packing or remove the old packing and replace it with enough packing to more than fill the nut. The packing nut will compress the packing to form a watertight mass.
- (3) If the faucet has o-rings instead of packing or a packing washer, first turn off the water supply to the faucet. Next, remove the stem and replace the rubber o-ring near the base. Be sure the new o-ring is exactly the same size as the old one--some fit the same diameter stems but have varying thicknesses.

4.6.2 Single-lever Faucets

4.6.2.1 General Remarks

There are several types of single lever faucets. The two most common are the hollow ball type on kitchen sinks and the cartridge type on bathtub/shower installations. While each type has its own problems, repairs are simple.

4.6.2.2 Hollow Ball Type

When the spout begins to drip, replace the springs and seats. When the handle leaks, replace the o-rings. Neither job is difficult and it is probably best to do both at the same time, as the repair kit usually contains parts for both operations. Most hardware stores sell kits suitable for standard makes and models of faucets. The make is stamped on the faucet. See Figure 4-15. Here are instructions for both jobs:

- a. Turn off the water supply to the faucet.
- b. Loosen but do not remove the set screw in the front of the handle (use an Allen wrench).
- c. Remove the handle.
- d. Unscrew the cap and remove it. If you are using a wrench or pliers, cover the teeth with masking tape to prevent scoring the chrome finish.
- e. Remove the spout by sliding it sideways and lifting at the same time.
- f. Lift out the ball and two-piece can assembly. Replace the two piece can assembly with parts from the repair kit.
- g. Remove the seats and springs from the socket and replace them with parts from the repair kit.

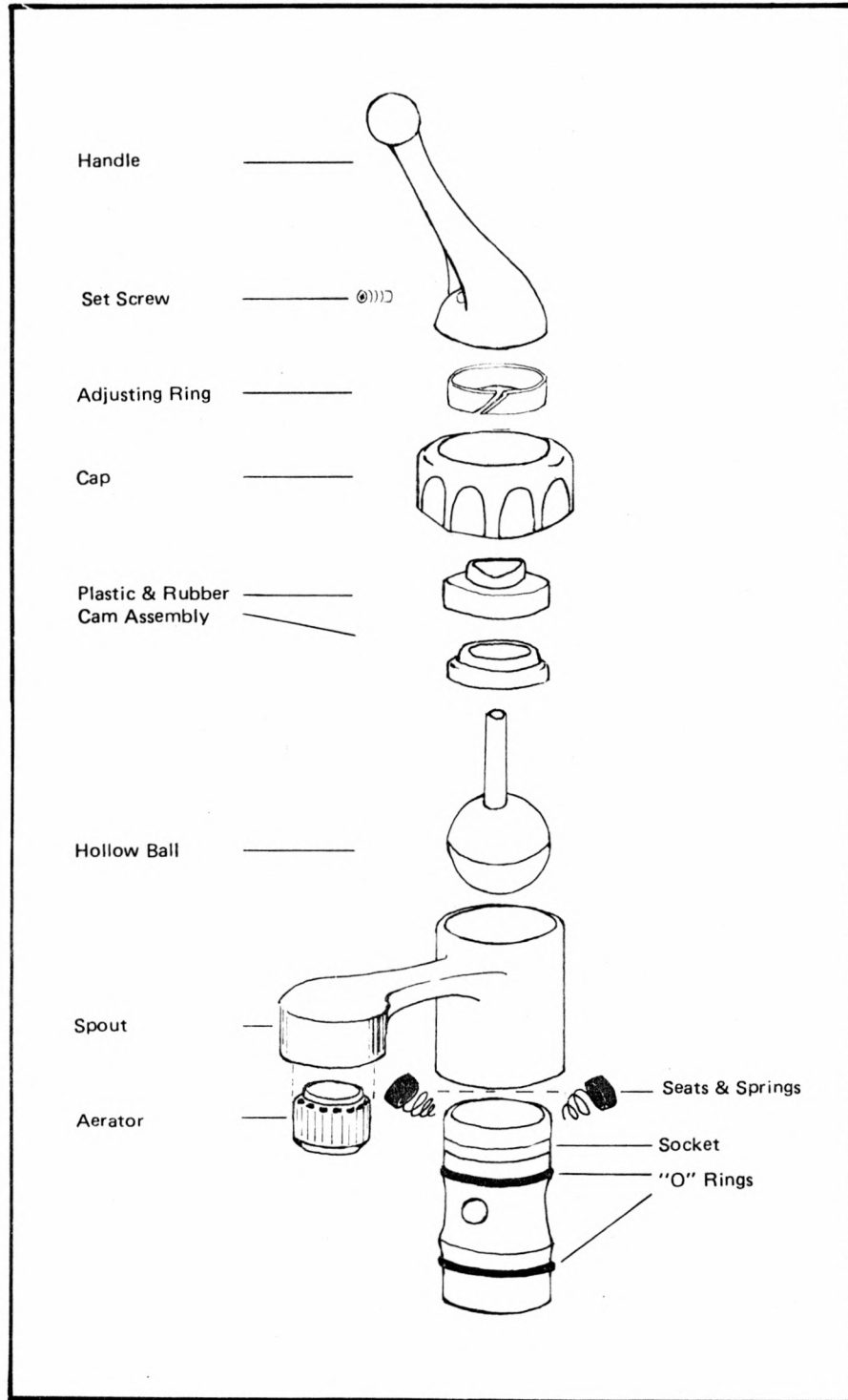


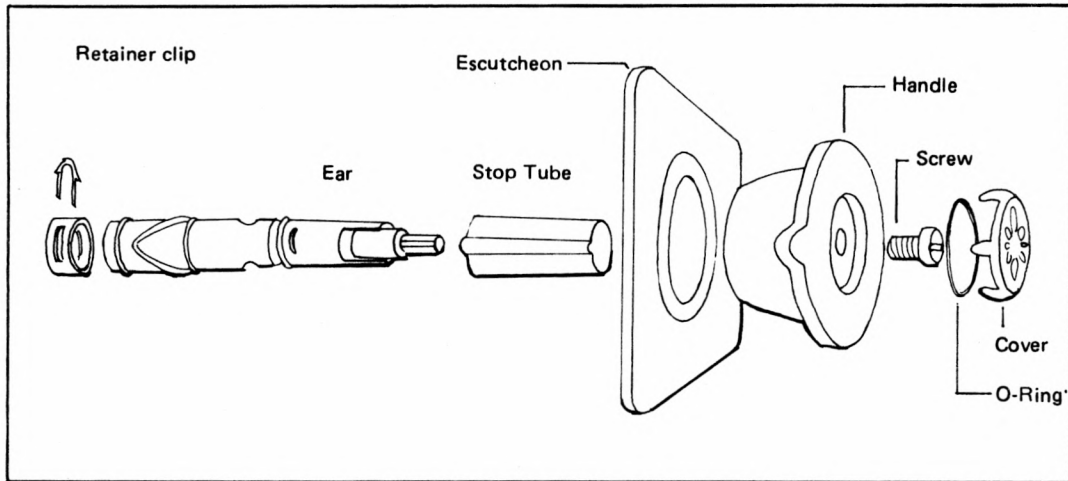
FIG. 4-15 HOLLOW BALL TYPE FAUCET

- h. Remove the two o-rings from the outside of the socket and replace them with parts from the repair kit.
- i. Reassemble the faucet in the reverse order.
- j. unscrew and clean the aerator on the spout.

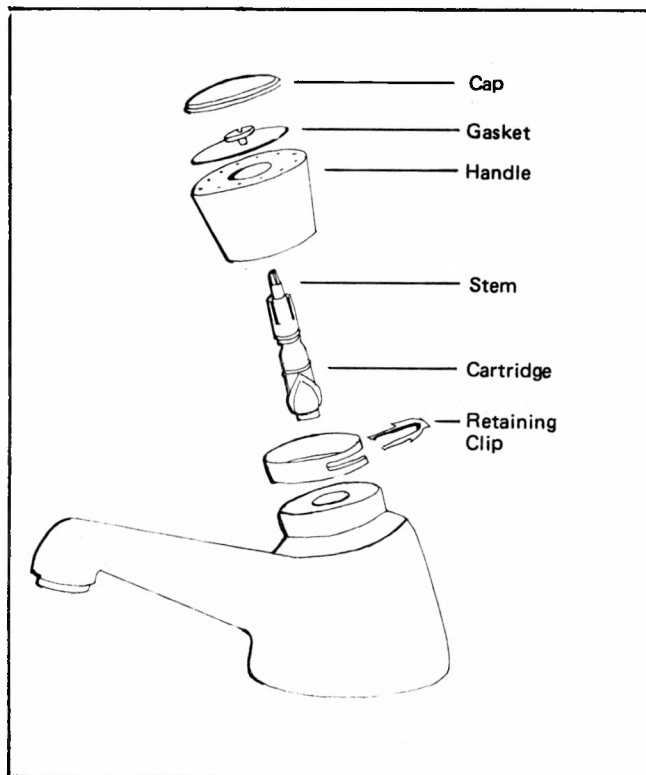
4.6.2.3 Cartridge Type

When this type of faucet leaks, replace the cartridge. As with hollow ball-type faucets, repair kits are available at hardware or plumbing supply stores. See Figure 4-16. Follow these instructions:

- a. Pry off the decorative cap covering the screw which holds the handle in place.
- b. Remove the screw and slide off the handle.
- c. Remove the retaining clip at the base of the handle and slide the cartridge out of its housing.
- d. Place a new cartridge all the way into the housing until the front of the cartridge ears are flush and aligned with the body. Replace the retaining clip so that its legs straddle the cartridge ears and slide into the bottom slots of the faucet housing.
- e. Reassemble the faucet in the reverse order. The red flat on the cartridge stem should be aligned with the points on the handle.



4-16.1 FOR SHOWER INSTALLATION



4-16.2 FOR BASIN INSTALLATIONS

FIG. 4-16 CARTRIDGE TYPE FAUCET

4.6.3 Replacing Faucets

- a. Shut off the water supply to the faucet. See Figure 4-17.
- b. Use a wrench to undo the nut holding the water-pipe in place and also the one holding the faucet to the sink.
- c. Remove the old faucet.
- d. Use compression fittings to connect a length of flexible copper tubing to the new faucet. Place the faucet on the sink and mount it using a nut
- e. Make the connection to the water supply pipe using a compression fitting or a compression/sweat fitting, depending on whether the supply pipe is of rigid or flexible copper tubing. If the water supply pipe is galvanized steel, call a plumber to thread the pipe where it was cut, and to install a dielectric union to prevent premature failure at the fitting.

4.6.4 Adjusting Basin Pop-ups

When the pop-up mechanism in the sink starts to leak or give other trouble, the answer is a simple adjustment: See Figure 4-18.

- a. Remove and clean the stopper.
- b. Clean the team of the flange and check to see if it is damaged.
- c. Replace the stopper and check to see if it seats itself properly.

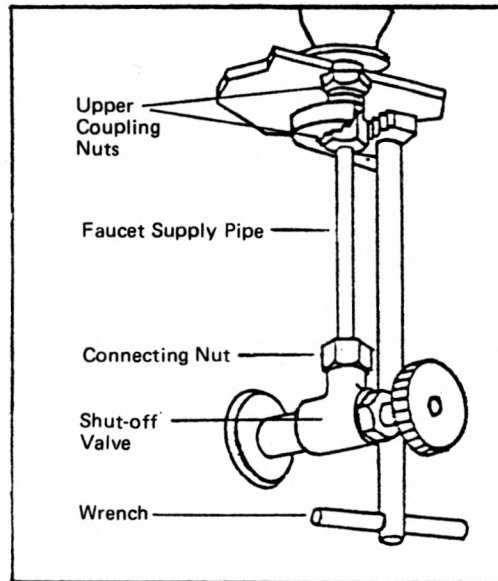


FIG. 4-17 REPLACING A FAUCET

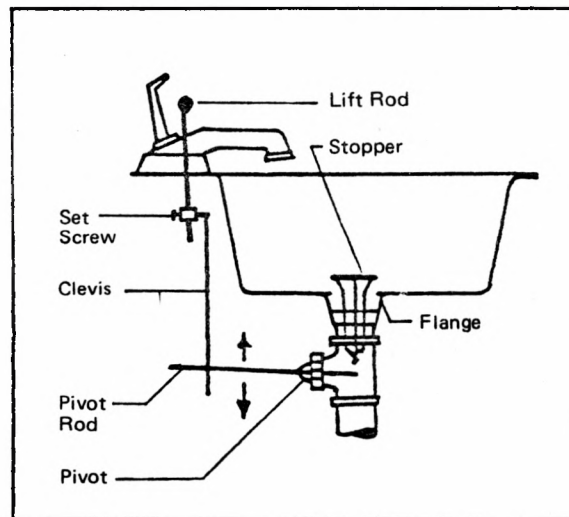


FIG. 4-18 ADJUSTING BASIN POP-UPS

- d. When the lift rod is all the way up, the stopper should be seated properly. Check underneath the basin. The pivot rod should slope slightly upward from the pivot to the clevis. To adjust this, loosen the set screw holding the clevis to the lift rod, push the stopper down hard, and tighten the set screw.
- e. If the basin holds water now but the lift rod doesn't operate as easily as before, adjust the linkage between the pivot and the clevis so they meet at nearly a right angle when the lift rod is up.
- f. If the pivot leaks, try tightening the retaining nut slightly. If that doesn't work, remove the retaining nut and replace any washer or gasket underneath.

4.7 Unclogging Drains

Houses have three different types of drains:

- a. fixture drains - those pipes, including a trap, which drain a particular fixture such as a toilet, bathtub, or sink.
- b. mains drains or building drain - those pipes which take the wastewater from the fixture drain to the outside of the house.
- c. building sewer - that which carries wastewater from the building drain to the septic tank or street sewer.

Normally, if a fixture drain is blocked, only that fixture will not drain. If the main drain is blocked, then all fixtures draining to that pipe will be plugged. And if the building sewer is plugged, then all the pipes in the house will be plugged.

Note: During prolonged cold spells, frost or ice can clog vents at roof outlets. This often causes syphoning of traps beneath sinks, bathtubs or toilets.

4.7.1 Fixture Drains

When dealing with plugged drains, always try the simplest method of unplugging first, that is, start by running hot water down the drain for five minutes if the flow is just a little slow. If the flow does not improve, use a commercial drain cleaner, following the manufacturer's instructions.

CAUTION: If the drain is completely clogged, do not use a commercial drain cleaner. The drain cleaner may not work and if the trap has to be taken apart, you will be working with caustic water which is dangerous to your health.

If the commercial drain cleaner doesn't work, use a plunger. Place the plunger over the sink drain or hole in the toilet and work it vigorously up and down for a few minutes. Sometimes spreading vaseline on the plunger head will give a better seal. Be persistent: sometimes working a plunger for five minutes will save you two hours work later. If the plunger does not work, use a closet auger or snake. The closet auger works its way down into the drain as it is cranked. The

twisting action grabs any obstruction and moves it around or frees it.

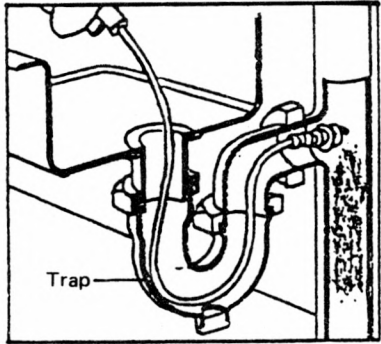
The next step if the drain is still plugged is to dismantle the trap or open the cleanout to clear the obstruction. See Figures 4-19 and 4-20.

After this, if the drain is still plugged, the last step is to call a plumber.

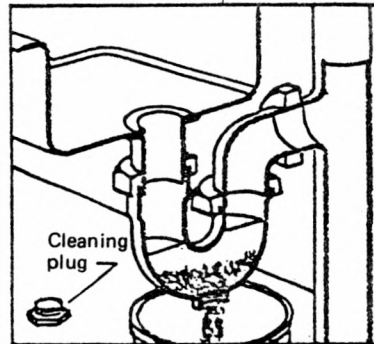
4.7.2 Main Drain or Building Drain

Main drains do not get plugged very often, but when they do, they should be easy to clear. See Figure 4-21. First, find out where all the cleanout plugs are. Start at the one nearest the building sewer and check this pipe out first. If the blockage is not in this section of pipe, work your way to the fixture drains, one section at a time, as follows:

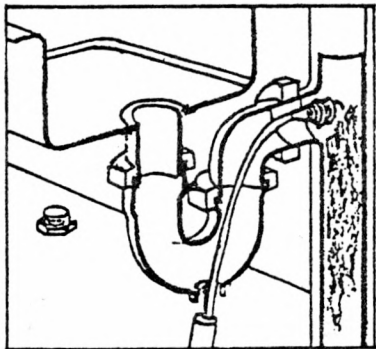
- a. unscrew the cleanout plug;
- b. have an empty pail nearby to catch any backup wastewater if this is the plugged section;
- c. crank a closet auger into the drain towards the building sewer; and
- d. flush the drain with a garden hose when the blockage is cleared.



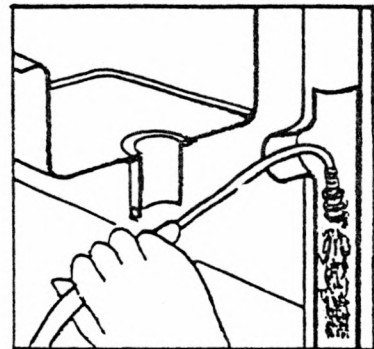
4-19.1 AUGER CLEARING BASIN TRAP



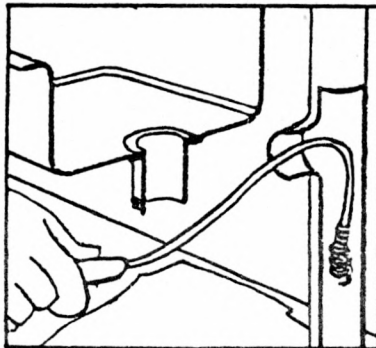
4-19.2 BASIN TRAP CLEARED BY REMOVING CLEANOUT PLUG



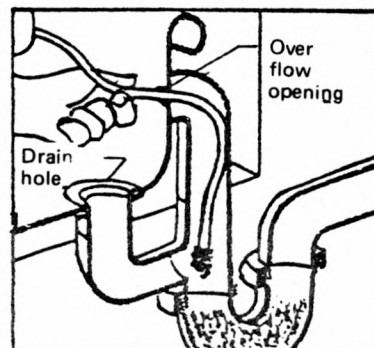
4-19.3 AUGER CLEARING BASIN DRAIN VIA CLEANOUT HOLE



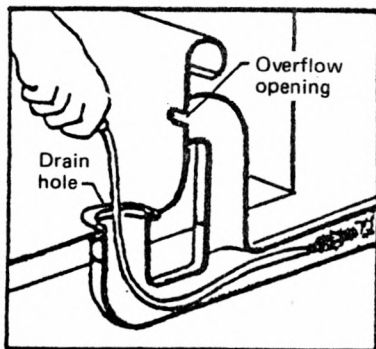
4-19.4 AUGER CLEARING BASIN DRAIN WITH TRAP REMOVED



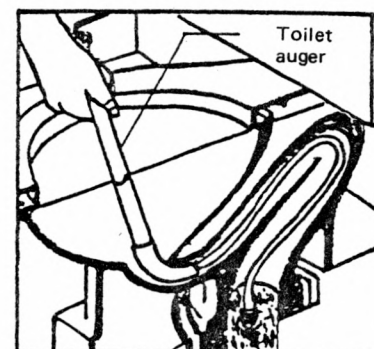
4-19.5 BE SURE TO TWIST AUGER TO FREE DEBRIS OR CLOGGED MATERIAL



4-19.6 AUGER CLEARING BATHTUB DRAIN VIA OVERFLOW OPENING



4-19.7 AUGER CLEARING BATHTUB DRAIN



4-19.8 AUGER CLEARING WATER CLOSET

FIG. 4-19 CLEARING FIXTURE DRAINS

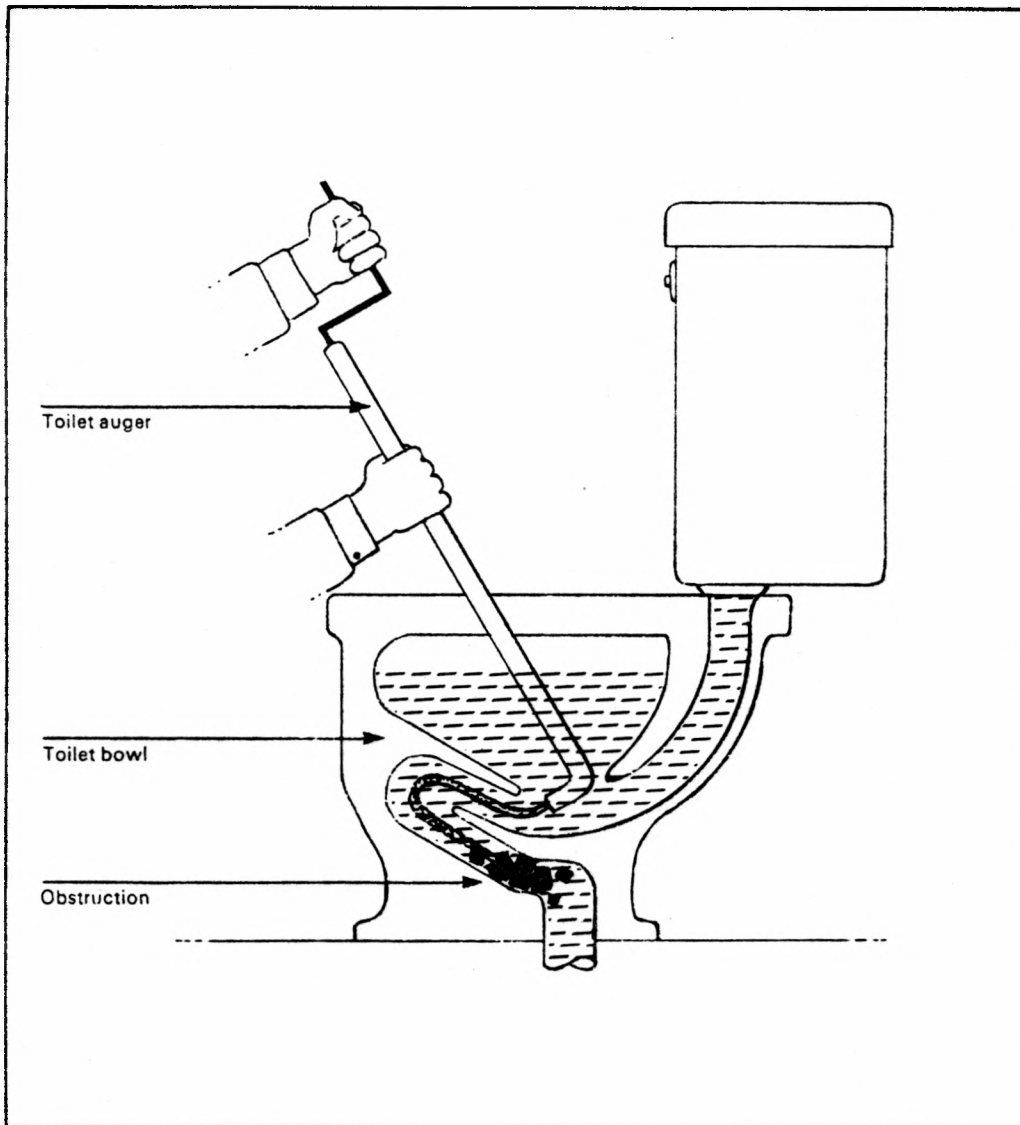
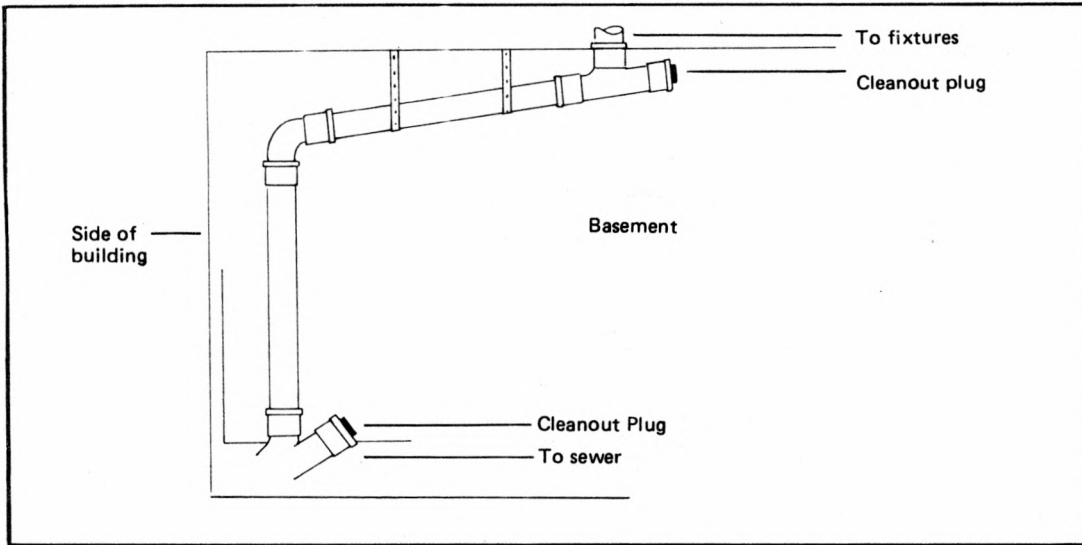
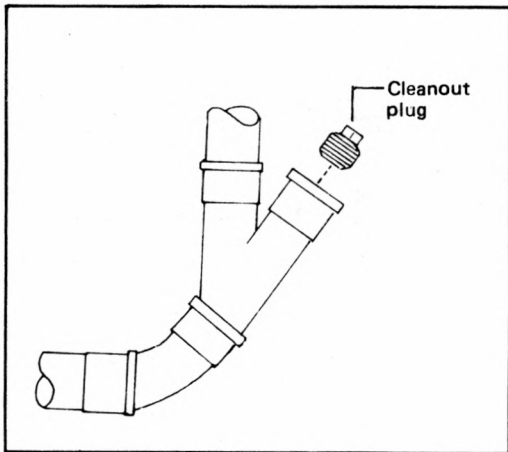


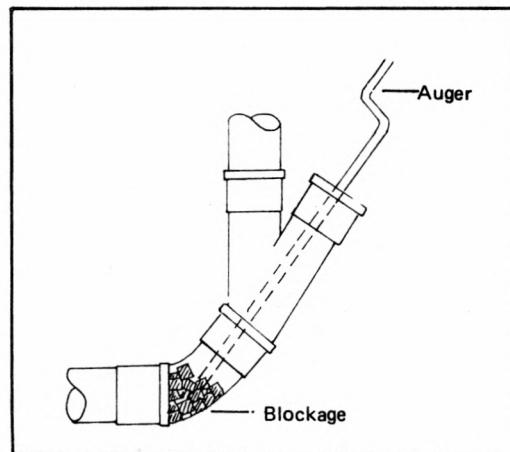
FIG. 4-20 CLEARING BLOCKED TOILET WITH TOILET AUGER



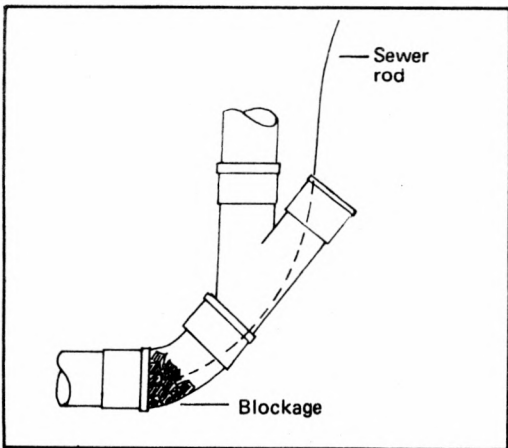
4-21.1 DRAINS TO SEWER



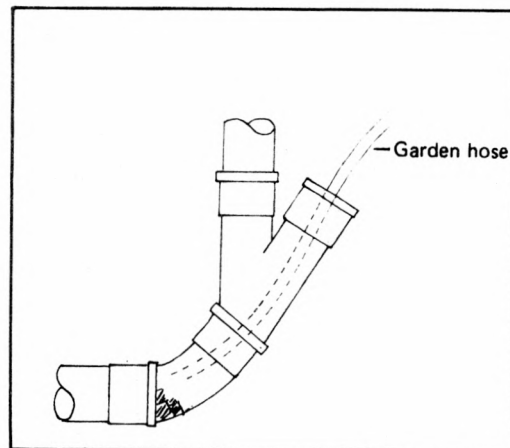
4-21.2 REMOVE CLEANOUT PLUG



4-21.3 CLEAR BLOCKAGE WITH AUGER



4-21.4 CLEAR BLOCKAGE WITH ROD



4-21.5 RUN HOSE TO CLEAR AWAY DEBRIS

FIG. 4-21 CLEARING BUILDING DRAIN

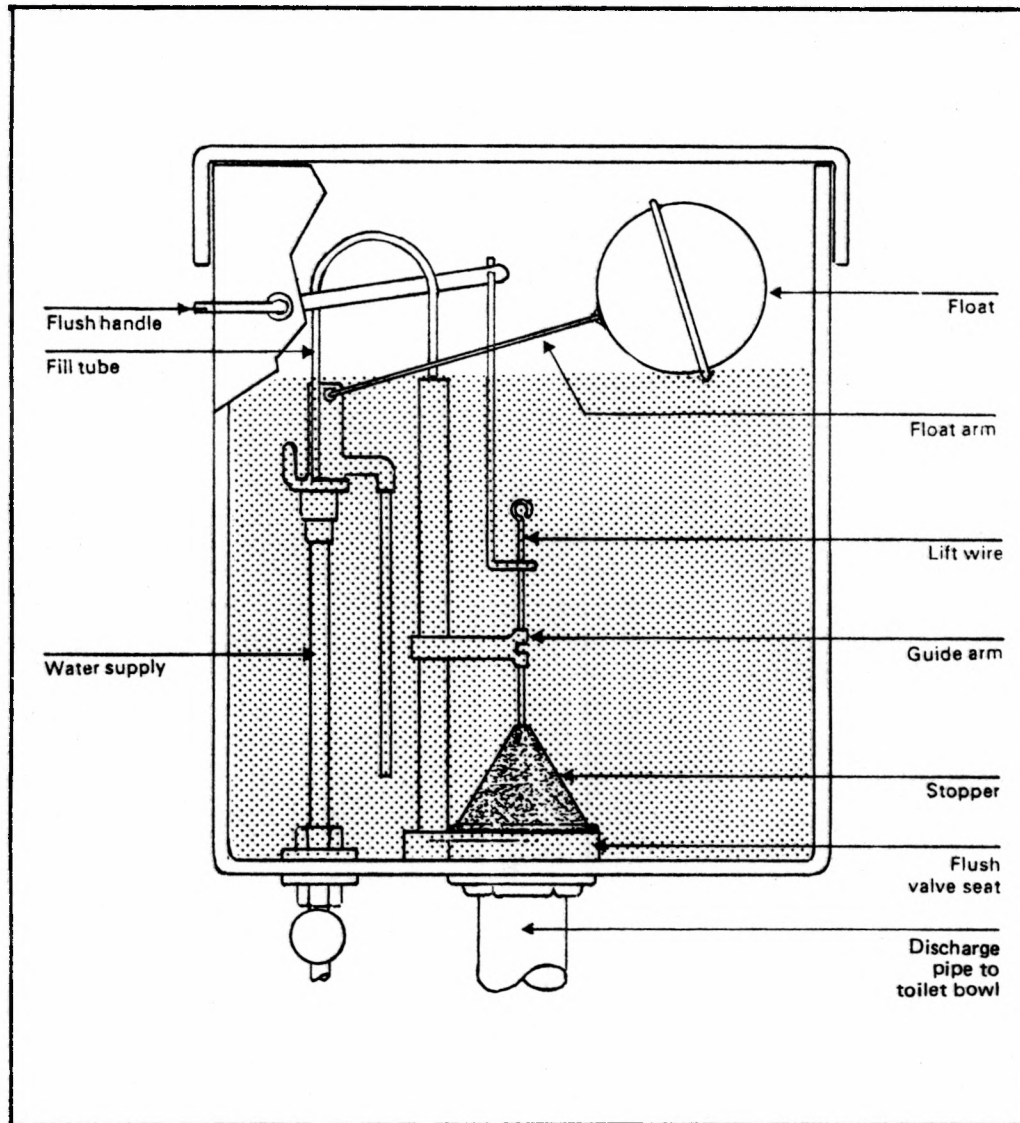


FIG. 4-22 TOILET TANK

4.7.3 Building Sewer

This drain seldom gets plugged because it is the largest. However if it does, remove the cleanout plug nearest the drain and insert a closet auger by twisting and pushing. If this frees the blockage, insert a garden hose into the line and turn it on full for five minutes to wash any debris away.

If the blockage remains, call a plumber. Many times roots from trees penetrate the building sewer and grow in the fertile environment. Copper sulphate prevents root growth. A dosage of not more than a 100 g (1/4 lb.) every three weeks at the cleanout should work.

Note: Use caution in handling this chemical.

4.8 Repairing Flush Tanks

One of the most common problems with a toilet tank is that the lift wire attached to the stopper becomes bent or corroded and sticks in the guide arm. Clean the guide arm and wire with steel wool or fine emery cloth. If the water keeps running out the overflow, adjust the arm linkage so that the float shuts off the supply sooner. Bending the float arm so the float ball is about 13 mm (1/2 in.) lower may correct the fault. See Figure 4-22.

Only half the float ball should be submerged. If it sinks lower, check it for leaks. If the float leaks, remove it from the arm and evaporate the water. As you slowly heat the float, the escaping steam will pinpoint the hole. Then patch the hole

with liquid or lead solder, or silicone sealer. Order a new float then, because the old one could give out at any time.

If the curved fill tube is broken off or is not discharging into the overflow pipe, replace or realign the tube. This tube rinses the bowl after flushing and helps fill the bowl to prevent the entrance of sewer gas into the bathroom.

5.0 ELECTRICAL REPAIRS

5.1 Safety Rules

- a. Always shut off or disconnect power before handling wires, switches, or outlet boxes. If you are in doubt about how to do any job, call an electrician. THE LAW IN SOME PROVINCES AND AREAS PROHIBITS ELECTRICAL WORK FROM BEING DONE BY ANYONE OTHER THAN A CERTIFIED ELECTRICIAN. CHECK BEFORE YOU BEGIN.

- b. Always unplug the appliance or fixture before starting repairs. If it is permanently wired in (stoves, dryers, etc.), remove the fuses or turn the current breakers to the off position. Fuses or circuit breakers are located at electrical panel boards, (or in the case of a stove, on the machine itself).

- c. Certain appliances such as television sets, air conditioners, and air cleaners have components that store electrical charges. That is, even though they are turned off and unplugged, you may still get a shock accidentally. Do not attempt to work on these appliances.

- d. Do not remove or short-circuit any safety devices, even for a test.
- e. Do not use a fork or other metal object to poke into an electrical appliance (toaster, hairdryer, etc.). Always unplug the appliance before trying to free an object.
- f. Buy Canadian Standards Association (CSA) or Underwriter's Laboratories (UL) approved or listed parts/appliances only. Look for the stamp.
- g. If an appliance creates a shock, shut off the power or unplug it immediately. Do not use it or plug it in again until the cause of the short circuit has been determined and eliminated.
- h. When replacing a broken light bulb, check to make sure the power is off and use insulated pliers to remove the bulb socket.
- i. When replacing a burned out bulb, do not handle the bulb with bare fingers. If it is necessary to do so, make sure your hands and feet are dry and touch only the glass of the bulb, never the metal socket. Stand on a dry surface.

5.2 Use of Warrantees, Owner's Manuals, and Service Manuals

Before attempting to repair any electrical appliance, check to see whether it is still on warrantee. Many items have some kind of guarantee, and any repair, however small, may cause it to be voided. It can be particularly frustrating to find that you must pay to have some major repairs done just because you replaced a small part yourself and voided the warrantee. The cost of maintaining the warrantee is built into the purchase price, so why not use the service.

Before sending an appliance to a service centre or trying to repair it yourself, check the owner's manual. Besides providing operating and maintenance instructions, many manufacturers now include a booklet containing information designed to cut down on customer complaints. This is a simple trouble-shooting guide that enables an owner to solve many minor problems associated with particular appliances before calling in service personnel.

Owner's manuals and sometimes service manuals are provided with electrical appliances. They give specific information about the appliance listing operating instructions, maintenance that can be done by the owner, a parts list, names and locations of authorized service and parts depots, and in some cases, instructions for dismantling and assembling the appliance for repairs. These manuals can be invaluable and should be kept safe in a special folder or desk drawer for reference.

Larger stores and manufacturers have their own shops for repairing appliances. However, many times you will find one private shop authorized to repair a variety of different manufacturer's goods. Check the yellow pages and look for the company names or logos in each listing.

When you know that your appliance needs a certain part, check the list of repair or parts depots so you can buy it and replace it yourself if the warrantee is up. This will save you a service charge.

5.3 Grounded Electrical System

The electrical system in your house is grounded. This means there is a wire connecting both the neutral bar and a grounding plug in the main panel to either a metal rod driven into the earth outside your house or to the incoming metallic water supply pipe. See Figures 5-1 to 5-3.

Each circuit or set of wires entering the main panel has one live wire (black or coloured, but never white), one neutral wire (white), and one bare uninsulated equipment ground wire. The neutral wire is connected to the neutral bar in the main panel and thus is grounded. In addition, the bare equipment ground wire is attached to the ground lug in the main panel. At the load end, this wire is connected to the metal parts of the outlet box, receptacle, switch, motor housing, etc., ensuring grounding of the equipment.

5.4 Fuses and Circuit Breakers

5.4.1 General Information

Too much current flowing through a wire can cause the wire to get hot enough to set fire to any nearby materials. Fuses and circuit breakers are used to prevent this from happening.

Circuit breakers are reusable, that is, when there is an overload, they shut themselves off or cause themselves to be shut off. This prevents the current from heating the wires further or fusing electrical parts in appliances. They are easy to use; simply push the switch past the "off" position to "reset" before moving it to "on" for some types. For others, simply push the switch to the "on" position.

Fuses on the other hand have a metal fuse link that melts, thereby causing the power stoppage. Blown fuses must be replaced.

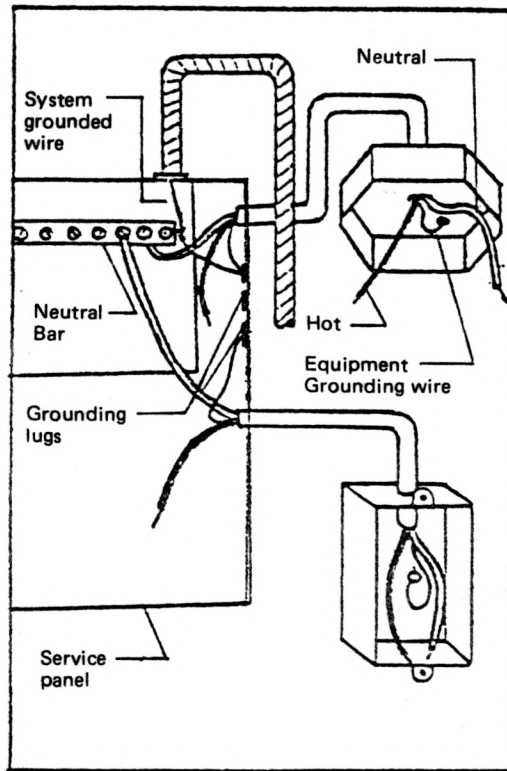


FIG. 5-1 MAIN PANEL CONNECTIONS

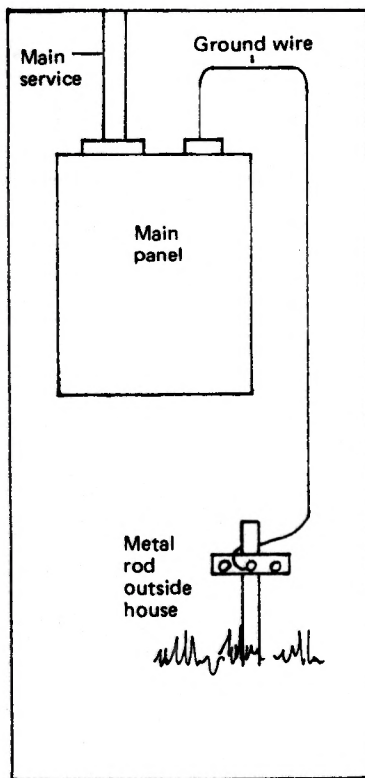


FIG. 5-2 GROUNDING BY USE OF METAL ROD DRIVEN IN GROUND OUTSIDE HOUSE

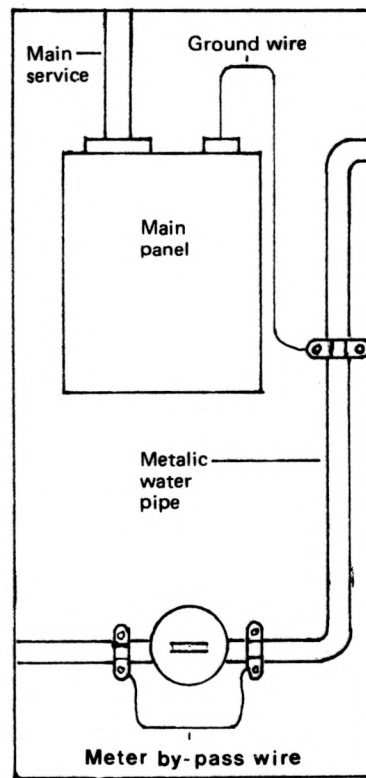


FIG. 5-3 GROUNDING BY CONNECTING TO INCOMING METALLIC WATER PIPE

In both cases, the blown circuit is a sign of trouble and should not be turned on until the problem has been identified and repaired.

DANGER: Never replace a fuse or circuit breaker with one rated for a higher amperage. Never force a circuit breaker to stay on. Never replace a blown fuse with a wad of foil or a penny.

5.4.2 Types of Fuses (see Figure 5-4)

a. The plug fuse has:

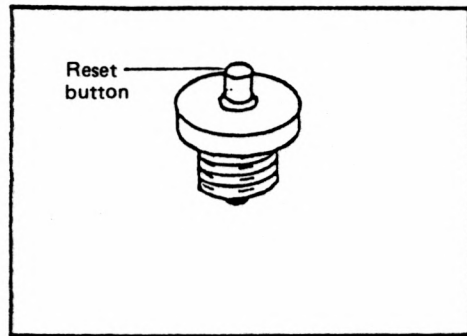
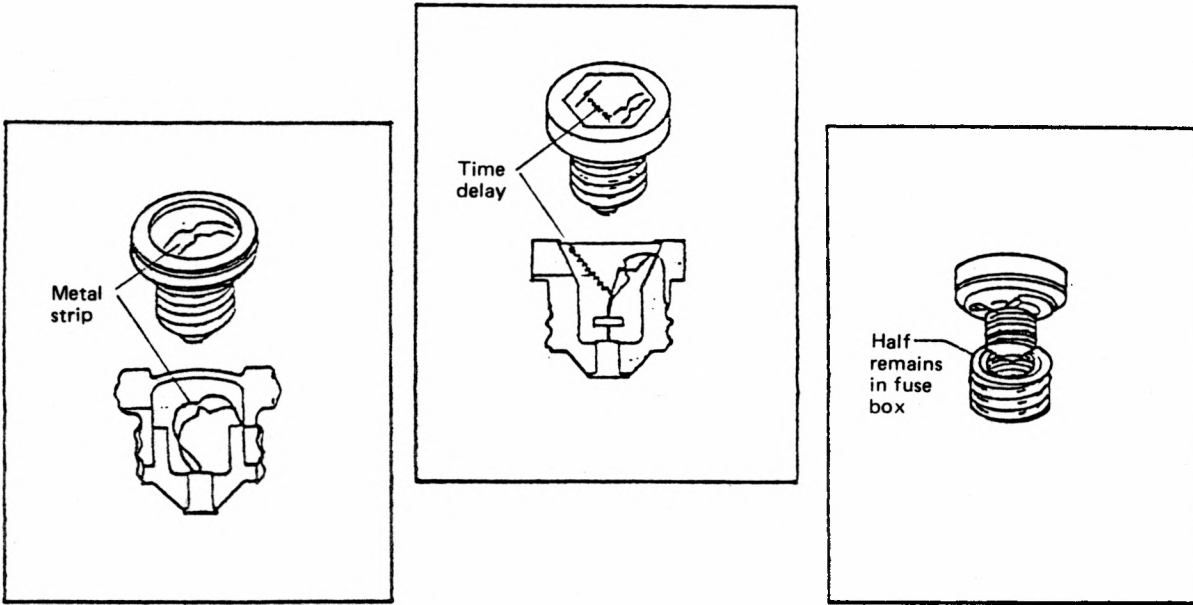
- (1) a base similar to a light bulb;
- (2) a metal strip showing through a mica window at the base; and
- (3) a blackened window or break in the metal link when the fuse has blown.

b. The Fusetron fuse:

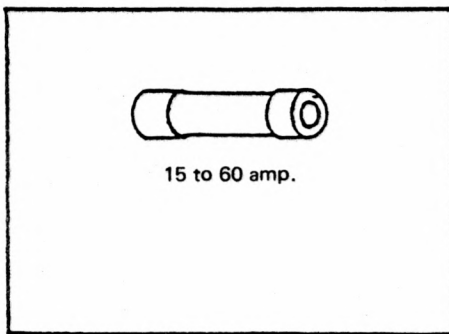
- (1) has a time delay for circuits that overload for just a few seconds;
- (2) blows only for continuous overloads or shorts;
- (3) is similar to the plug fuse except that a spring is attached to a metal link; and
- (4) is used mainly on large appliances and power tool circuits

c. the Type S fuse:

- (1) has a base sized to the ampere rating, and

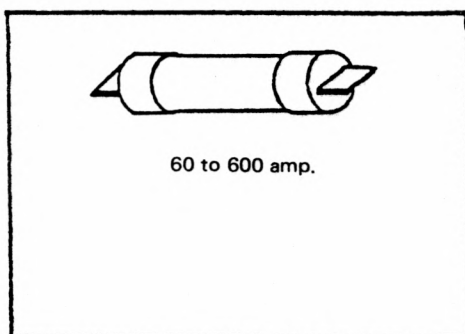


SCREW-IN BREAKER



15 to 60 amp.

FERULE CONTACT CARTRIDGE FUSE



60 to 600 amp.

KNIFE BLADE CONTACT CARTRIDGE FUSE

FIG. 5-4 VARIOUS FUSES

- (2) features an adapter which is installed permanently in a socket in the fuse box and accepts only a matching fuse.

d. The screw-in breaker

- (1) replaces a fuse, and is reusable, and
- (2) has a button that pops out when blown. Push this button to reset.

e. The ferule contact cartridge fuse:

- (1) is made for 15-30 ampere circuits, and
- (2) is mounted on a spring clip in fuse box or on pullout block.

f. The knife blade contact cartridge fuse:

- (1) is made for 60 ampere and higher circuits, and
- (2) is mounted on a spring clips in the fuse box or on pullout blocks.

5.4.3 Replacing blown fuses:

a. From a fuse box socket:

- (1) Dry your hands and feet.
- (2) Turn off the main power switch.
- (3) Grip the glass on the fuse and twist counter clockwise.

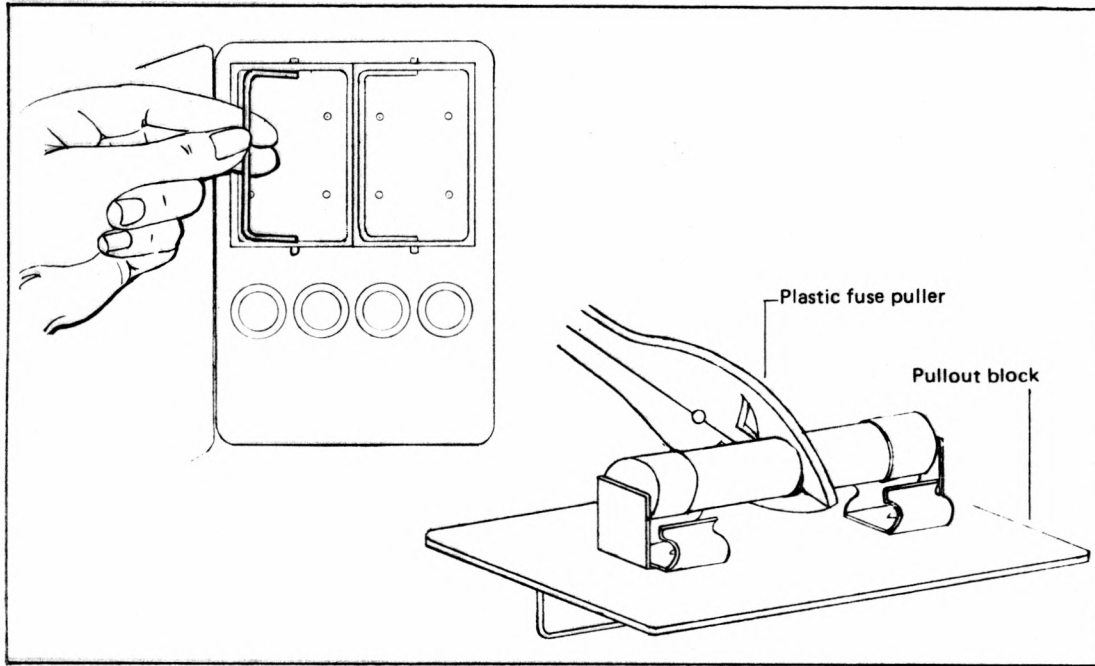
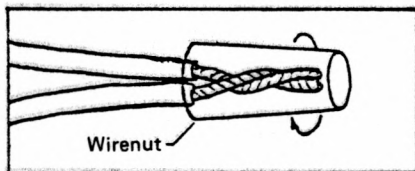
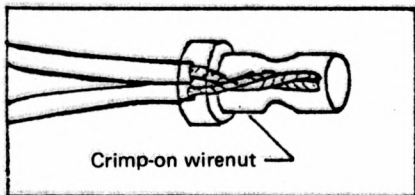


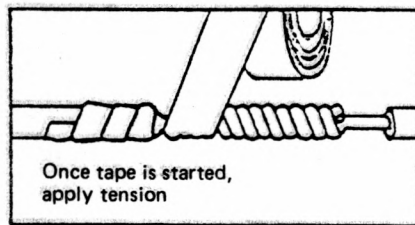
FIG. 5-5 REPLACING FUSES ON PULLOUT BLOCKS



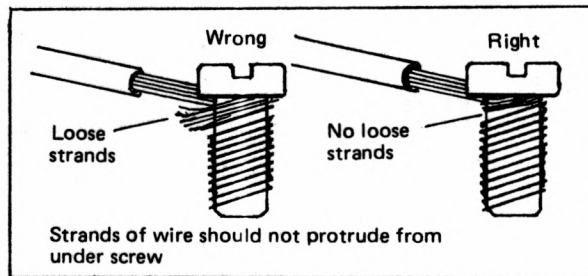
5-6.1 WIRE NUT CONNECTOR



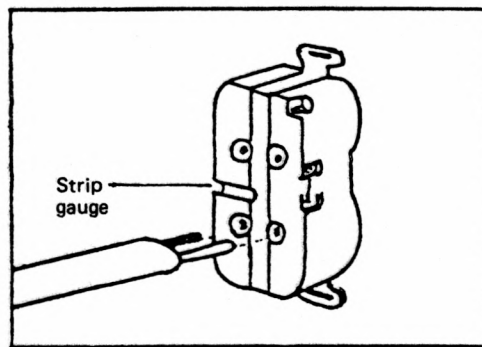
5-6.2 CRIMP ON WIRENUT CONNECTOR



5-6.3 SPLICING WIRE



5-6.4 SCREW CONNECTION



5-6.5 RECEPTACLE WITH GRIP HOLE

FIG. 5-6 WIRE CONNECTIONS

- (4) Never touch the metal on the socket when removing a fuse.
- (5) Replace the fuse with one of the same rating.

b. Cartridge fuses in fuse boxes:

- (1) Dry your hands and feet.
- (2) Turn off the main power switch.
- (3) Grab the centre of the fuse with your hand or a fuse puller and pull the fuse straight out.
- (4) replace the fuse with one of the same rating.

c. Cartridge fuses in pullout blocks: (see Figure 5-5)

- (1) Dry your hands and feet.
- (2) Grab the handle of the fuse block and pull straight out.
- (3) Grab the centre of the fuse with your hand or a fuse puller and pull the fuse straight out.
- (4) Replace the fuse with one of the same rating.

5.5 Repairing and Replacing Wires
Plugs, Switches and Outlets

5.5.1 Making Wire Connections (see Figure 5-6)

a. A wire nut is a simple device joining two wires:

- (1) Strip approximately 25 mm (1 in.) of insulation from the ends of the two wires.

- (2) Twist the two wires in a clockwise direction with a pair of pliers.
 - (3) Screw on the wire nut in a clockwise direction.
 - (4) Be sure no bare wires are exposed.
- b. Crimp-on-wire nuts are used on appliances that vibrate:
- (1) Strip approximately 13 mm (1/2 in.) of insulation from the ends of two wires.
 - (2) Twist the two wires in a clockwise direction with a pair of pliers.
 - (3) Place the wire nut over the two leads and crimp on with a crimping tool.
- c. When using splicing wire:
- (1) Strip approximately 25 mm (1 in.) of insulation from the ends of the wire to be joined.
 - (2) To make a permanent joint, solder each wire.
 - (3) Wrap the base wire with electrical tape, overlapping the tape onto the insulation.
- d. Some devices (receptacles, plugs, switches) come with grip holes:
- (1) Strip as much insulation from each wire as is shown on the gauge of the particular device.

- (2) Insert each wire into the appropriate slot, where a locking device will hold it in place.
 - (3) To remove the wire, press a small screwdriver against a release slot marked on the device, and pull it out.
- e. Screw terminals are the most common type of connection:
- (1) Remove approximately 18 mm (3/4 in.) of insulation from each wire.
 - (2) Use long-nosed pliers to wrap the end of the wire into a loop.
 - (3) If the wire is stranded, twist the bare end in a clockwise direction.
 - (4) Wrap the loop of wire around the terminal screw in a clockwise direction and tighten. Make sure no loose strands of wire project from the screw head.
- f. The Underwriters' Knot (see Figure 5-7) is used to prevent the wires from being jerked out of the plug if it is inadvertently kicked or pulled. It is best to pull about 75 mm (3 in.) of wire through the plug or fixture and then to trim off the excess.

5.5.2 Replacing A Plug

When unplugging a fixture, pull the plug, not the cord. Replace any damaged plug, that is, one with loose prongs, a cracked body, or a blackened spot on it. To replace a plug: (see Figure 5-8)

- a. Make sure the cord is not live.

- b. Remove any protective cover from the plug.
- c. Loosen the screws inside the plug, and remove any wires from the screw terminals.
- d. Remove the old plug.
- e. Push the cord through the hole in the new plug from the outer side.
- f. Tie an underwriter's knot with the two wires and pull the knot down into the plug casing between the prongs.
- g. loop the wires around the screws connected to the two flat prongs, and tighten the screws securely.
- h. If the plug is three-pronged (grounded), attach the third wire (never black) to the u-shaped prong. (see Figure 5-9)

CAUTION: There should be no bare wires in contact with each other. To remove a female plug: (see Figure 5-10)

- (1) Remove the screw or nuts and bolts holding the plug together.
 - (2) Separate the halves.
 - (3) Unscrew the terminal screws and remove the wires.
 - (4) Replace the female plug and reassemble it in reverse order.
- i. If the plug is molded, replace the entire cord.

5.5.3 Replacing A Light Switch

The most common switch in a house is the single-pole switch with two brass-coloured screws and in some cases a grounding screw. This switch is wired into the live (black) line, with the live

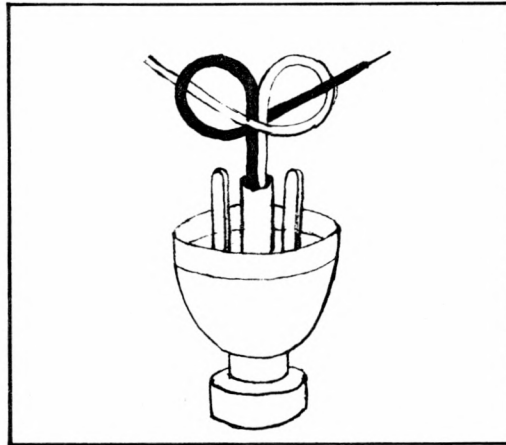


FIG. 5-7 UNDERWRITERS KNOT

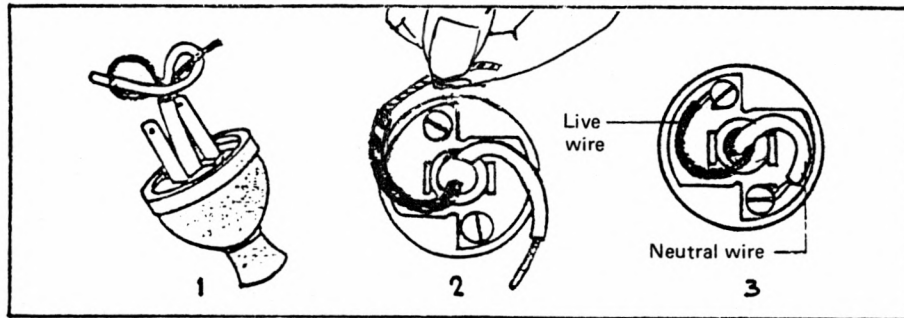


FIG. 5-8 TWO PRONGED PLUG

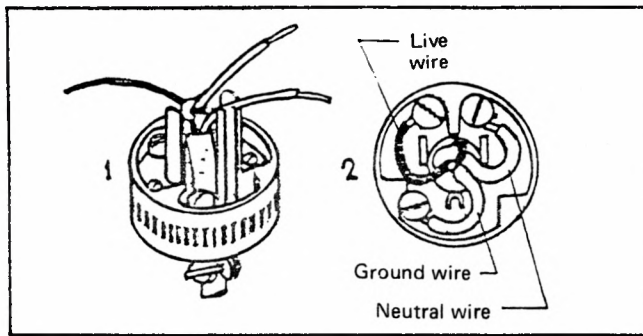


FIG. 5-9 THREE PRONGED PLUG

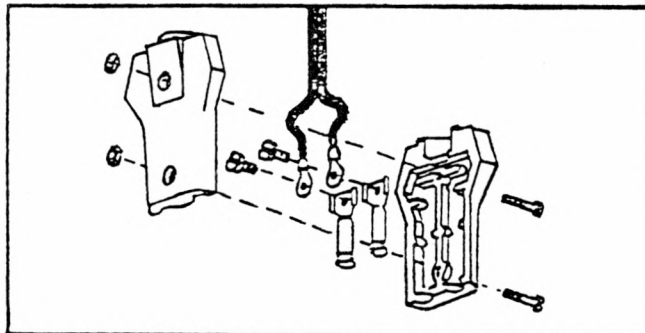


FIG. 5-10 FEMALE PLUG

wire from the main panel usually connected on top. Follow these instructions to change the switch: (see Figure 5-11)

- a. Turn off the power to the switch at the main panel.
- b. Remove the screws holding the cover plate onto the electrical box.
- c. Remove the screws holding the switch onto the electrical box and pull the switch out of the box.
- d. Remove the wires from the old switch and attach them to the new switch in the same position.
- e. Tighten all connections and push the wires and the switch back into the electrical box.
- f. Fasten the screws in place and replace the cover plate.

Dimmer switch controls can replace ordinary switches. They are wired in the same manner as ordinary switches.

5.5.4 Replacing A Lamp Switch

A pull chain or push pin lamp socket is as easy to replace as a plug: (see Figure 5-12)

- a. Remove the plug from the wall socket.
- b. Use a screwdriver to pry apart the upper portion of the socket. Note the dents made for the upper part to fit over the lower part. Push up on these dents to separate the two parts.

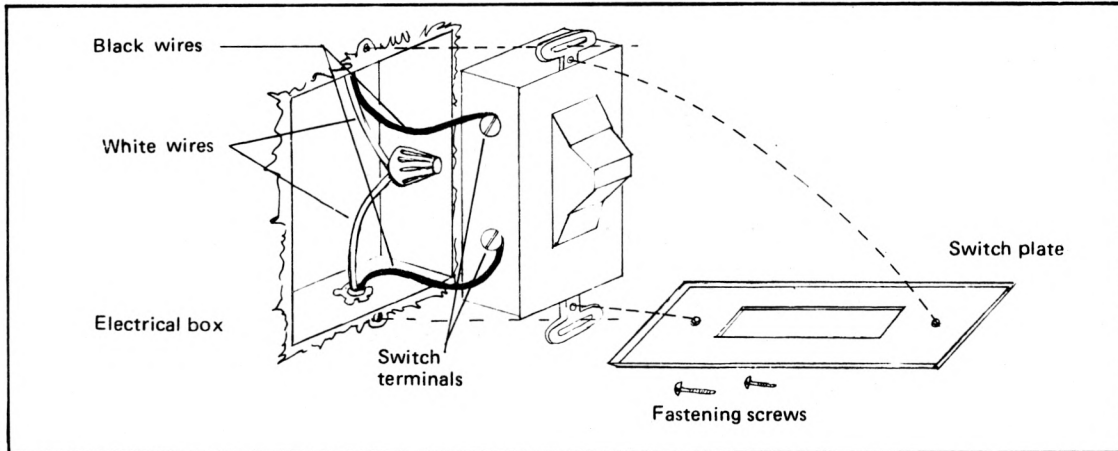


FIG. 5-11 REPLACING A LIGHT SWITCH

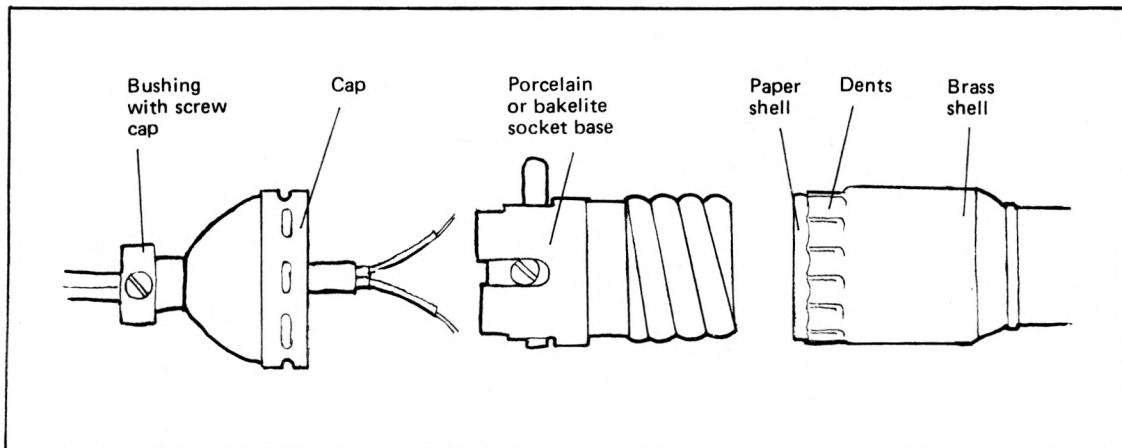


FIG. 5-12 LAMP SOCKET

- c. Inside the socket are two terminal screws for wires. Loosen the screws and remove the defective socket.
- d. If there is no Underwriters' knot just inside the cap, tie one now before proceeding. This relieves the strain on the connection and enables the wire ends to fit snugly into the socket cap.
- e. Attach the wire ends to the terminal screws of the new socket by winding the wire around the screws in a clockwise direction.
- f. Tighten the screws and snip off any loose wire ends.
- g. Replace the insulating shell and put the outer shell back on. Make sure the upper and lower fit shells snugly at the dents.

5.5.5 Replacing a Receptacle/Outlet

If an electrical outlet or receptacle is faulty, it will usually short-circuit and blow a fuse or trip a circuit breaker whenever anything is plugged into it. Replacing an outlet is simple and easy to do: (see Figure 5-13)

- a. Turn off the power to the receptacle at the main panel.
- b. Remove the screws holding the cover plate to the electrical box.
- c. Remove the screws holding the receptacle onto the electrical box and tug the receptacle out of the box.

- d. Before disconnecting anything, make a quick sketch to help you remember where each wire goes. Then remove the wires from the terminal screws of the receptacle.
- e. Attach the wires to the new receptacle in the same manner as the old receptacle (using the sketch if necessary).
- f. Newer receptacles are the three-wire grounded type. If there is a grounding wire in the electrical box, (see Figure 5-14) connect it to the equipment ground screw on the receptacle. If there is no grounding wire in the electrical box, connect a wire to the grounding screw on the receptacle and run it to the nearest metallic cold water pipe.
- g. Tighten all the connections and push the wires and receptacle back into the electrical box.
- h. Fasten the screws in place and replace the cover plate.

Working on multiple receptacles is just as easy as working on a single receptacle. Just remember to make a sketch of the wiring layout beforehand. If there are small children in the house, consider a child-proof safety receptacle. The latter requires adult finger strength to twist the covering discs to expose the slots.

5.5.6 Three and Four-way Switches

Three and four-way switches are used for a variety of reasons. Their wiring is quite different from that of single pole switches, and an electrician should be called to do any work on them.

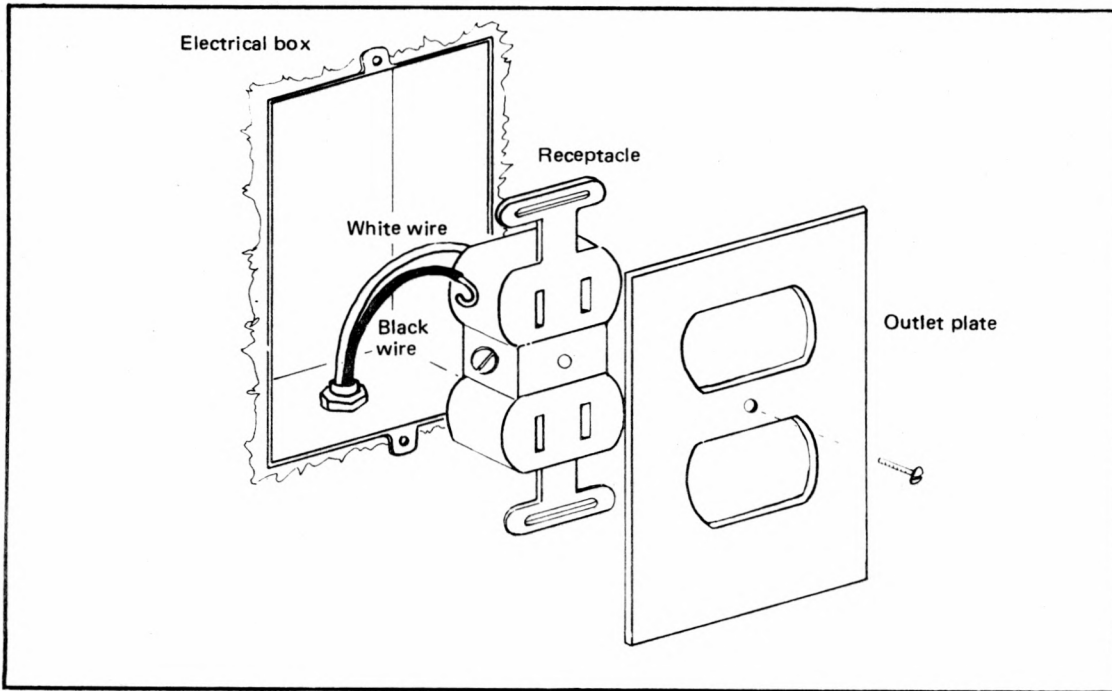


FIG. 5-13 WALL RECEPTACLE

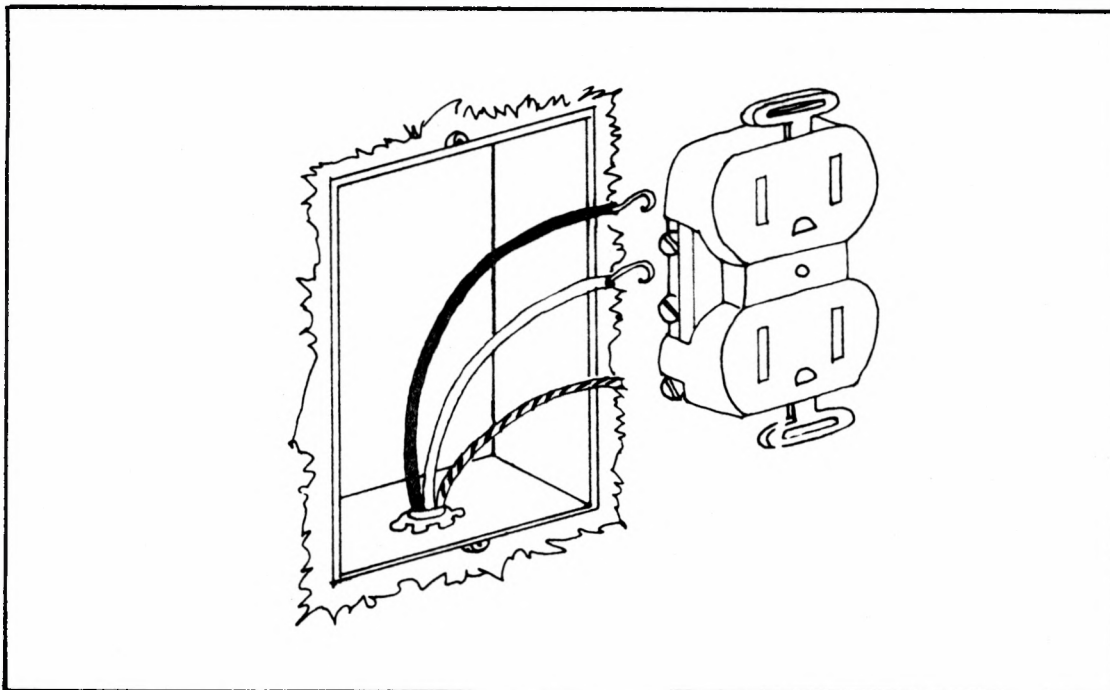


FIG. 5-14 WALL RECEPTACLE WITH GROUNDWIRE

6.0 APPLIANCES6.1 Use and Care of Irons

- a. When an iron sticks or grabs the clothes, it may be too hot or have a dirty sole-plate. Be sure the heat is at the proper setting for the material being ironed. Use detergent and water to clean a dirty sole-plate.
- b. Use a polishing compound to buff a scratched metal sole-plate. If the soleplate is rough, let the iron cool a bit, then rub the soleplate with clean, crumpled brown paper onto which is sprinkled some slightly damp table salt.
- c. If the soleplate is sticky because of starch build-up, let the iron cool a bit, then run it over a piece of aluminum foil that has been sprinkled with damp table salt. Repeat several times and wipe the iron with a damp cloth.
- d. Use distilled or soft water only for an iron. Hard water, even if processed through a water softener, may leave mineral deposits.
- e. Empty the iron when you are finished using it. Unplug it, turn the steam off, and tip the iron so that it empties.
- f. Change frayed power cords as soon as possible.
- g. do not iron over buttons, zippers or fasteners, especially if the soleplate is coated with a non-stick finish.

- h. Store the iron resting on its heel with the steam off. let it cool down before storing in a cupboard.
- i. Do not store the iron in its carton: the soleplate may become damaged by moisture. Be sure the iron is dry before storing for extended periods of time.
- j. To clear water and steam passages:
 - (1) poke out mineral deposits from steam vents with paper clips, nails, or a stiff piece of wire;
 - (2) fill the iron with equal parts of water and vinegar and steam it over a grill or rack until empty; and
 - (3) clean clogged openings with a needle. Use a fine needle for spray openings and be sure not to enlarge the holes.

6.2 Use and Care of Vacuums

- a. Replace dust bags when half full so that suction is not decreased. Be sure to unplug the vacuum before changing the bag.
- b. Keep the bristles clean.
- c. When vacuuming a rug or carpet that has been cleaned with cleaning fluid, be sure the cleaning fluid has completely dried before starting.
- d. Do not use a vacuum for sucking up liquids unless it is so designed (wet vacuum, or wet/dry vacuum).

- e. Be sure to change the air filter in a cannister vacuum when changing the bag. This keeps dirt and dust out of the motor.
- f. Poor suction is caused by broken boxes, obstructions, leaks and loose or jammed fans.
- g. Excessive noise in the vacuum indicates moving parts are out of balance or hitting other parts.
- h. Vacuums normally cause interference on radios and television. If the interference increases with time, have the vacuum checked by a repairman.
- i. To clear the hose, push a broom handle, toilet auger, or straightened clothes hanger through the hose after disconnecting it from the cannister body and vacuum head. Be sure to tape the end of the hanger or auger to prevent holes from being punched in the hose.

6.3 Maintenance of Ranges

6.3.1 General Use and Care

- a. Clean electric ranges regularly to prevent accumulation of cooking spatters and grease.
- b. Before cleaning the oven, check the owner's manual to see if the door can be removed. Some late models have this feature. Simply pull the door straight off the hinges. Your job will be much easier.
- c. Some ovens have bottom elements that can be raised or tilted out of the way during cleaning. Check the owner's manual to see if your oven has this feature.

- d. Vents are used in the oven to remove excess moisture and ensure even temperatures. Air enters the oven usually through a gap at the bottom of the oven door and passes out of the oven through a pipe under one of the elements. Be sure these openings are not obstructed by aluminum foil or other materials.
- e. Replace the door gasket when it becomes cracked or deteriorated. Pull off the old gasket and clip on a new one. The gasket usually has a gap at the bottom for venting.
- f. If a burner or the oven fails to operate, check the fuses in the panel on the range. Do not replace burned-out fuses with new ones of a higher rating. Fuses for burners should not exceed 15 amps; fuses for ovens should not exceed 20 amps. The rating of the fuse is marked inside the glass window.

6.3.2 Replacing a Surface Heating Element

If the surface heating element is burned out, it may be replaced as follows:

- a. Shut off the power to the range at the main panel.
- b. Remove the reflector pan.
- c. Unscrew the element and pull it out of the opening in the range top.
- d. Pry off the clips and remove the insulating block.
- e. Disconnect the leads to the element and connect them to the new element in the same manner.

- f. Replace the element and reflector pan in the range top.

6.3.3 Replacing a Broil or Bake Heating Element

If the broil or bake heating element in the oven is burned out, it may be replaced as follows:

- a. Shut off the power to the range at the main panel.
- b. Remove the screws holding the element in its mounting.
- c. Pull the element out of its mount and disconnect the leads.
- d. Connect the new element to the leads and mount the new element.

6.4 Use and Care of Refrigerators

6.4.1 Defrosting

If the refrigerator does not defrost automatically, it should be defrosted whenever frost or ice builds up, so as to permit more efficient operation. This is done by turning the control dial to the "defrost" position and removing loose ice or water after it has melted.

Note: Ice should not be chipped away from compartment walls as the evaporator coils may be damaged.

6.4.2 Adjusting Doors

The refrigerator door should shut slowly by itself when half open. To adjust the door so that it closes properly:

- a. Tilt the refrigerator back on its rear legs and prop it up with a piece of wood.

- b. Adjust the front leveling nuts/legs or rollers so that the side with the door hinge is slightly higher than the latch side. Repeat until the door closes by itself when left open.

- c. If the door sags, loosen the hinges and adjust the door. Depending on the model you may have to:
 - (1) pry off a cover plate to reach the hinge screws,
 - (2) open or remove the freezer door on two-door models to loosen the screws on the fridge door, or
 - (3) remove the bottom grill to reach the lower hinge screws.

6.4.3 Cleaning and Adjusting the Drain Pan and Hose

A drain pan is located underneath the refrigerator behind a grille. It collects water from the fridge and freezer compartments during the defrost cycle and evaporates it into the kitchen air.

If the drain pan rattles, remove the grille and reposition the pan. If the hose or drain pan is cracked and leaks, replace them with parts from a dealer or hardware store.

If the drain tube becomes clogged, it may be cleared by poking a stiff wire down the drain hole in either compartment.

6.4.4 Cleaning Condenser Coils

Condenser coils are located underneath or on the back of the freezer and should be cleaned once a year with a vacuum. Otherwise they will become clogged with dust and dirt causing the refrigerator to run continuously or for extended periods and fail to defrost properly.

6.5 Use and Care of Washers and Dryers

- a. Be sure to check the operating instructions or user's manual if anything goes wrong. This will save you the cost of a service call in case the problem is simply remedied.
- b. Keep the lint screen clean by removing accumulated lint whenever possible. A heavy layer of lint will reduce air flow and cause clothes to dry slowly. The lint screen may be located behind the door, in a slot on top of the dryer, or elsewhere depending on the model.
- c. Remove any obstructions in the hot air vent at the back. Be sure the vent does not sag as water and lint will collect, restricting airflow.
- d. When the washer or dryer is not levelled properly, the result will be excessive vibration and noise. To adjust the legs:
 - (1) tilt the machine back on its rear legs and prop it with a piece of wood;

- (2) adjust the front leveling nuts/legs;
- (3) remove the piece of wood and place the machine on its four legs;
- (4) check the machine with a carpenter's level; and
- (5) if the machine is not level, repeat the previous steps until it is.

7.0 HEATING

7.1 Gas-fired Furnaces

7.1.1 Restarting a Pilot Light

Figure 7-1 illustrates the components of a gas-fired heating system.

When the pilot light in a gas-fired furnace goes out, the gas supply should automatically shut off. In order to relight the pilot light:

- a. Lower the thermostat to its lowest setting to ensure that gas will not go into the main chamber.
- b. Wait five minutes to allow any gas in the main chamber to clear.
- c. Turn the gas feed button to 'pilot' and push the button down, holding it for 30 seconds.
- d. If the furnace has a mechanical spark button, press it to ignite the gas in the burner. Continue to hold the gas feed button down for 60-90 seconds after the pilot lights so that the gas will not shut off automatically.

- e. If the furnace does not have a mechanical spark button, open the door to the main chamber and position a lit match underneath the pilot light burner. When the pilot is lit, close the burner door and continue holding the gas feed button down while still set at 'pilot'.
- f. After the pilot has been burning for 60-90 seconds, turn the gas feed button to the 'on' position.
- g. If the pilot light goes out after burning for a few minutes, call for expert help as this indicates a more serious problem.

7.1.2 Checking Propane Tanks for Refilling

During the winter heating season, frost will appear on the outside of the tank to the level of the propane left in the tank.

7.2 Oil-fired Furnaces

7.2.1 Common Problems that the House Owner can Solve

Figure 7-2 illustrates the components of an oil-fired residential heating system.

A house owner can fix many minor defects in an oil-fired furnace.

If you cannot solve the problem, and before calling the servicer, try to write down or remember how the furnace acted just before it stopped running, or the conditions at the time the furnace quit. For example, did you notice anything out of the ordinary such as noises or frequent stopping and starting?

Was the local power off, causing the furnace to stop operating?

Anything that you noticed can help the servicer to solve the problem.

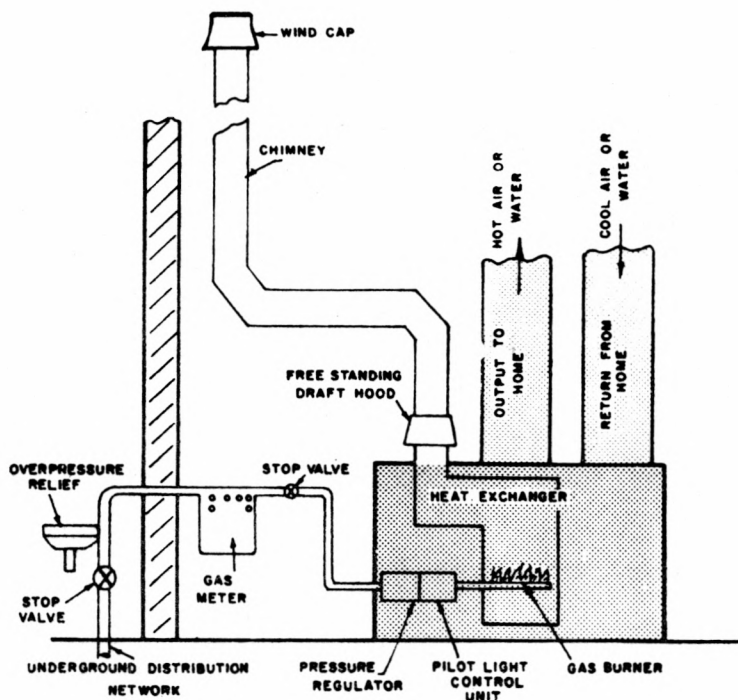


FIG. 7-1
SCHEMATIC ILLUSTRATION OF THE COMPONENTS OF A GAS - FIRED HEATING SYSTEM

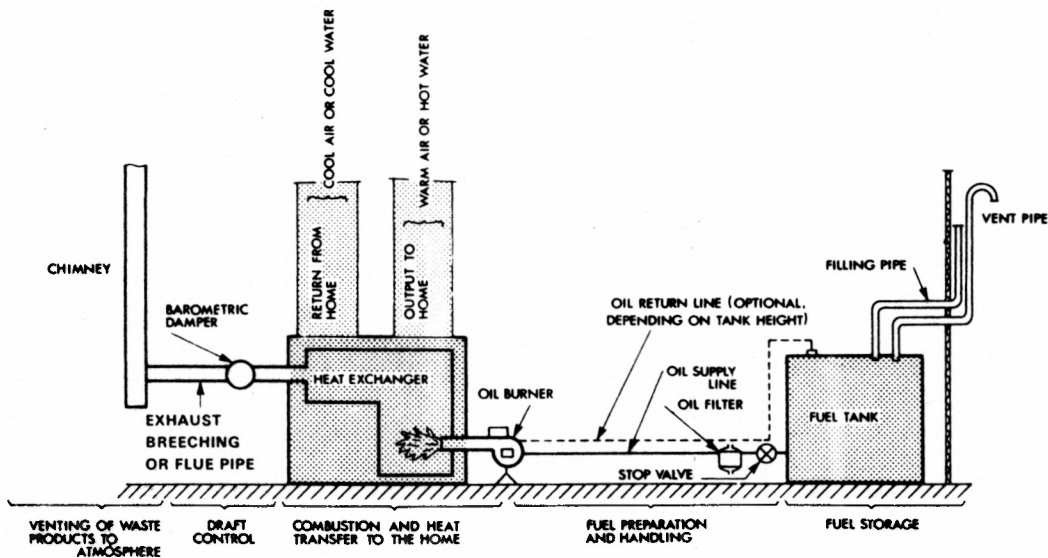


FIG. 7-2
SCHEMATIC ILLUSTRATION OF THE COMPONENTS OF AN OIL - FIRED RESIDENTIAL HEATING SYSTEM

FURNACE RUNS CONTINUOUSLY OR USES AN EXCESSIVE AMOUNT OF OIL

- Step 1: Check furnace room maintenance chart. Have air filters been cleaned or changed recently? If not, turn the furnace wall switch off and clean or change filters as required.
- Step 2: Check belt on blower fan to see if it is in good condition and adjusted properly. The belt should have 12-18 mm (1/2 to 3/4 inch) slack between pulleys.
- Step 3: Check air flow at all registers to see if it is normal and if heat is adequate. Be sure the damper under the register is open and that nothing is piled on top of the register.

NOTE: If the register damper is closed, or something is piled on top of the register, your furnace will have to run longer in order to heat your home and will use more fuel oil to furnish the amount of heat that you desire.

- Step 4: If all the above items are normal, and the furnace still runs continuously or is using an excessive amount of oil, call the servicer.

FURNACE WON'T START BUT FAN WILL RUN ON SUMMER SWITCH

- Step 1: Check to see if the oil level in your tank is low. If the tank is less than 1/8 full have it refilled. If the oil level is sufficient, go to Step 2.
- Step 2: Push reset button on relay - press in slowly, hold for a moment and release pressure. The burner should start, if not, try to reset again. If the burner still does not start, go to Step 3.

Step 3: Call servicer.

FUEL TANK IS EMPTY

Step 1: Fill tank with clean fuel oil, then go to Step 2.

Step 2: Turn off furnace wall switch, then go to Step 3.

Step 3: Bleed oil pump by opening the bleeder valve, which is located on the top or end, about one turn counter clockwise. Leave open until oil starts to flow from the port on the bleeder valve. Then retighten the bleeder valve to its original position, and go to Step 4.

Step 4: Turn on furnace wall switch, then go to Step 5.

Step 5: Push reset button on relay - press in slowly and hold, then release pressure on button. If the furnace burner does not start and continue to run, go to Step 6.

Step 6: Be sure the furnace wall switch is off. Bleed the oil pump again as in Step 3, making sure you are getting oil flow, not just oil bubbles. Then go to Step 7.

Step 7: Push reset button on relay - press in slowly and hold, then release pressure on button. Try again, very carefully. If the furnace still fails to start and continue to burn, go to Step 8.

Step 8: Call servicer.

NOTE: If the furnace has been off for several hours or days, and the temperature in your home or furnace room is below freezing, place an electric heater in front of the furnace burner area to warm the burner motor and oil pump and relay before trying to restart the furnace.

BURNER STARTS AND RUNS, BUT FAN DOES NOT RUN EVEN AFTER BURNER HAS RUN FOR SEVERAL MINUTES.

Step 1: Turn furnace wall switch off, then go to Step 2.

Step 2: Check for broken belt on fan blower. If broken, replace with a new belt. If belt is okay, go to Step 3.

Step 3: Turn furnace wall switch on and allow furnace to run again. If the fan still fails to operate, go to Step 4.

Step 4: Call servicer.

FAN RUNS CONTINUOUSLY BUT BLOWS COLD AIR

Step 1: Check switch. If it is turned to the summer position, change to the automatic or heating position, then go to Step 2.

Step 2: If fan continues to run, call servicer.

BURNER STARTS AND THEN SHUTS OFF A VERY SHORT TIME AFTER STARTING

Step 1: Check fuel in tank. If fuel supply is low or tank is completely empty follow the instructions under 'FUEL TANK IS EMPTY'. If fuel supply is sufficient, go to Step 2.

Step 2: Press reset button on relay - press it in slowly, hold, and then release pressure on the button. If the burner still fails to continue burning, go to Step 3.

Step 3: Follow the instructions under 'FUEL TANK IS EMPTY'. Even though there is adequate oil in the tank, it is possible for the oil pump to lose its prime, and it will not begin pumping again until air is bled from the pump and oil begins to flow from the pump bleeder valve. If this does not work, go to Step 4.

Step 4: If fuel is sufficient, but no oil will come out of the bleeder valve, check for a frozen oil line. Also check the furnace room maintenance chart to see if the fuel filter was changed as required. A dirty filter can restrict the oil flow. If all okay, go to Step 5.

Step 5: Check for leaks on the oil line as oil leaking out will allow air to be sucked in when the oil pump starts, thus causing it to lose its prime and preventing oil flow into the burner.

If oil leaks are evident tighten fittings carefully. If burner does not start and continue to operate, go to Step 6.

Step 6: Call servicer.

NOISY FURNACE

Check possible sources of noise as follows. When you locate the problem area, go immediately to Step 9.

Step 1: Turn off furnace wall switch. Check to see if the pulley is loose on the blower motor shaft. If okay go to Step 2.

Step 2: Check to see if the blower pulley is loose on the blower shaft. If okay go to Step 3.

Step 3: Check to see if the entire blower assembly is loose on the mounting rails. If okay, go to Step 4.

Step 4: Check to see if the blower wheel is striking the wall of the blower. If okay, go to Step 5.

Step 5: Check to see if the motor mounting clamps are loose, allowing vibrations. If okay, go to Step 6.

Step 6: Check to see if the drive belt is cracked or rough. If okay, go to Step 7.

Step 7: Check to see if there is a lack of lubrication oil on the motor bearings. Check the furnace room maintenance chart to see when the motors were last oiled: 3 or 4 drops of oil are needed every 3 months. If okay, go to Step 8.

Step 8: Check to see if the drive belt is too loose or too tight. If okay, go to Step 9.

Step 9: After determining the cause of the noise, repair as needed. If you are unable to repair, call the servicer.

7.2.2 Servicing the Furnace

When a servicer comes for the annual servicing and cleaning, these are the things that he/she will usually do:

- a. check dip stick movement in the fuel indicator on the tank;
- b. inspect fuel lines and connection;
- c. check exhaust breeching and connection;
- d. check that the burner operation is quiet and odourless;
- e. check that the flame is symmetrical;
- f. check that the refractor (or stainless steel) wall is rigid and not cracked or crumbling;
- g. check that the barometric door is operating properly;
- h. remove, clean, and inspect the stock controller;
- i. clean the joint between the breeching and the vertical chimney with a vacuum cleaner;

- j. clean interior metallic surfaces of the furnace with a wire brush, and vacuum soot out;
- k. clean the fan every three years;
- l. lubricate the drive motor;
- m. check the alignment, condition and tension of the drive belt;
- n. replace the oil filter cartridge and gasket;
- o. check that the electrodes are in good condition;
- p. clean and check the oil nozzle;
- q. purge any air from the oil pump;
- r. check the oil pressure in the oil pump; and
- s. adjust the burner after:
 - (1) testing for soot in the smoke stack,
 - (2) checking the flue gas temperature, and
 - (3) testing for the level of carbon dioxide.

7.3 Baseboard Heaters

Proper care and use of baseboard heaters includes the following:

- a. Keep furniture and curtains clear of the heaters to allow good air circulation. Drapes should be at least 150 mm (6") above the heaters.
- b. Clean the heaters with a vacuum cleaner before the heating season starts, and regularly throughout the winter. A buildup of dust and dirt lowers efficiency and raises heating costs.

7.4 Space Heaters

7.4.1 General Information

Figure 7-3 shows the components of a space heater.

Follow these rules to ensure best operation of a space heater:

- a. Use only kerosene, stove oil or No. 1 fuel oil. Never use crank case oil.
- b. Clean up oil spills around the heater immediately. Do not let oil seep onto floors or carpets.
- c. Keep furniture, magazines, newspapers and other flammable objects away from the heater. Do not string clothes-lines over the top of the heater.
- d. If the fire in the heater goes out, check that there is not too much oil in the pot before relighting (see 7.4.2 below). Never light a hot burner; allow it to cool down first.
- e. If there is a lot of soot in the fire chamber, clean it out as it acts as insulation and wastes fuel.
- f. A lot of soot usually indicates a poor draft through the heater. A poor draft may be caused by a chimney not high enough above the roof ridge, or by obstructions causing air turbulence around the chimney. Another cause is a poorly adjusted draft regulator on the smoke pipe. Before re-adjusting the draft regulator, read the directions.

7.4.2 Flooded Space Heaters

Sometimes too much oil accumulates in the burner before lighting. It may not ignite, and when the householder tries to light it again, he/she finds a lot of oil in the pot. This situation is called a "pooled burner". If it has not yet been lit, remove the clean-out plug and drain the excess oil into a pan or other receptacle (see Fig. 7-4). Then replace the plug and light the burner as usual.

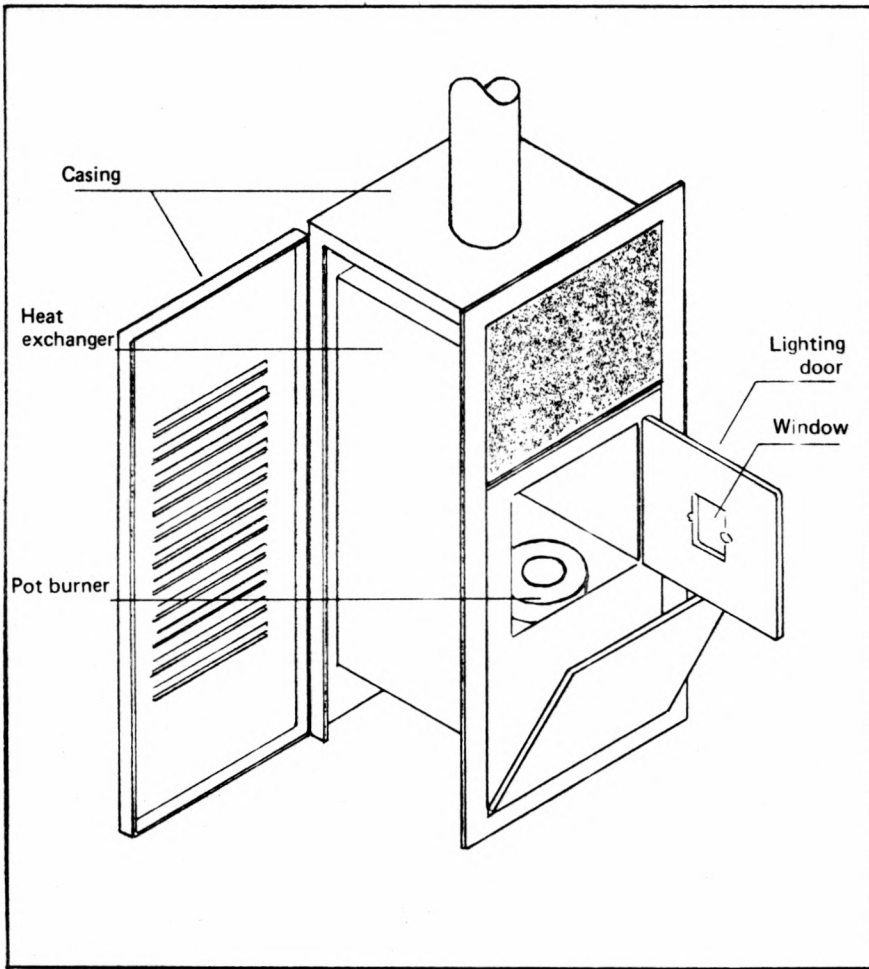


FIG. 7-3 - SPACE HEATER

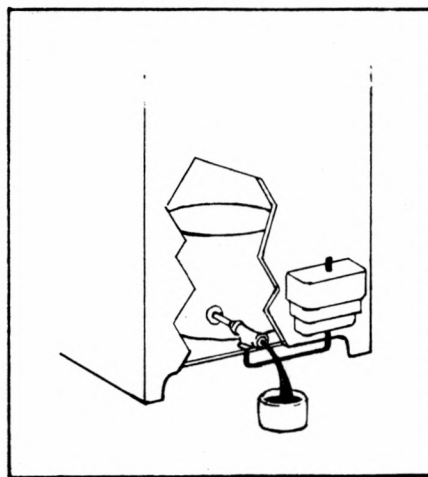


FIG. 7-4 - DRAINING EXCESS OIL FROM BURNER

If a pooled burner has been lit, allow it to burn off. There may be a danger of fire because of overheated smoke pipes at walls, ceiling or in the attic. Keep a water-type extinguisher or garden hose handy to put out any fires occurring while the pooled oil burns off. Check the walls, ceiling and attic several times for possible fire after the burn-off.

Follow these steps to reduce risks:

- a. Turn the oil control valve handle to low and leave it there. Do not turn it off.
- b. Keep the lighting door in the heat exchanger (or combustion drum) above the burner partially open during the burn-off period. If the lighting or access door is below or at the same level as the burner, keep it closed to reduce the draft and slow down combustion.
- c. It is also helpful to keep the draft regulator open. The fire will eventually die down. Then the valve may be turned up to any desired setting. If the fire goes out entirely, remember it is dangerous to relight the hot burner. Let the pot cool down. Remove the block from the draft regulator.

Burning off a flooded burner may cause alarm because the heater makes a great deal of noise. Do not panic. There is little danger from the heater: remember, it had to pass a "burnoff" test to get an approved rating. The danger comes from combustible articles close to the burner, or from a smoke pipe not fastened together with sheet metal screws.

7.5 Wood Burning Heaters

7.5.1 General Information

For safety and efficiency, it is very important to burn only air-dried wood. This is wood that has been dried for at least one summer and has a moisture content of approximately 20%.

Burning wet or green wood leads to creosote formation in flue pipes. Freshly cut hardwoods have a moisture content of about 45%, softwoods (conifers) about 55%. Thus hardwoods are preferred as fuel, if available at a reasonable price.

Table 1 may be of use in choosing a suitable fuel.

TABLE 1Quality Characteristics of Wood as Fuel

<u>Tree</u>	<u>Easy to Split</u>	<u>Ease of Starting</u>	<u>Heavy Smoke</u>	<u>Sparks</u>	<u>Coaling Qualities</u>
Apple		poor	no	few	excellent
Ash	yes	fair	no	few	good
Beech	no	poor	no	few	good
Birch	yes	good	no	moderate	good
Cherry	yes	poor	no	few	excellent
Cedar	yes	excellent	yes	many	poor
Elm	no	fair	medium	very few	good
Hemlock	yes	good	medium	many	poor
Hickory	yes	fair	no	moderate	excellent
Locust	no	poor	no	very few	excellent
Maple	yes	poor	no	few	excellent
Oak	yes	poor	no	few	excellent
Pine	yes	excellent	medium	moderate	poor
Spruce	no	poor	yes	moderate	poor
Willow	yes	fair	no	few	poor

Source: Northeast Regional Agricultural Engineering Service.

7.5.2 Wood Burning Safety

If handled with common sense, a wood stove, furnace or fireplace need not create a fire hazard in your home. The two most common problems to avoid with wood appliances are faulty installation and creosote buildup.

Ensure that your wood heater is installed according to the Canadian Heating, Ventilating and Air Conditioning Code. If you are in any doubt, contact the Provincial Fire Marshall who will have a qualified inspector check your installation, usually without charge. The Regional Fire and Safety Officer of DIAND will also provide advice on proper installation.

DO'S AND DON'TS FOR WOOD BURNING SAFETY

DO burn only air-dried wood.

DO clean your chimney, stove pipe and stove (or furnace) interior thoroughly at least once a year.

DO maintain your wood heater properly. Check stove pipes and chimney monthly for creosote, and if necessary clean.

DO stoke your stove up to a higher burning rate for 20 to 30 minutes after each slow burn to reduce creosote buildup.

DO prepare for a long, slow burn by loading the stove or furnace and letting it burn at a moderate rate for half an hour before reducing the air intake.

DO purchase a good-sized, multi-purpose (wood or electric) fire extinguisher for each wood heater; you might also want to invest in a smoke detector.

DO store ashes in a non-combustible (metal) container with a secure top; ashes make a valuable fertilizer.

DO open the damper before re-loading a stove or furnace, to prevent the fire from smoking.

DON'T use your wood heater to burn trash; never use gasoline, kerosene, charcoal starter or similar liquids to start a fire.

DON'T overload your wood appliance; never heat a stove to red hot.

DON'T place combustible materials such as firewood, newspapers, clothing, drapes, or furniture within 122 cm (48 inches) of a wood heater.

DON'T do anything to cause a sudden, sharp change in the temperature of a cast-iron stove, such as throwing cold water on a fire or adding a snow-covered log.

7.5.3 Creosote

7.5.3.1 General Information

Creosote is an oily or tarry liquid resulting from the distillation of wood during the process of combustion. It is present in the gases given off by all types of burning wood and in its solid and semi-liquid states is highly combustible.

When creosote forms on the inside of stove pipes and chimneys it may build up to a considerable thickness. As the creosote builds up, the draft opening is reduced. When the build-up is permitted to take place over an extended period, sufficient creosote may be present in the stack to cause a serious fire, if ignited. All users of wood burning equipment should be thoroughly familiar with the causes, control and cure of creosote deposition. When these are well understood, wood burning equipment properly installed and properly used will give unmatched satisfaction and economy.

7.5.3.2 Causes of Creosote Formation

Creosote condenses from the flue gases when the stack temperature drops below 120°C. The amount of creosote deposited in the pipe and chimney is affected by the amount of moisture in the flue gases, the temperature of the stack, the rate at which the wood is burned, the amount of draft in the stack, and how completely the combustion elements in the flue gases have been consumed in the process of combustion.

In short the causes of creosote buildup are:

- wet wood,
- incomplete combustion,
- cool surfaces, and
- poor draft in the flue pipe.

7.5.3.3 Control of Creosote

Creosote can be controlled by the following methods:

a. Moisture in the flue gas can be kept low by:

- (1) using the driest wood obtainable;
- (2) mixing small pieces (preferably slab wood) with every charge - these smaller pieces should be kept on the charcoal bed first when adding fuel;
- (3) never using large wood by itself during mild weather when combustion is relatively slow;
- (4) never adding more than a 12-hour supply of wood at a time; and
- (5) always using dry split wood in mild weather.

b. The temperature of the stack can be increased by:

- (1) insulating the stove pipe extension; and
- (2) using an insulated chimney.

- c. The amount of draft in the stack can be controlled by:
- (1) having as few bends in the chimney as possible;
 - (2) ensuring the chimney is of adequate height and diameter;
 - (3) preventing any leaks;
 - (4) eliminating any external obstructions at the chimney outlet; and
 - (5) insulating the chimney properly.
- d. The rate at which the wood is burned is dependent upon the season of the year and your heating requirements. Creosote deposits are more apt to occur during mild weather when the draft damper is closed and the wood just sits in the stove. During times when little heat is needed, use only enough split, dry wood to last 4 - 6 hours.

7.5.3.4 Removal of Creosote Already Formed and Prevention of Accumulation

If a stove pipe or chimney is badly plugged the only practical way of cleaning it is to take the pipe apart and scrape it. The chimney must also be scraped.

The small amounts of creosote that normally deposit can be kept from accumulating by opening the draft damper for 20 - 30 minutes before adding fuel. This will increase the stack temperature and cause any creosote in the pipe to dry. In the process of drying the creosote will shrink and fall from the inner walls of the pipe. If a small amount of "chimney sweep" (which may be purchased at most hardware stores) is thrown over the glowing bed of charcoal it will help eliminate any creosote deposit.

Any creosote remaining should be burnt off regularly, preferably once a week. Place several sheets of crumpled newspaper in the stove or furnace and allow the fuel door to remain open at

least 2.5 cm (one inch) to provide ample draft. Flames will be carried up into the smoke pipe and will ignite any creosote present.

If this is done regularly there will never be enough creosote in the pipe to cause a dangerously high temperature when it burns.

Remember, "A FAST FIRE A DAY WILL KEEP CREOSOTE AWAY".

7.5.4 How To Put Out a Chimney Fire

A chimney fire in an airtight stove can be controlled by shutting off all drafts and dampers. If possible, place wet burlap bags on the roof around the chimney. If you are not sure that the fire is under control call the fire department.

7.5.5 Insurance for Houses with Wood Burning Appliances

If you install any kind of wood burning device in your home be sure to notify your insurance agent.

Some agents have informed customers it may be difficult to obtain insurance if they install a wood burning stove or furnace. All insurance agents must rely on the guidelines provided, and the rates or premiums supplied to them by their company. The underwriting requirements may vary among companies. Some will accept a stove-heated home with premium penalty or at a variable surcharge; and others may altogether refuse to insure a house using a wood stove as a primary heat source. Where difficulties arise you should shop around. The restrictions placed on one agent by the companies she/he represents may not occur with another.

7.6 Forced Air Furnaces

In a forced air furnace, warm air is supplied through ducts to all parts of the building. Warm air is fed through the ductwork by a fan or blower

after it is heated in the furnace. Separate cold air return ducts carry cold air back, through a filter, to the furnace where it is reheated.

Access to the air circulating fan (blower) and air filters is commonly through a panel at the rear of the furnace (the opposite end of the furnace from the burner).

Disposable air filters should be replaced with new ones of the same size in the fall, and washable ones washed at least once a month during the heating season. Be sure to check how the old filters are sitting in place before removing them. Most new filters have an arrow on the edges of the cardboard housing indicating the direction air should flow through them.

Warm air discharge and cold air return registers should be checked often to ensure they are not blocked by furniture. In addition, warm air register leads should be removed and the ductwork vacuumed twice yearly. Some warm air registers are adjustable to allow temperatures in individual rooms to be varied. Plastic deflectors may also be placed over warm air registers to deflect heat towards the centre of the room, and to keep drapes out of the way.

Keep the circulating blower fan blades clean. If they are clogged with dirt and lint they will not move air efficiently. A vacuum cleaner is useful for removing dust and lint. An empty or new bag in the vacuum cleaner will improve the suction and might help if the dust and lint are held by grease or oil.

If the blower is not accessible, be sure it is cleaned when scheduled maintenance servicing is done.

The blower fan belt will not operate properly if it is too loose, too tight, or too worn. The belt tension should give 12-18 mm (1/2-3/4 inch) play midway between the pulleys. If the belt is worn, it should be replaced.

8.0 WALLS AND CEILINGS

8.1 Repairing Gypsum Board

8.1.1 Setting Popped Nails

- a. Press the gypsum board tight against the wall and drive ring-shank nails into the gypsum board above and below the popped nail.
- b. Either pull the popped nail or set it deeply into the gypsum board.
- c. Repair the hole in the gypsum board as detailed in section 8.1.3.

8.1.2 Repairing or Replacing Loose Joint Tape

- a. Carefully remove all loose or split joint tape. Use a sharp knife so that good material is not removed.
- b. Apply a thin layer of joint compound to the wall, place new tape over the area, and smooth out any bubbles with a putty knife.
- c. Apply a second coat of compound while the first coat is still damp.
- d. Let the joint compound dry. Then apply further coats, feathering the edges and sanding until the repaired area is smooth.

8.1.3 Patching Small Holes

To repair small holes or cracks in plaster or gypsum board, simply fill them with patching compound and smooth with a putty knife. Sand the area after it has dried so that it matches the rest of the wall.

8.1.4 Patching Large Holes

For holes up to 250 mm (10 in.) in diameter:

- a. Mark a square or rectangle around the hole and cut it out with a saw.
- b. Cut a piece of dry-wall about 100 mm (4 in.) larger than the rectangle and glue it to the inside face of the wall. Use a piece of wire and a stick to hold it in place while the glue sets.
- c. Cut a piece of dry-wall the size of the rectangle and glue it into place as a patch.
- d. Apply dry wall tape over the joints as detailed in 8.1.2 previously to obtain an unnoticeable patch.

For larger holes, cut the damaged area back to the centre of the nearest studs and nail a patch in place. Apply drywall tape to the joints as detailed in 8.1.2.

8.2 Replacing a Damaged Ceiling Tile

- a. Remove the damaged tile completely using a knife or other tool.
- b. Clean away all old adhesive or staples from the furring or bearing surface.
- c. Trim a replacement with a knife and straightedge so that it fits the opening exactly.
- d. Place adhesive on the furring strips or bearing surface and press the replacement tile into place. Hold the tile in position a few minutes until the adhesive sets.

8.3 Removing Toggle Bolts, Expanding Anchors and Plugs

- a. Grip expanding anchors or plugs with needlenose pliers and remove them from the wall.
- b. Unscrew expansion bolts and toggle bolts with wings. Leave the expanded flange or wing assembly in the wall.
- c. Patch the holes with spackling compound or patching plaster as detailed in Section 8.1.3.

8.4 Repairing Wallpaper

8.4.1 Air Bubble Repairs

Slit air bubbles with a razor blade, soak the area with water, apply paste with an eyedropper or small brush, and press the loose paper into place with a clean damp cloth.

For contact-adhesive wall coverings, prick a hole in the bubble and smooth it down with your fingers.

8.4.2 Repairing Holes and Tears

Place a small patch made from the same wallpaper over the hole. Be sure to match the pattern exactly.

If the wallpaper is torn or the edges are lifting, peel back the loose paper, cover with contact adhesive, and press the paper back into place.

8.4.3 Cleaning Soiled or Stained Wallpaper

Many wallpapers are washable. If it is soiled or stained, vacuum the area first to remove any dust or dirt. Then wash an inconspicuous test area

with a soft sponge dipped in cool water and a mild detergent. Check to see if the colors run or other problems occur. If you find the wallpaper can be washed successfully, proceed to do the entire wall in small areas of 1 m x 1 m (3 ft. x 3 ft.). Do not use too much water or the wallpaper may become unstuck.

8.5 Repairing Bathtub Enclosures

8.5.1 Replacing Ceramic Tile

- a. Remove the grout around the joints in the damaged tile.
- b. Use a hammer and chisel to break out the tile, working from the centre outwards.
- c. Apply adhesive to the back of the new tile with a putty knife. Leave 12 cm (1/2 in.) border clear around the edges.
- d. Place the tile in the clean opening and force it into place, level and aligned with the other tiles.
- e. Use tile grout to fill in the edges, forcing it into all the spaces.
- f. Let the grout stand 10-20 minutes, then remove the excess. Be sure all gaps and cracks are filled.
- g. Use a damp cloth or sponge to remove any remaining tile grout.
- h. If the tile requires shaping, score it with a glass cutter where you want to remove it. Then use pliers to break away small pieces at a time. Smooth the edges with a file.

8.5.2 Sealing Bathtubs

Remove any grout or tile cement from the joint between the tile and the bathtub. Use a screwdriver or knife to loosen and remove the large pieces. Wipe, brush, or vacuum any small particles or dust from the joint. Apply sealant (e.g., silicone seal available at the hardware store) to the crack and smooth the surface before it dries.

To seal under spouts, shower head or faucets, remove the cover plates or unscrew them and apply caulk.

9.0 DOORS AND WINDOWS

9.1 Correcting Sticking Windows

Apply hard soap or paraffin to the sash channel and stops in window frames to allow double-hung sash windows to move freely. Usually a small amount is enough to overcome friction.

If dirt or paint has accumulated in the grooves or on the edges of the mouldings, clean or sand the areas to free the sash. When the wood of the sash or frame is swollen due to moisture, tap a block of wood the width of the sash groove along the groove to loosen the sash. The last resort is to remove the sash from the frame and plane the sides of the sash.

9.2 Stopping Rattling Windows

9.2.1 Double Hung Windows

A rattling window is usually caused by the sash fitting too loosely in the frame. To stop the rattling, tap the edge of the moulding holding the sash in place. Use a block of wood so as not to

damage the moulding. This should shift the moulding enough to prevent vibration. If that does not work, remove the moulding and renail it in place so the window does not rattle.

9.2.2 Sashless Windows

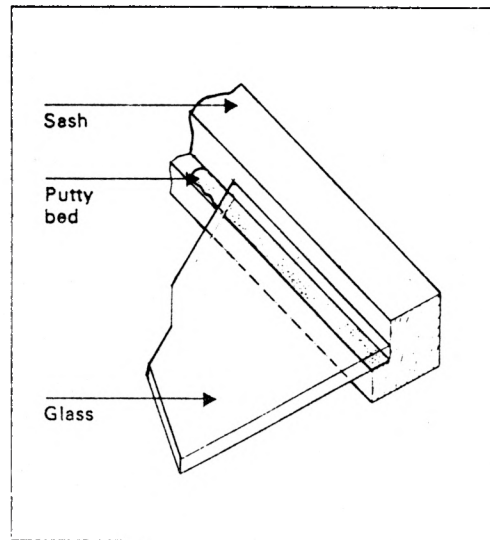
Install pressure latches on frames to hold the glass tight. Use one latch for each piece of glass.

Note: A sash is a wooden or metal frame holding the glass in the window frame. A sashless window is one where the glass slides alone in a slot within the window frame.

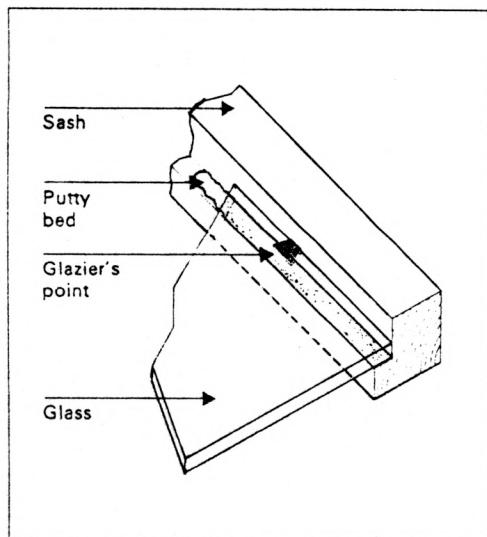
9.3 Replacing a Broken Window Pane

9.3.1 Wooden Windows (see Figures 9-1 to 9-3)

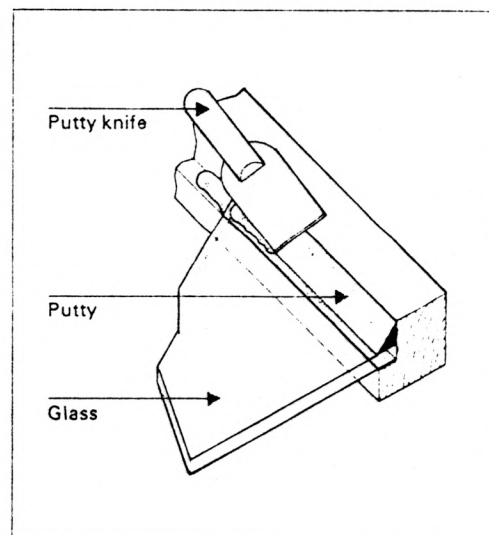
- a. Remove the old putty with a knife or chisel.
- b. Remove the glazier's points and save them for use later.
- c. Use a pair of gloves when removing the old glass. Be sure to remove all the pieces.
- d. In many cases, the paint will come off with the putty. Apply a primer to the bare wood before installing the new pane.
- e. Apply a 3 mm (1/8 in.) thick bed of putty to the rebate of the sash.
- f. Press the new pane firmly against the putty. Be sure all sides have good contact. The glass should be cut 3 mm (1/8 in.) smaller than the actual size required.



**FIG. 9-1 PRESS EDGE OF WINDOW PANE
FIRMLY INTO BED OF PUTTY**



**FIG. 9-2 INSERT GLAZIER'S POINTS
EVERY 10 cm.**



**FIG. 9-3 APPLY MORE PUTTY, FLUSH WITH
EDGE OF WINDOW SASH**

- g. Insert glazier's points every 100 mm (4 in.).
- h. Roll putty into a 6 mm (1/4 in.) thick rope and press it into place, being sure it sticks to the wood and the glass.
- i. Use a putty knife to dress the putty surface, bevelling it the same as the other side of the rebate. If the putty sticks to the knife, wet it with a sealant.
- j. Let the putty dry for one or two weeks before painting.

9.3.2 Aluminum Windows

- a. The glass in some aluminum windows is held in place by a gasket. Pull the gasket from the window frame to remove the glass. If the gasket has deteriorated, buy a new one of the same shape.
- b. Remove the broken glass from the frame. Wear gloves to prevent cuts. Be sure all small pieces have been removed.
- c. Lay a new pane carefully in the frame. It should be .8 mm (1/32 in.) smaller than the frame.
- d. Replace the gasket by pressing it under the frame lip, working from corner to corner.

Note: If the incidence of glass breakage is high, consider using light-weight polycarbonate or transparent acrylic plastic sheet.

9.4 Repairing Doors that Bind

When doors bind, the problem may be due to house settlement (see Figure 9-4). If the settlement is minor, sand or plane the door or frame to eliminate sticking.

If the settlement is major, find the cause and prevent further settlement by using jacks or other means.

9.5 Preventing Swelled Wood

When wood is removed from the door or frame when rectifying a problem, finish the bare wood to match the door in order to prevent absorption of moisture and subsequent swelling.

9.6 Straightening Bowed and Warped Doors

A bowed door can be straightened by placing it horizontally on supports at both ends with the bulge up. Then pile heavy weights such as bricks on the bulge for a few days.

If a door is warped on the hinge side, install a third hinge between the two existing hinges to correct it.

When the door is warped on the latch side, remove the doorstop from the frame and place it matching the edge of the door in the closed position.

9.7 Tightening Loose Screws

Tighten all loose screws on strike plates, latches and hinges. If the screws are loose because of enlarged holes, use larger screws or fill the holes with wood putty and reset them.

9.8 Repairing Binding Doors

If the door binds because of loose hinges, check for loose screws holding the hinges. Repair as detailed in 9.7. See Figures 9-5 to 9-7.

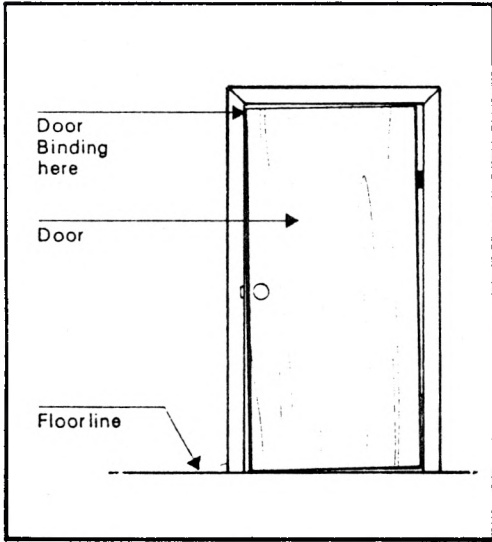


FIG. 9-4 POORLY ADJUSTED DOOR

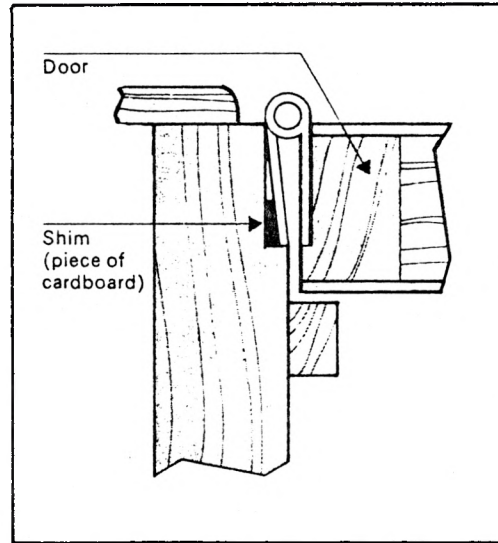


FIG. 9-5 INSERT STRIP OF CARDBOARD UNDER LEAF OF HINGE, TO THE FRONT

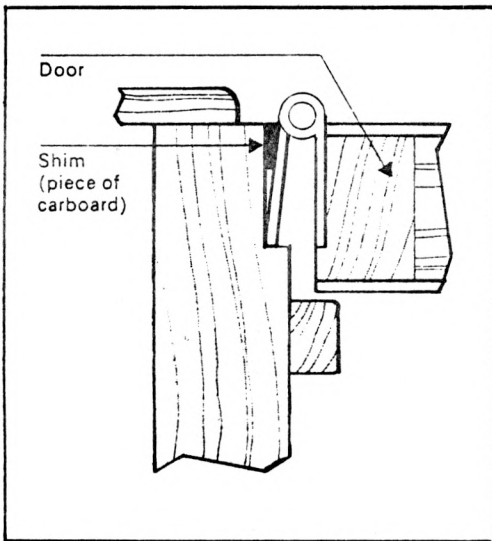


FIG. 9-6 INSERT STRIP OF CARDBOARD UNDER THE LEAF NEXT TO THE PIN

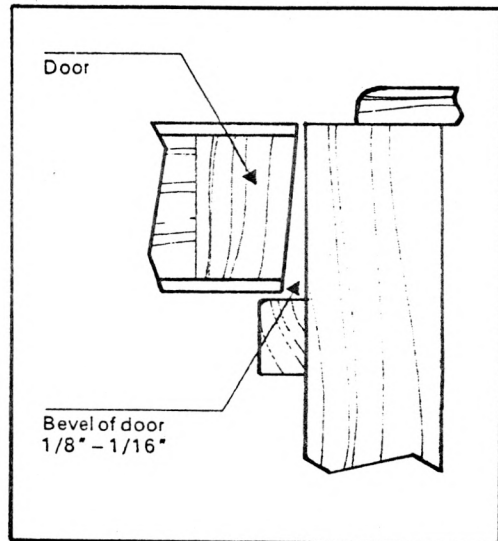


FIG. 9-7 BEVEL LOCK EDGE OF DOOR

When the door binds against the frame, locate the points where it sticks. Put a cardboard shim under the bottom hinge in the joint if the door binds on the latch side. Shim the top hinge if the bottom binds.

When the door is hard to close, insert a narrow cardboard shim between the jamb and the leaf of each hinge. It is easy to see the many variations possible by using one or two pieces of cardboard under each hinge.

Sand or plane off a small amount of wood if the door still binds at the top or bottom and the hinges have been shimmed. Planing is the last resort and should be done with the grain of the wood.

Bevel the lock edge of the door at least .6 m (1/16 in.) to compensate for the swing of the door.

9.9 Repairing Strike Plates

When the latch does not reach the strike plate and the door does not stay closed, remove the strike plate and place a cardboard shim under it so that the strike plate will be nearer the door.

When the door sticks, check the screws holding the strike plate. Tighten all screws as detailed in 9.7.

If the door keeps opening because the latch does not enter the strike plate opening, file the opening to make it larger.

When it is too much out of line, follow these steps to repair it:

- a. Remove the latch plate.

- b. Extend the mortise to the new position.
- c. Fill the screw holes with plastic wood.
- d. Refit the strike plate in the mortise.
- e. Fill in the exposed mortise with wood putty.

10.0 FLOORING

10.1 Care and Maintenance

10.1.1 Wood Floors

10.1.1.1 Cleaning

Sweep with a dust mop or soft broom. Clean with a string mop or scrubbing brush dampened in cold water. If the floor is very dirty, use a lukewarm soap solution. Mop up excess water as quickly as possible to prevent damage.

10.1.1.2 Preservation

Wax and polish hardwood floors using a paste wax. Do not wax softwood floors. Instead, paint them with floor enamel when necessary.

10.1.2 Linoleum

10.1.2.1 Cleaning

Sweep with a dust mop or soft broom. Clean with a string mop dampened in cold water, or use a lukewarm soap solution.

10.1.2.2 Preservation

Use a paste floor wax or water emulsion wax. Polish if required. Never use solvents.

10.1.3 Tile Floors: Asphalt, Rubber and Vinyl Asbestos10.1.3.1 Cleaning

Sweep with a dust mop or soft broom. Clean with a mop dampened in cold water, or use a lukewarm soap solution.

10.1.3.2 Preservation

Apply a thin coat of water-emulsion type liquid wax (thick coats usually look bluish or milky). Polish or buff to obtain a harder finish.

10.1.4 Sheet Vinyl Flooring10.1.4.1 Cleaning

Vacuum or sweep with a dust mop or soft broom. Clean with a sponge mop and mild detergent solution. Mop up suds as you clean, and rinse with clean water.

10.1.4.2 Preservation

Some types of sheet vinyl flooring do not require additional care such as waxing. If loss of gloss occurs, original shine may be restored by applying a thin coat of acrylic floor polish. Rubber-backed mats may cause staining of vinyl surfaces, so do not use them.

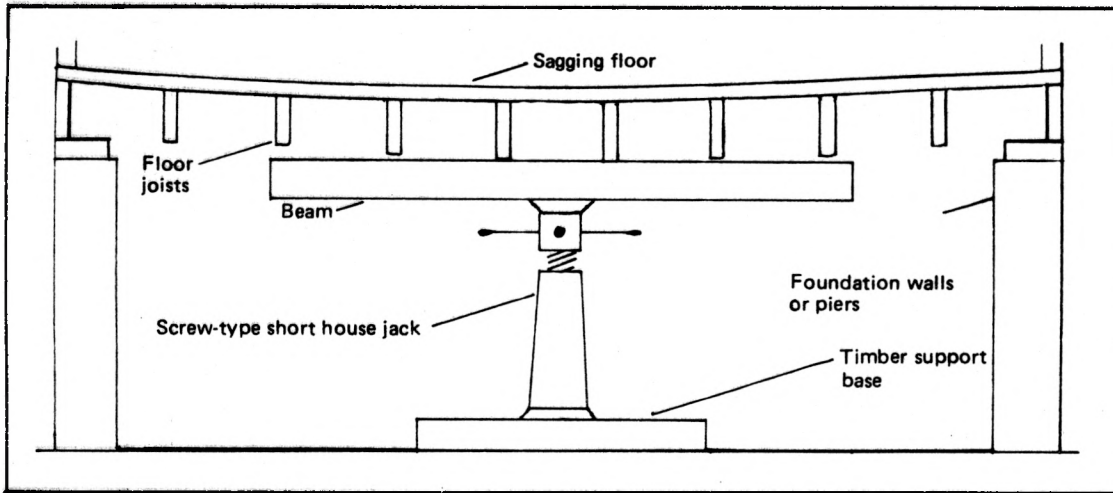
10.1.5 Concrete Floors

Mop or scrub with water or a soap solution. Clean unsealed concrete with damp sawdust to cut down dust. Concrete floors may be sealed with a clear masonry sealer to reduce dust and to give a better appearance.

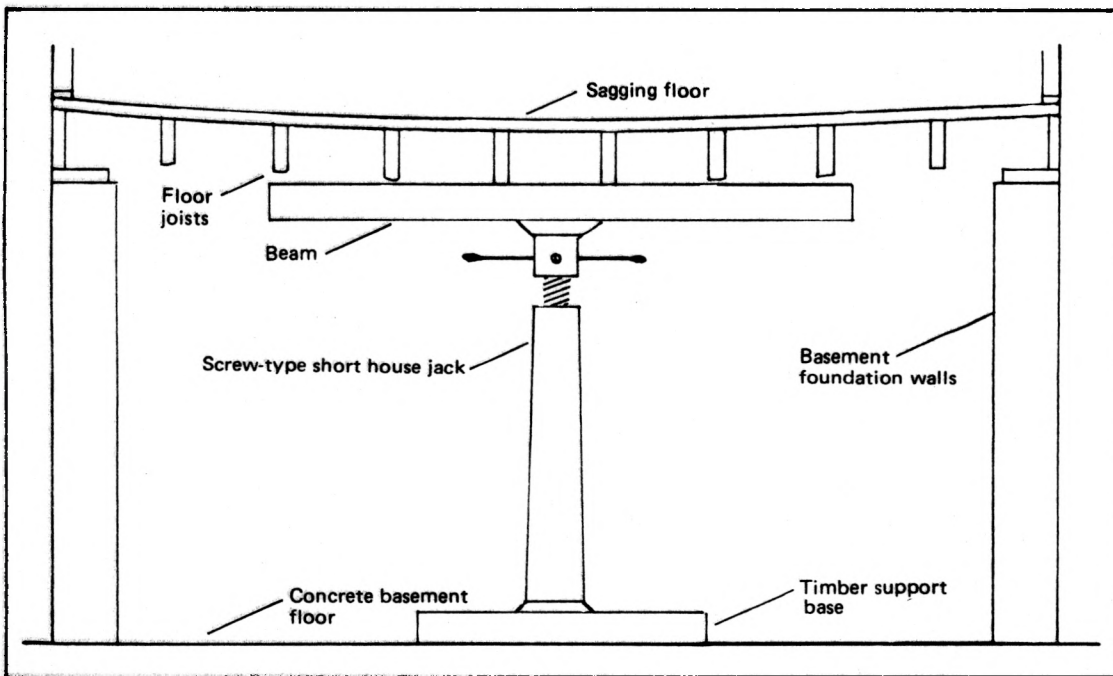
10.2 Repairing Sagging Floors

Floors may sag when joists are undersized, improperly placed, improperly spaced or have an excessive span. Sagging floors can cause a multitude of problems around the house ranging from sticking doors and windows, squeaks in floors, cracks in walls and ceilings, to leaks in roofs. Use a level to check whether your floors are sagging. Here is one method of raising sagging floors: (see Figure 10-1)

- a. Place some heavy planks three feet long on the basement floor. This will act as a base for the jack to distribute the weight.
- b. Place an adjustable house jack on the planks and install a heavy beam on the house jack. Use two 2 in. x 6 in. or two 2 in. x 8 in. pieces of lumber nailed together along their length.
- c. Tighten the jack until it is snug up against the joists, then tighten it an extra quarter turn.
- d. Wait a week and add another quarter turn if needed. Follow this timing to lift the floor until it is level. Do not lift it any faster or you may cause structural damage or cracks.



10-1.1 HOUSE JACK IN CRAWL SPACE



10-1.2 HOUSE JACK IN BASEMENT

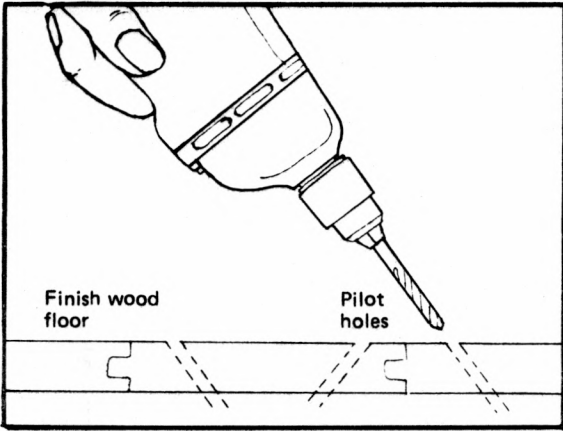
FIG. 10-1 REPAIRING SAGGING FLOORS

- e. If the sagging area is large, use a long beam with adjustable jacks at each end.

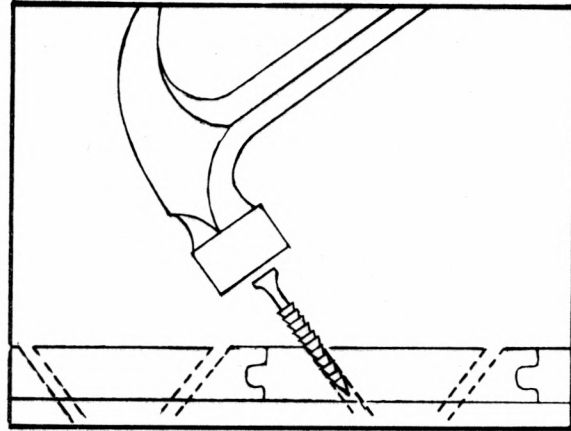
10.3 Repairing Squeaky Floors

Most hardwood floors develop squeaks at one time or another. Squeaks are usually caused by loose boards rubbing against one another or against a nail. The loose boards may be caused by poor construction, using improperly cured lumber, changes in wood due to humidity, or just old age. To repair a squeaky floor, just find the exact location of the squeak, then use one of the following methods to repair it:

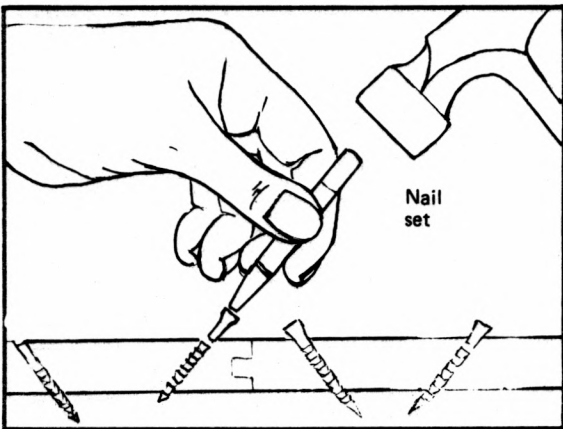
- a. Nailing from above: (see Figure 10-2)
 - (1) Drill small pilot holes through the hardwood into the joists or subfloor.
 - (2) Drive special flooring nails (they have rings around them with shaped edges for extra holding power) into the joists or subflooring.
 - (3) Use a nail set to countersink the nailheads about 3 mm (1/8 in.) below the floor surface.
 - (4) Fill the nail holes with wood putty and sand when dry.
- b. Solid blocking between joints: (see Figure 10-3)
 - (1) Cut a section of 50 mm x 200 mm (2 in. x 8 in.) lumber to fit between the joists where the squeak is.



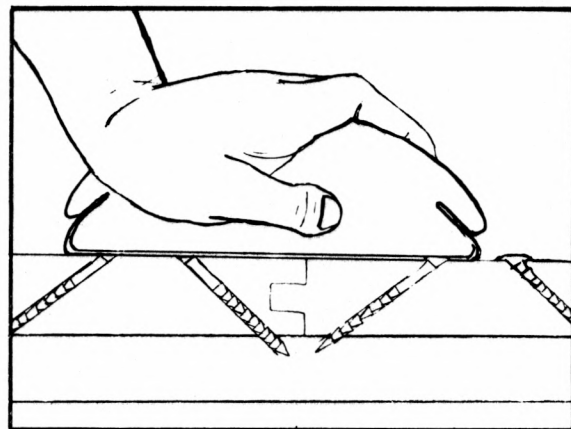
10-2.1 DRILL PILOT HOLES THROUGH HARDWOOD INTO JOISTS OR SUBFLOOR



10-2.2 DRIVE SPECIAL FLOORING NAILS INTO JOISTS OR SUBFLOOR



10-2.3 COUNTERSINK NAILHEADS



10-2.4 FILL NAIL HOLES WITH WOOD PUTTY AND SAND

FIG. 10-2 REPAIRING SQUEAKING FLOORS BY NAILING FROM ABOVE

(2) End-nail the piece of lumber into place between the joists.

c. Screwing down loose floorboards: (see Figure 10-4)

(1) Drill small pilot holes up through the subfloor.

(2) Use 1 in. or 1-1/4 in. wood screws to draw the flooring down to the subfloor.

(3) Use washers on the screws to get better holding power for the screwheads.

(4) Be careful to use the proper size screws so that the floor surface is not damaged by screws coming through.

d. Sealing floorboard ends:

If the joint at the ends of pieces of hardwood flooring opens up, put some graphite on the ends and seal the crack with wood putty.

e. Wood shims: (see Figure 10-5)

(1) Tap a thin wooden shim between the subfloor and floor joist if it squeaks

(2) Be careful the shim does not raise the flooring.

f. Sagging joints: (see Figure 10-6)

If the floor joists warp or sag, parts of them may not support the flooring adequately, causing a squeak. Place a piece of wood alongside the floor joists at the gap, prop the hardwood snug up against the subfloor, and nail it to the floor joist.

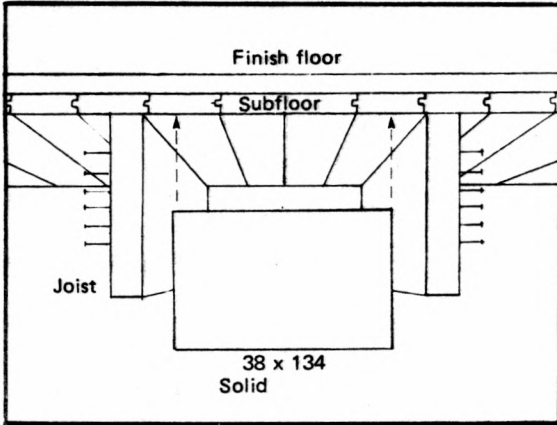


FIG. 10-3 REPAIRING SQUEAKING BY INSTALLING BLOCKING BETWEEN JOIST

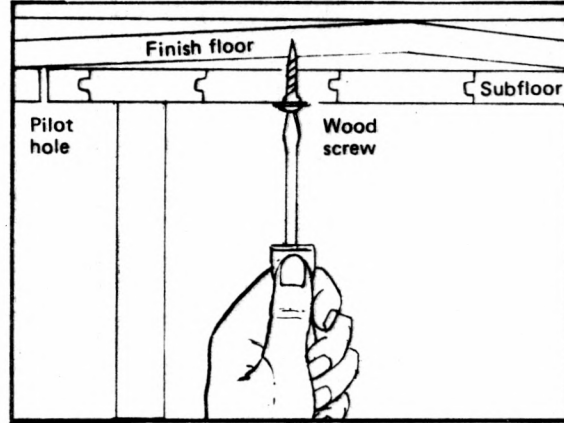


FIG. 10-4 REPAIRING SQUEAKING FLOORING BY SCREWING DOWN FLOORBOARDS FROM BELOW

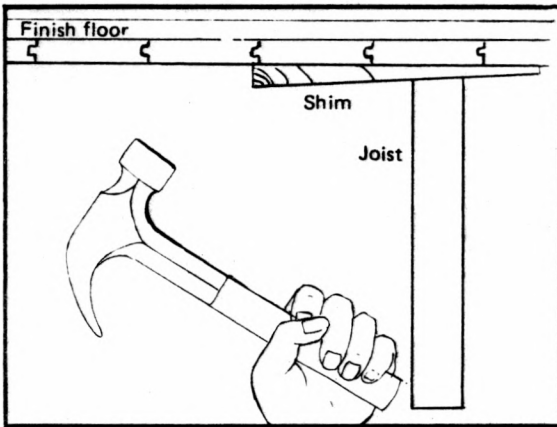


FIG. 10-5 REPAIRING SQUEAKING FLOORING BY SHIMMING

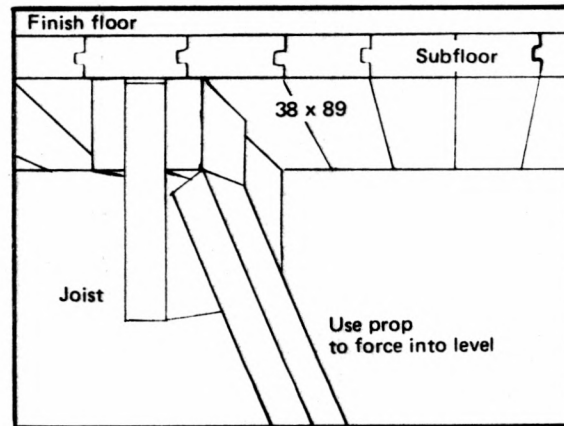
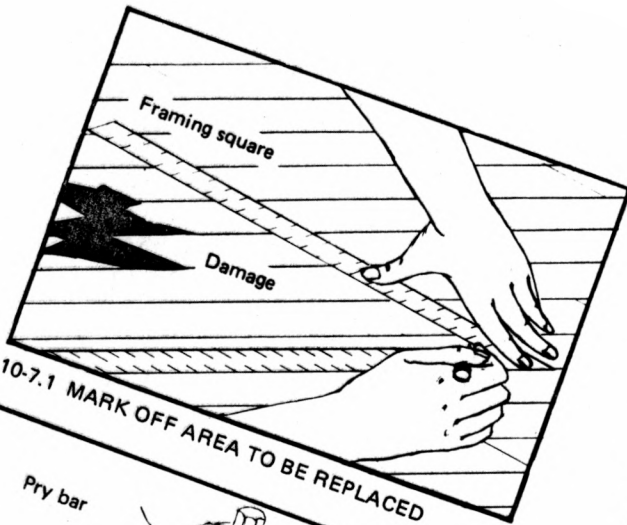


FIG. 10-6 REPAIRING SQUEAKING FLOORING BY PROPPING AND NAILING SUPPORT TO JOIST

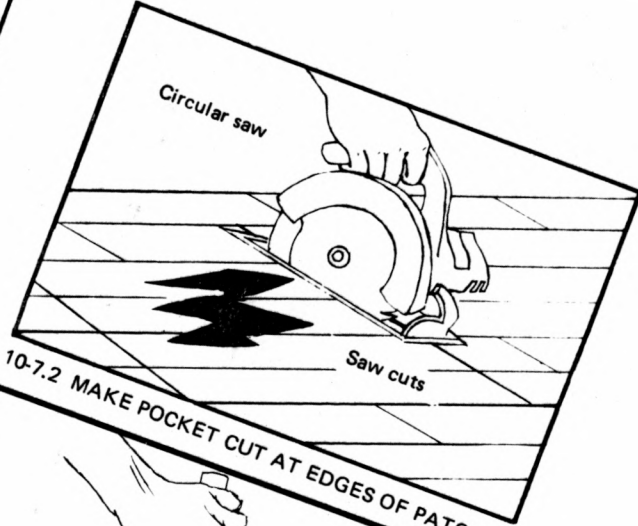
10.4 Patching Floors10.4.1 Wood Floors

The following steps may be used to replace warped, splintered, or curled hardwood floors: (see Figure 10-7)

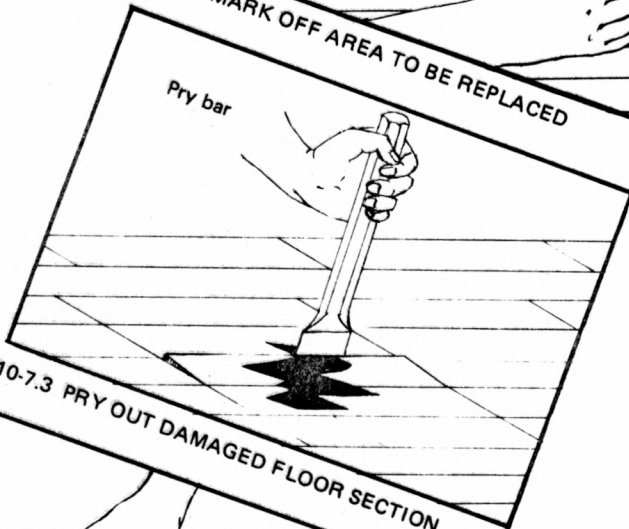
- a. Use a framing square to mark off the patch area.
- b. Use a circular saw to make a pocket cut at each end of the patch. Watch out for nails and be sure not to cut through the subflooring.
- c. Use a pry bar to remove the damaged flooring. Work it back and forth until the pieces come out. Be careful that you do not split any wood when removing nails.
- d. Clean the edges of the good flooring and make sure the subfloor surface is smooth and even.
- e. Carefully cut new boards for the patch. Make a snug fit.
- f. Place the switch board in place using a finishing nail at the tongue. The next board's groove will hide the nail-head.
- g. Chisel the bottom groove off the last board.



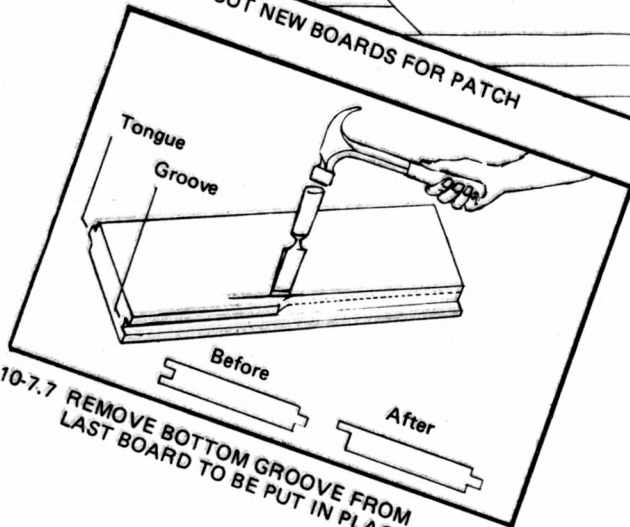
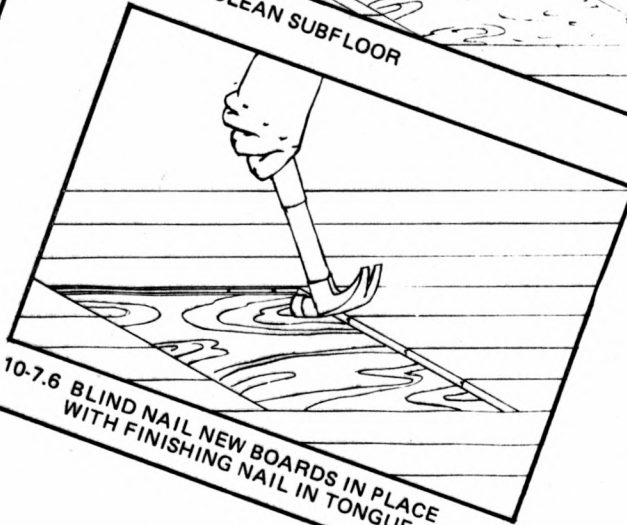
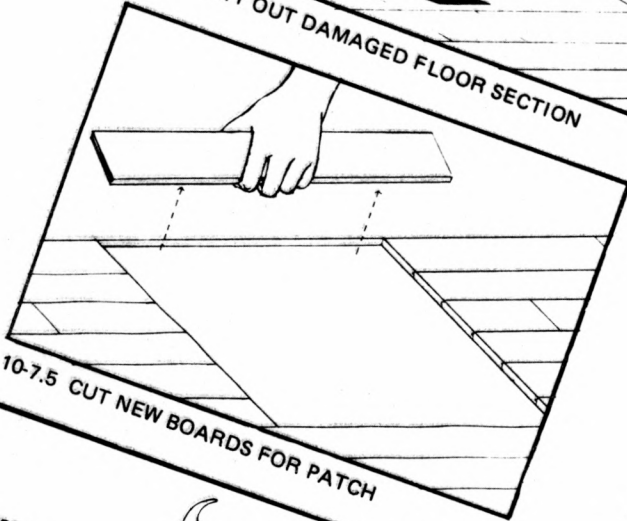
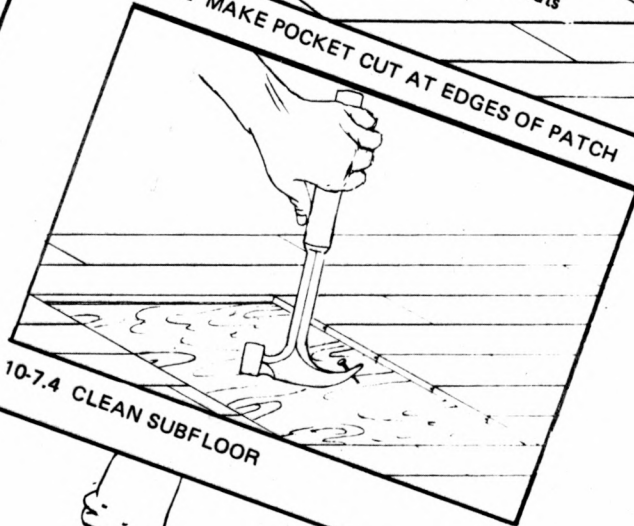
10-7.1 MARK OFF AREA TO BE REPLACED



10-7.2 MAKE POCKET CUT AT EDGES OF PATCH



10-7.3 PRY OUT DAMAGED FLOOR SECTION



10-7.7 REMOVE BOTTOM GROOVE FROM LAST BOARD TO BE PUT IN PLACE



10-7.8 GLUE LAST BOARD IN PLACE

FIG. 10-7 SEQUENCE IN PATCHING A WOOD FLOOR

- h. Apply glue to the subfloor, tongue, and half the groove. Put the last piece into place. Use a wood block to protect the hardwood when tapping it into place.
- i. Place a weight over the glued section so so that it bonds to the subfloor

10.4.2 Tile Flooring

Damaged tiles can usually be easily replaced. follow these steps:

- a. Soften the tile and adhesive by working a warm iron over it. Be sure to apply heat only to the tiles you want to remove.
- b. Slip a putty knife blade under a corner of the loosened tile and lift. Do not pry against the edge of adjacent tiles as you will loosen them.
- c. Scrape all the old glue from the subfloor and make sure it is smooth and even.
- d. Apply a thin coat of adhesive to the subfloor with a serrated spreader or brush. Use the adhesive the dealer recommends for the particular tiles you use.
- e. Place the new tile on the subfloor--do not slide it into place.
- f. Clean the adhesive oozing from the joints and put a weight on the tile for a few days to ensure that the tile is glued in place.

10.4.3 Sheet Flooring

If your sheet flooring is damaged and needs replacement, just remove a small section, following these steps:

- a. Use a framing square to mark off a rectangular section to replace. Cut out the flooring with a linoleum or utility knife.
- b. If the flooring is glued down, apply a little heat with an iron to soften the adhesive, then pry off the flooring section.
- c. Lay the cut-out section on a piece of matching material and trace around it. Be accurate to ensure a good fit.
- d. Use a framing square or other straight edge as a guide when cutting.
- e. Clean the subfloor section well so that the patch will lie flat and even.
- f. Apply adhesive to the subfloor with a serrated spreader or brush and lower it into place.
- g. Wipe off any adhesive that squeezes from the edges of the patch and apply a weight for a few days to ensure the patch is glued in place.

11.0 RUGS AND CARPETS

11.1 Regular Maintenance

Carpets can remain in good condition with proper and regular care. Follow these tips to keep your carpet wear low and appearance high:

- a. Provide mats at all entrances to the house. It is easier to keep the dirt out of the house than to vacuum it up out of the rug.
- b. Keep the entrance mats clean, less dirt will be tracked into the house.
- c. Keep additional mats on hand for really dirty days.
- d. Keep the doors and windows closed on dirty days.
- e. Carry foods on trays to cut down on spills and stains.
- f. Do a thorough vacuuming regularly. A good rule of thumb is to vacuum light traffic areas weekly, medium traffic areas twice weekly, and high traffic areas daily.
- g. Remove spots and stains as soon as they occur or are discovered. They are easier to remove when fresh.
- h. Repair burns, rips, tears and other damage immediately.
- i. Provide thorough in-depth cleaning every two or three years as required. Thorough cleaning is done by liquid shampooing or steam cleaning.
- j. Use a vacuum with a beater bar built into the head or into a special head attachment to beat the carpet while vacuuming. This type of vacuuming is essential for cleaning regular types of carpet, particularly if the pile is dense.

- k. Change the vacuum bags when they are half full; suction is reduced as the bag fills up.
- l. Use a canister type of vacuum for light vacuuming or for a shag carpet where suction alone is required.
- m. The only daily care for shag carpet is to rake them to prevent damage from overvacuuming and tearing of the pile yarns.
- n. Use a surface brightener if the carpet looks dull after a period of time. Dullness results from an accumulation of soiling materials such as oils, dust, and other air-borne particles. There are several powder-type cleaners and spray-on foams available for this purpose.

Note: Some products leave a sticky residue on the carpet fibres that causes faster carpet soiling after cleaning. A good way to check the product is to place some in a dish and let it evaporate for a few days. If it sticks to the plate, it will stick to the carpet fibres and hold dust particles. If it dries to a powder, it can be vacuumed out.

- o. Use curtains, shades, or awnings to protect the carpet from direct sunlight and fading.
- p. Do not overwet the carpet when cleaning.

- q. When wet shampooing, place plastic film under the legs of furniture until the carpet is dry. This will prevent rust and other stains.

- r. Pooling or watermarking is a condition where the pile fibres take a permanent set. It is more common with some types of carpet than others and the reason for its occurrence is unknown except that traffic contributes to the condition. It cannot be changed once formed.

- s. Balls of fluff on the new carpet are merely loose bits of fibre left on the carpet during manufacture. The shedding should stop after a few months of use and vacuuming.

- t. If tufts arise from the pile surface, cut them off with scissors, never pull them out.

- u. Do not use ammonia or preparations containing ammonia on rugs. Also avoid soaps containing alkalies, such as heavy laundry soaps, strong dishwashing and floor scrubbing compounds, and wall and sink cleansers. The pile, and the dyes with which it has been colored, may be sensitive to alkaline solutions, which may cause discolouration or bleeding of colors, and may even damage fibres.

- v. Lift furniture--do not push or drag it over the carpet. This can seriously damage the fibres.

- w. Turn rugs around to face a different direction once or twice a year. This helps to distribute wear over the entire surface and lengthens the life of the rug.

- x. Do not dust small throw rugs by snapping or shaking them out windows or doors. The snapping may break the yarns in the backing even though they are firmly bound.

11.2 Stain Removal

11.2.1 General Remarks

In most cases accidental spills can be looked after with a minimum of trouble by following a few simple rules. Ninety per cent of all spills can be removed without staining if attended to before the spot starts to dry. Simply absorb the material in a cloth, then apply water to the spot, and absorb the material dissolved in the water.

Many major fibre manufacturers, carpet manufacturers, and maintenance equipment and supply firms make spot removal charts or stain removal information available to the public. This information is usually also made available when the floor covering is purchased and should be referred to for stain removal.

For detailed stain removal information covering a variety of problems, refer to A Professional Guide to Carpet Maintenance, published by the Canadian Carpet Institute, Montreal, 1976, 32 pp.

11.3 Carpet Repairs

11.3.1 Repairing Large Damaged Areas

- a. Cut the damaged area from the carpet.
- b. Be sure the pile of the replacement section lies in the same direction as the rest of the carpet.
- c. Be sure the colour and pile is matched.

- d. If there is no spare carpet for making the repairs, remove the carpeting from a clothes or linen closet to get a piece to make the repair.
- e. When cutting the damaged area from the carpet, try to make the cuts between the rows of pile and keep the cut rectangular in shape.
- f. Clean all the exposed flooring and approximately three inches of flooring from the edge of the cut under the carpet so that the double-faced tape will hold.
- g. Apply the double-faced tape to the floor, placing one-half of the width of the tape under the edges of the carpet
- h. Lift all four edges of carpet, remove the protecting paper from the tape, and lower the carpet onto the tape. Press firmly.
- i. Place the patch in the opening and press firmly into place.
- j. Blend the pile together at the seams.

11.3.2 Repairing Tears

- a. Make two cuts, one at each end of the tear, and perpendicular to the tear. They should be at least 100 mm (4 in.) apart, and between rows of pile. The cuts must be long enough to allow the carpet to be folded and taped underneath
- b. Fold the carpet back and completely clean the exposed floor and approximately three inches of flooring beneath the carpet.
- c. Apply the double-faced tape to the floor placing one-half of the width of the tape under the edges of the carpet.

- d. Lift the edges of the carpet, remove the protecting paper from the tape, and lower the carpet onto the tape. Press firmly.

11.3.3 Repairing Split Seams

- a. Where the edges of split seams have not been damaged, they may be repaired in the same manner as described in 11.3.2.
- b. Where the edges have been unravelled or are otherwise too badly damaged, it is necessary to cut out the damaged area and replace it with a new piece of carpet at least 100 mm (4 in.) wide as described in 11.3.1.

11.3.4 Repairing Burns

- a. If the burn is superficial, cut off the burnt fibre ends. This will restore a uniform colour. Fluff the uncut pile around the cut area to mask the missing fibre ends.
- b. If the above is not satisfactory, call a carpet dealer to refluff the burn area.
- c. Another method is to cut the burn out in a circular piece from the carpet. Insert a new piece (from leftover trimmings) into the hole and repair as in Section 11.3.1

11.3.5 Ripples and Humidity

Excessive humidity or damp weather can cause temporary buckling or ripples in a carpet. This will probably disappear with drier weather. If it doesn't, call a carpet layer to restretch the carpet, or rent a knee kicker and do the job yourself.

11.3.6 Static Electricity

To reduce static electricity, increase the humidity of the house with a humidifier.

12.0 EXTERIOR SIDING12.1 Brick, Block and Stone

The most common problem with brick, block and stone is crumbling mortar joints or cracks in mortar. Follow these steps to effect repairs:

- a. Use a hammer and chisel to clean out all loose mortar to a depth of 18 mm (3/4 in.). Be careful not to chip the brick, block or stone. Only solid mortar should be left in the joint or crack.
- b. Clean the joint or cracks with a wire brush.
- c. Wet the bricks and joints down so that they will not suck all the water out of the mortar when it is applied.
- d. Mix some packaged mortar with water on a board. Follow the manufacturer's directions on the bag.
- e. Pack some mortar into the joint or crack with a trowel. Hold the board with the mortar at the joint and push it into the crack with the trowel.
- f. Let the mortar dry a bit, then brush the joints with a soft wet brush.
- g. Tool the joints with a jointing tool or piece of pipe to match the surrounding mortar joints.

- h. Dampen the joints periodically for the next few days.

12.2 Bevel Siding

Common problems with bevel siding include peeling paint, splits, warping and rot.

One cause of peeling paint is moisture. Be sure wood is completely dry when you paint it.

Warping and splitting can be repaired without replacing the siding. Try renailing it in position with ring-shank nails, or gluing it. When the warp is excessive, cut the siding into two or three pieces and place the pieces back in their original position. Be sure to seal the saw kerfs with caulk.

If the board is rotted, it is best to remove it and replace it with a new section as follows:

- a. Remove as much of the rotted piece as possible without damaging the good surrounding siding.
- b. Make a vertical cut at each edge of the rotted piece with a key-hole saw.
- c. Slip a hack-saw blade underneath the rotted section and saw through the nails holding it in place.
- d. Remove the rotted section and set a new piece of siding in its place.
- e. Use a nail set to drive the heads of nails below the surface of the siding.

- f. Use wood putty to fill the nail head holes, and sand when dry.

12.3 Cedar Shakes and Shingles

The usual maintenance problems with cedar shakes and shingles are splits, cracks and breaks. If the shingle is split or cracked, try nailing it in place with ring-shanked nails. Then fill the nail-head hole with wood putty and sand when dry.

If the shake or shingle is broken, replace it with one from an inconspicuous spot on the house. Then replace that one with a new shingle or shake. Just pry out or saw through the nails holding the shingle/shake in place and remove the shingle/shake. Nail the replacement in position.

12.4 Plywood Siding

Common problems with plywood siding are splits, cracks and delamination. Normally just apply a caulk to the split or crack and nail the area with ring-shank nails or screws. Fill the nail-head holes with wood putty and sand when dry.

For delaminations, make sure the wood is dry, then apply a good quality adhesive and nail the area with ring-shank nails. Fill all nail-head holes with wood putty and sand the area when dry.

12.5 Hardwood Siding

Repainting and repairing splits and checks due to moisture are the normal maintenance items with hardwood. Repair splits and checks as detailed in 12.4. Replace the entire panel if it is badly

damaged, nailing with ring-shank nails, caulking joints, and filling nail-head holes with wood putty, and sanding.

12.6 Aluminum Siding

Aluminum siding is virtually maintenance free. The finish is factory applied and so does not require painting. The only recommendation for maintenance is to wash it with detergent and water every year or two.

13.0 ROOFS

13.1 General Remarks

In order to keep a roof in top condition and weatherproof, it should be inspected twice a year-- in spring and fall. Before inspecting a roof, be sure to take the following precautions.

- a. Do not climb on a highly pitched roof unless you are properly prepared and equipped.
- b. When walking on a roof wear rubber-soled shoes to provide a non-slip surface.
- c. Never walk on a roof in extremely hot weather as the roofing material may be very pliable and easily damaged.
- d. Never climb on a roof in wet or windy weather as chances of a fall are increased greatly.

13.2 Checking a Roof and Spotting Leaks

When inspecting a roof to see if it is in good condition, be sure to check for the following:

- a. ridges - Check for cracked, damaged, loose or missing shingles.
- b. valleys and vents - Check for cracked, damaged, loose, or missing shingles and unsound flashing.
- c. shingles - Check for loose, curled-up, damaged, or missing shingles.
- d. gutters and downpoints - Check to see that these are clear of obstructions, silt buildup, and blockages; that hangers are straight; and that there is proper slope and no leaks.

When water leaks through the roof and down onto the ceiling below, the leak does not necessarily show up directly below the point where it enters the house. Many times the leak in the roof is a distance away from where it shows up in the ceiling. If a roof is known to be leaking, crawl into the attic space or the space between the rafters with a flashlight on a bright and sunny day. Check the entire roof for pinpoint of light coming through. Push a small nail up at these pinpoint so that you can plug the holes from above with roofing cement. Also look for water stains on roof trusses, rafters, and sheeting. Mark the highest part of the water mark so that you can find it easily later. If there is no evidence of a leak, wait for rainy weather, then return to the attic or space between the rafters and check for running water, dampness, or other signs of leaks. Be sure to mark the highest part of the leaking area.

13.3 Repairing Roofs

13.3.1 Wood Shingles and Shakes

Repair cracked or split shingles with roofing cement. Renail loose shingles but be sure to predrill the nail holes as wood shingles are easily split when dry.

Remove rotted or damaged shingles and replace missing shingles by following this procedure:

- a. Remove the damaged or rotted shingle by splitting it in pieces along its grain.
- b. Remove any protruding nails with a hacksaw.
- c. Lay a new shingle and use galvanized nails to hold it in place. Drive the nails just below the adjacent course above the replaced shingle. Be sure to allow for wood swelling.
- d. Seal the nail holes with roofing cement.

13.3.2 Asphalt Shingles

Repair cracks and holes with roofing cement. Glue down any curled shingles using roofing cement.

Replace all shingles or the ones that are badly damaged using the following procedures.

- a. Pry up and remove nails holding the shingle. Use a screwdriver or flat shovel but do not damage adjacent shingles.
- b. Use roofing cement to seal the holes left by the nails.

- c. Cut a new shingle to fit the space and slip it into place.
- d. Lift the adjacent tile just above the replacement tile and nail the shingle to the roof.
- e. Coat the nail heads with roofing cement.

13.3.3 Roll Roofing

Repair all cracks, rips and otherwise damaged rolled roofing with roofing cement. To repair holes, apply roofing cement, nail a new piece of roofing on, then apply more roofing cement to seal the hole.

Replace badly damaged roll roofing.

13.4 Care and Repair of Flashings

Flashings are used wherever two or more surfaces on a roof meet--around plumbing vents, roof vents, chimneys, flues, roof valleys, dormers, and other miscellaneous roofing parts. It is usually a metal sheet (galvanized sheet metal, copper or aluminum) that spans the joint between both surfaces. The most usual defects in flashing are rusting, separation from the mortar holding it in place, and failure of the caulking.

Whenever a failure occurs it should be repaired at once by filling any cracks and patching any holes with roofing cement. A liberal coating should be applied whenever there is any doubt as to the flashings' condition.

13.5 Cleaning Chimneys and Flues

Chimneys and flues should be cleaned regularly. The frequency of cleaning depends on the use and the type of fuel used in the fireplace or burner. Some types of wood send creosote or tar up the

flue or chimney which cakes on the inside surface causing smoking or fires in the chimney or flue.

You can clean the chimney or flue yourself using the following method:

- a. Open the damper.
- b. Seal the fireplace opening or stove with a wet sheet, canvas or plastic sheet.
- c. Wrap chains, bricks or other heavy objects in canvas or heavy cloth and tie it to a long rope.
- d. Lower the bundle down the chimney or flue and work the rope up and down vigorously against the sides of the chimney/flue. Clean the chimney/flue all the way to the damper level using this method.
- e. Wet the soot down in the chimney/burner before you remove it.
- f. Be sure to remove any soot from around the damper before you close it.

13.6 Repairing Chimneys

Check the chimney cap to see if mortar has weakened and crumbled away. Chip away any loose mortar to a depth of 18 mm (3/4 in.) and replace as detailed in 12.0. Check the chimney for hot spots indicating a broken flue or firebrick and replace when found. Seal the joint around the flue so that water cannot enter and cause damage.

If the chimney has a spark arrester or rain guard to prevent sparks or embers from flying out, check these to ensure they are in working order and not a fire hazard to your house. Replace any that are damaged, rusted, or otherwise hazardous.

13.7 Providing Adequate Venting of Roof Spaces

Roof spaces require ventilation in order to remove moisture that is transmitted through the house structure. When this moisture is not removed, the consequences can be decreased effectiveness of existing insulation, rotting of framing and sheathing, shortened roof life, and other problems arising from water condensation, such as staining in ceilings, drips, and electrical short circuits.

Ventilation is easily provided by either soffit vents, gable-end vents, roof-type vents, or any combination of them. You should have a minimum of .1 m² (1 sq. ft.) of vent area for each 30 m² (300 sq. ft.) of insulated attic area, and the vents should be placed uniformly on opposite sides of the building. Be sure to choose vents so that insects and rain cannot gain entry to the roof space.

Check that vents are not clogged or blocked whenever paint peels from soffits or fascia.

13.8 Emergency Repairs to Roofs

If the roof is leaking, a quick emergency repair can be made by covering the leaking area on the roof with a sheet of heavy plastic or a plastic garbage bag. Spread the material over the leak, tuck the high edge of the material under the existing roofing, and tack down all the edges using strips of wood.

14.0 GUTTERS AND DRAINAGE

14.1 Wood Gutters

Wood gutters are not widely used today because they are heavy, susceptible to rot, and require frequent patching, waterproofing, painting, and replacement. They can be constructed by the homeowner in remote areas, however, at a reasonable price.

14.2 Steel Gutters

Steel gutters are available with enamelled or galvanized finishes. They are prone to rusting if not protected and thus must be painted regularly. They are relatively inexpensive and require replacement within about 5 years.

14.3 Aluminum Gutters

Aluminum gutters are available with enamel or plastic finishes. They are light, easy to handle and install, highly resistant to corrosion, and have a life of 10-20 years. They are however, not as strong as steel gutters, and can be dented by ladders. They are moderately priced.

14.4 Plastic Gutters

Plastic gutters are sturdy and durable (i.e. they resist rot, blister, and rust,) but they are expensive. They are available in white only and should not be painted. When installing, be sure to allow for expansion of the plastic to avoid buckling later. Metal hangers are used to support the gutters.

14.5 Gutter and Downspout Maintenance

Check gutters and down spouts twice a year--once in the spring before the rains and again late in

the fall after the leaves have fallen. Remove all debris from the gutters and look for holes and rust spots. Debris not only blocks water flow but holds moisture that causes rotting or rusting.

Check the gutters for proper slope (about 1 cm drop per metre (1/8 in. per ft.) of gutter). Lift any sagging areas so that all water drains away.

When debris has been removed and gutter slope has been checked, run water in the gutters to clean them completely. If any areas show rust, scrape or wire brush them, then apply a coat of roofing cement.

If the downspout is blocked, use a hose to flush out the debris or a water closet auger to worm it out.

When leaves are an especially bad problem, place a strip of vinyl coated screening over the gutters. Nail the screening under the first course of shingles to fix it in place. Strainers can be placed at the top of downspouts to prevent clogging if this happens frequently.

14.6 Repairing a Leaking Gutter

Follow these steps to repair a leaking gutter:

- a. Clean all dirt and debris away from the damaged area, using a wire brush, steel wool, or sandpaper.
- b. Wipe the cleaned area with a rag soaked with solvent.

- c. Apply a thick coat of roofing cement to the damaged area.
- d. For holes larger than 6 mm (1/4 in.) place a piece of galvanized sheet metal over the hole and cement in place with roofing cement. Then cover the patch with another coat.
- e. For very large areas, use a large piece of galvanized sheet metal to cover the damaged area. Use pop rivets or sheet metal screws to hold it in place. Then cover the entire area with a thick layer of roofing cement. Be sure to use steel fasteners with aluminum gutters etc., to avoid a chemical reaction that will cause corrosion.

14.7 Repairing Leaking Downspouts

Leaks at downspouts usually occur at seams or joints. Use a butyl caulk or other good silicone seal to repair these.

14.8 Splash Pads

Water collected by gutters and drained by downspouts should be directed away from the house to prevent soil erosion near the house, structural problems in the house due to moisture, and water leaks into the basement. One method of doing this is to direct the water onto a concrete pad which deflects the water far enough away so that it will not cause problems.

Splash pads are available from building supply centres or can be made at home.

14.9 Dry Wells

Another method of disposing of roof drain water is to drain it to a dry well - usually a 45 gallon

drum, punctured and filled with large stones or coarse gravel and buried in the ground beside the house.

15.0 SANITATION

15.1 Drinking Water: General Recommendations

If drinking water comes from either a well or a spring, take care to keep the source unpolluted. Do not let surface water contaminate the supply. This might mean building a fence to keep animals away. Locate privies, sewage disposal fields and pits at least 30 m (100 ft.) from the source of the drinking water supply, and take advantage of grade levels to direct drainage away from the water supply.

It is not safe to assume that clear, colourless and odourless water is free from impurities. If possible, send a sample of the water to a laboratory for analysis. If the quality of the drinking water is not reliable, use these methods to make it safe for drinking:

- a. Boil for 5 to 10 minutes to kill the germs. Then pour the water into a clean, covered container and store in a cool place.
- b. Alternatively, add a chlorine compound to kill the germs.

15.2 Batch Chlorination of Drinking Water

One method is to add 2 mg/L of chlorine to water, using small portions of a 3 per cent stock solution. When using Perfex, Javex, Chlorex, etc., which have 5 1/4 per cent available chlorine,

reduce the dose by slightly less than half. Commercial suppliers sell a 12 per cent solution in 23 L (5 gallon) bottles. The use of solutions is simpler and therefore better for small amounts of water.

However, the use of calcium hypochlorite is less expensive, and preferable for larger amounts of water. Here is how to chlorinate the water:

- a. Prepare a 3 per cent solution of calcium hypochlorite by adding 15 ml (one level tablespoon) of high test hypochlorite, which contains about 70 per cent available chlorine, to 0.31 L (1 half pint) of water or 30 ml (two level tablespoons) to (one pint) 0.6 L of water. Allow the hypochlorite to settle. Then pour off the clear liquid.

- b. Mix the 3 per cent solution in the water to be treated. Use the following proportions:

Quantity of Water (Litres)	Quantity of 3% Solution
5	.07 ml
25	1.65 ml
250	16.5 ml
1 000	66 ml
2 500	165 ml
5 000	330 ml

Equivalent in imp. gal.

1	6 drops from a medicine dropper
3	19 drops
16	1 tsp.
50	1/2 oz.
100	1.1 oz.
250	2 2/3 oz. (1/3 cup)
500	5 1/3 oz. (2/3 cup)
1,000	10 2/3 oz. (1 1/3 cup)
5 ml	= 1 standard teaspoon
1 standard cup	= 8 imp. fl. oz.
1 imp. fl. oz.	= 1.04 U.S. fl. oz.
1 ml	= 21 average drops
160 imp. fl. oz.	= 1 imp. gallon
128 U.S. fl. oz.	= 1 U.S. gallon
1 imp. gallon	= 1.2 U.S. gallon

ABBREVIATIONS:

ml	- millilitre
U.S.	- United States
fl. oz.	- fluid ounce
imp.	- imperial

- c. Make sure that the chlorine is well mixed with the water. While pumping into a tank, add the chlorine. Generally, the jetting action of the incoming water mixes the chlorine adequately. In haulage tanks the movement of the tank provides the mixing.

- d. Provide a chlorine contact time of at least 20 minutes. In the case of haulage tanks, this is generally provided in travelling.

16.0 FIRE

16.1 Emergency Procedures

If you wake up at night and smell smoke, first feel the bedroom door. If it is hot, do not open it as this will spread the fire. If the room is upstairs, do not jump to the ground. Open the window and call for help.

When fire breaks out, evacuate everyone first, then call the fire department if there is one in the area (The number should be written next to the phone). Never re-enter a burning building. Notify neighbours on each side of the house to prepare to evacuate their houses if necessary.

16.2 Fire Prevention

Following the rules below will help to guard against fire.

1. The most frequent causes of fires are carelessness and untidiness. Keep the house clean and free of litter at all times.
2. A fire extinguisher should be installed in each house (10 lb. ABC type). A preferred location for mounting is near an exit door.
3. Plug only one electrical appliance into each outlet.
4. Use only appliances approved by the Canadian Standards Association (CSA) or Underwriters Laboratories (UL). All approved appliances are so labelled.

5. Do not use gasoline for cleaning, and do not store it in the house.
6. Do not leave small children unattended.
7. Before leaving the house, even for a short time, make a check:
 - Are ashtrays safe?
 - Is the stove shut off (Oil-fired heating stoves should be turned down)?
 - Is the thermostat turned low enough?
 - Is the electric iron unplugged and on a stand?
 - Are electrical appliances unplugged?
8. Check flammable curtains or drapes so that they cannot blow over ashtrays, electric bulbs, TV sets, space heaters, stoves or portable heaters.
9. Snuff out matches and place them in large, clean ashtrays. Never throw matches into waste baskets or garbage pails.
10. Do not light matches in closets or small enclosures. Use a flashlight if more light is required.
11. Replace worn or broken cords on lamps and electric appliances. Do not roll or drag furniture over cords; this can break the

wires inside. Do not run electrical cords under rugs or string them around the room on nails.

12. Do not let grease collect around the stove. Do not run clotheslines over stoves and heaters and combustible material such as paper. Keep boxes and furniture away from heaters.
13. Do not empty ashtrays before you go to bed. Instead, empty them into a covered metal container in the morning.
14. Do not put Christmas trees where they obstruct exits or stairways or are exposed to direct heat. Turn off Christmas tree lights when leaving the house or going to bed.
15. Consideration should be given to installing smoke and heat detectors in appropriate locations.
16. Never smoke in bed.

17.0 REFERENCE LIST

Autry, James A. 1980. Better Homes and Gardens Complete Guide to Home Repair, Maintenance and Improvement. Des Moines, Iowa. Meridith Corp.

Carrell, Al. 1971. Super Handyman's Encyclopedia of Home Repair Hints. Englewood Cliffs, N.J. Prentice-Hall, Inc.

Canadian Carpet Institute. 1976. A Professional Guide to Carpet Maintenance. Montréal, Quebec.

Harris, Cyril M., ed. 1975. Dictionary of Architecture and Construction. New York. McGraw-Hill, Inc.

Health and Welfare Canada. 1973. Sanitation Manual for Isolated Regions (5th ed.) Ottawa.

Liles, M.D. and R.M. 1974. Good Housekeeping Guide to Fixing Things Around the House.

National Research Council of Canada, Associate committee on the National Building Code. 1977. Residential Standards, Pub. No. NRCC No15563 Ottawa.

Nunn, Richard E. 1972. Popular Mechanics Complete Manual of Home Repair and Improvement. New York. Book Division, Hearst Corp.

Readers' Digest Association (Canada) Ltd. 1977. The Readers' Digest Complete Do-it-yourself Manual. Montreal, Quebec.

Readers' Digest Association (Canada) Ltd. 1977. Readers' Digest Fix-it-Yourself Manual. Montreal, Quebec