

HEALTHY BUILDINGS

A handbook for the maintenance of

RURAL HEALTH FACILITIES

UNDP/ILO RURAL HEALTH SERVICES
INFRASTRUCTURE DEVELOPMENT PROJECT
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1.0 INTRODUCTION

1.1 Foreword

This handbook is written to help both a Provincial works team and the staff themselves to look after a rural clinic or health centre.

Although this handbook is directed towards health facilities, it is possible to use it for other buildings such as schools, houses and government offices.

This handbook helps you to look after your buildings by giving you:

A '**preliminary inspection**' list of things to look at first of all

A '**monthly inspection**' list of things to check each month

An '**annual inspection**' list of things to check each year

A list of things to check after a **cyclone or earthquake**

Ways to **recognise common building problems** and what to do about them

Simple ways to work out **how much material** is needed

Helpful hints on **how to build** properly

A list of **common words** used in the building industry

A recommended minimum list of **tools required**

Examples of completed check lists to help you fill in your own

Other problems may exist or new ones arise which are not covered in this handbook: these can be included in a later version. If you have any problems in using the handbook or comments to make you are invited to send these to the ILO office in Honiara.

1.2 Background

There are many clinics, area health centres and nurse-aid posts throughout Solomon Islands, some new and some old. All of them need to be properly looked after so that proper health services can be provided in a clean and hygienic manner, and so the staff and patients alike are happy and can take pride in what they do.

A building is like a garden - it has to be properly cared for it so it remains productive. It must be regularly maintained so anything that can cause it harm can be fixed and the building remain healthy and useful as long as possible.

It is important to be able to see what needs fixing in a building as soon as possible because the longer it is left, the bigger a problem gets. The time to fix something that needs fixing in a building is **now**.

Like everything in this world buildings do not last forever - dust to dust, ashes to ashes. How long a building will last depends on how it was made, the materials used and how well it has been looked after. Some parts of a building will last longer than others because of the materials used - concrete, steel, timber, plastic. Some parts of a building need to be cared for more than others because they are the most used or are made materials that last for only a short time - toilets, doors, waiting areas, guttering. For this reason it is possible to plan which and how often what parts of a building should be inspected to spot the problems as they arise and before they get bigger and more difficult to fix.

There are many reasons why buildings can be damaged, but also ways to avoid damage for which prevention is better than cure:

Cyclone and earthquake	-	Make the building stronger
Insects & animals	-	Keeping the building clean & dry
Laziness or slackness	-	Deal with problems so they don't get bigger
People	-	Repair damage when it happens
Poor construction	-	Recognising and correcting faults
Rain and sun	-	Keep the building dry, shaded and ventilated
Tress, and other objects	-	Keeping the area clear

This manual helps you to keep your building healthy and working properly by showing you how to deal with these problems.

1.3 Available resources

It is expected that this handbook will be kept with each Province and that there are photocopying facilities available to make copies of the lists for inspections.

It is assumed that each Provincial works team has a Provincial works officer or his representative who can visit each facility at least once a year for an annual inspection beginning with the preliminary inspection.

It is assumed that each Province has a Provincial works team comprising minimally a carpenter, plumber and electrician who are mobile and have access to materials to carry out whatever work is necessary.

It is assumed that each rural health facility will have a 'maintenance officer' who is responsible for routine and regular maintenance and who will have at least a basic knowledge of carpentry, painting and gardening. It is not expected to rely on this person for plumbing or electrical work or other than the most basic of building work.

It is expected that all staff at the rural health facility will be prepared to assist their maintenance officer in routine tasks as may be necessary:

There is a section at the end of this handbook which lists a minimum recommended tool kit. It is suggested that this be kept on hand under close control at each of the facilities for the use of the staff maintenance officer and if necessary the Provincial works team.

Samples of the completed check lists have been included in the handbook to help you write down what problems may be found so that other people can understand and know what to do, .

1.4 How to use this handbook

Regular inspection:

Use the check lists in the next section of this handbook to look at a building and write down what problems you have seen. There are three types of list:

The first is the '**Preliminary inspection**' list. Because some of the problems in a building are due to the way it was built rather than age or use or damage, it is important to fix these where possible at the very beginning. Most of the things on this list can only be fixed by the Provincial works team.

The second is a '**Monthly Inspection**' list for routine maintenance and is designed for the staff maintenance officer to regularly keep an eye on the building. If the maintenance officer is unavailable the list is simple enough to be used by someone else who can write down any problems seen.

The third list covers '**Annual Inspection**' which lists the things that should be looked at perhaps once a year. Of course if you see something on this list that needs fixing at any time during the year it should be fixed immediately. Most of the things on this list can only be fixed by the Provincial works team.

The fourth and fifth cover the things to check after a '**cyclone**' or '**earthquake**'. Some of these items can be fixed by the staff maintenance officer, but most only by the Provincial works team.

Problems and how to deal with them:

To help show what things are problems that need fixing there is a section with photographs and a description of the work needed to fix that problem. This is divided into the different trades that will be needed to maintain the building.

Useful information:

You can use the information in the last section of the handbook to help make a good job of your maintenance or repairs, to measure up what materials you may need, and to be able to explain clearly to someone else what part of a building needs to be repaired.

1.5 How to carry out the inspection

This handbook is made of a special plastic paper which will not rot or be eaten by insects. Photocopies can be made of the lists and other information. At the beginning of the year each facility should have available:

- 18 monthly inspection lists (enough in case some get lost or damaged)
- One monthly check list (to tick off inspections for each of 12 months)
- One copy of the annual check list
- One copy of the cyclone and earthquake damage lists (in case of need)
- One copy of the preliminary inspection list (for the first inspection only)

Preliminary inspection:

The first inspection should be carried out by the Provincial works officer and the staff maintenance officer. They will use will use the preliminary, annual and monthly inspection lists at the same time to closely inspect all the buildings and write down what problems have been found. Together they can decide what work can be done by the Provincial works team and what can be done by the staff themselves. The section on 'simple ways to measure' can help the Provincial works officer work out what materials may be required.

Monthly inspection:

This inspection will be carried out by the staff maintenance officer using a monthly inspection list. Using the section on 'problems and how to deal with them' he or she should decide whether problems found can be easily fixed or they will need help from the Province. A simple way to ask for help is to send the Province a copy of the list with a covering letter.

Annual inspection:

This inspection will be carried out by the Provincial works officer using the annual inspection list. Using the section on 'problems and how to deal with them' he or she should decide whether problems found need help from the Province or can be fixed by the staff maintenance officer. A simple way to ask for help is to send the Province a copy of the list with a covering letter.

Cyclone and earthquake inspections:

These inspections should be carried out by the staff maintenance officer as a means to share the load of disaster response. A copy of this list should be sent to the Province whether or not there has been damage.

2.0 REGULAR INSPECTION

2.1 Preliminary inspection

Termite attacks

Examine the trees, walls, ceilings, cabinet work and frames for evidence of termite attack
SECTION 3.1

Roof sheeting and flashings in place

Inspect all the roofs and all edges and changes of pitch and direction of the roofs to confirm that the edge of the roof is dressed against the bargeboards with proper flashings to stop rain from blowing under the roof
SECTION 3.7

Fascias and bargeboards are in place

Look at all the roofs to be sure that the ends of rafters and purlins are protected from the weather by timber boards
SECTION 3.8

Guttering is in place

Check all roofs that rainwater either falls to a gutter or onto the ground where there are proper ground drains to prevent erosion and flooding
SECTION 3.14

Roof structure properly built

Examine how trusses have been built and rafters and beams connected together to be sure they are strong and well-built
SECTION 3.6

Cyclone strapping

Examine the roof and how the walls are tied to the floor or ground to make sure there is proper strapping and reinforcement
SECTION 3.6

Steel frame is in good order

Examine all steel frames especially close to the ground to see if they are rusting through
SECTION 3.5

All bolts are fully tightened

Test each and all bolts used to be sure they remain tight and in good condition
SECTION 3.5, 3.6

Cracks in walls, floors and foundations are monitored
Make a record of where any cracks appear and test them for further movement if they appear to be getting bigger
SECTION 3.3, 3.4

Gable end windows have head flashings or sun screens
Look along the tops of all windows where there is no proper roof overhang to be sure that a proper flashing or metal drip has been placed along the top of the window
SECTION 3.7

Wall cladding finished with battens
Inspect all of the joints between fibro cladding and where fibro abuts blockwork on the outside of the building to be sure that they are properly protected from the weather
SECTION 3.7

Wall cladding properly watertight
Inspect all weatherboard and board and batten cladding for shrinkage that can expose gaps between the boards
SECTION 3.7

Render correctly done
Look at window and door frames to be sure that the render is not covering any weather grooves to bottom of all cills
SECTION 3.8

Window, door frames in good order
Inspecting all frames especially where they are close to or touching the floor or the ground to be sure they are not rotting and have been properly decorated
SECTION 3.8

All doors are in good order
Check that each door closes properly and is fully decorated especially along the top and the bottom edges
SECTION 3.8

Hardware functional
Check all handles and louvre windows to confirm all are in good working order
SECTION 3.9

**All screws provided to hinges and
louvres**

Inspect all door hinges and louvres to
be sure all screw fixings have been properly
provided and are in place
SECTION 3.9

Redundant work non-critical

Are any holes drilled by mistake likely
to cause problems of rotting
SECTION 3.8

Sink worktops in good condition

Inspect all worktops to be sure that
water is not leaking under or behind the sink
and rotting the worktop, or onto the floor and
rotting the legs
SECTION 3.8

Splashbacks in place

Check that some form of tiling or
boarding is provided behind the sink to stop
water splashing on the wall and running down
SECTION 3.13

**Services are properly installed and
protected**

Examining how pipes and electricity
lines enter the buildings to be sure they
cannot be vandalised or exposed by washing
out of the ground around the building
SECTION 3.10, 3.11

Waste outfalls OK

Inspect floors near to floor wastes and
gullies to ensure any water properly drains
away
SECTION 3.2

Decoration properly done

Look at window and door frames,
doors and cabinets to be sure that the timber
has been properly decorated with primer,
undercoat and top coat, and the tops of doors
and hidden faces are properly sealed
SECTION 3.12

Nail fixings are not rusting through

Inspect all cabinet work, shelving to
confirm that nail fixings used are not rusting
through paintwork
SECTION 3.8

2.2 Monthly inspection list:

Trim trees

Examine trees near the building for overhanging or dangerous branches

SECTION 3.14

Gutters and roof clear of leaves

Check all gutters and spouting are in good order and sweep all gutters and roofs of leaves and other debris

SECTION 3.1

Nesting insects

Look at all ceilings and walls and clean away any nesting insects, wasps etc.

SECTION 3.7

Doors in good order

Test all doors that they close properly, do not drag on the floor and are intact

SECTION 3.8

Door handles in good order

Inspect all doors, test all locks and handles to be sure all handles are firm and operate properly

SECTION 3.9

Louvres in place and not broken

Test all windows to check operation and that all glass is in place

SECTION 3.9

Insect screens intact

Examine insect screens for holes, tears and damage to battens

SECTION 3.9

Taps not leaking or missing

Inspect all tapware to check all fittings, handles and spouts are in place and taps are not dripping

SECTION 3.10

Toilet seats are in good order

Inspect all toilet fittings to be sure seats and covers are firmly fixed, intact and clean

SECTION 3.10

Basin wastes are not leaking
Run your finger under the pipe to ensure waste pipes are not leaking or dripping
SECTION 3.2

Soakaway not blocked or full
Inspect the ground around soakaway, the speed of toilet and shower drainage for evidence of problems with the soakaway
SECTION 3.2

Light fittings clean and working
Inspect and clean all light fittings and exposed bulbs and listed any missing bulbs
SECTION 3.11

Ceiling fans in good order
Examine and clean all fans and fan blades and check all blades are firmly fixed
SECTION 3.11

Decoration in good order
Inspect frames and doors especially for scratches and peeling. Clean mould where seen to occur
SECTION 3.11

Have you:

1. Swept the gutters?
2. Oiled the louvres and door handles?
3. Cleaned the ceiling fan blades?
4. Cleaned the light fittings?
5. Scrubbed off mould growths?

2.3 Annual inspection:

<p>Termite attacks Check for evidence of termite trails and nests in, on or nearby the building SECTION 3.1</p>	✓
<p>Inspect roof for rusting Check over all roof for signs of serious rusting or discolouration around fixings, flashings, capping or pipes passing through the roof SECTION 3.7</p>	✓
<p>Gutters in good order Examine gutters, downpipes and fixings to the roof for signs or rusting SECTION 3.14</p>	✓
<p>Fascias in good order Examine all fascias front and back for signs of rotting, water damage or algae growth SECTION 3.8</p>	✓
<p>Floors not pitted Inspect concrete floors especially where in constant use or subject to heavy loads such as in kitchens to schedule any pitting in the floor SECTION 3.3</p>	✓
<p>Floors not rotting out Closely inspect timber floors to bathrooms, showers and toilets from on top and underneath to check for water damage, rot or algae growth SECTION 3.7</p>	✓
<p>Vinyl tiles in good order Examine all tiled floors to record any missing or broken tiles SECTION 3.13</p>	✓
<p>Ceilings do not sag Check all ceilings and fixings are in good condition SECTION 3.7</p>	✓
<p>No rat damage to ceilings Check all ceilings for holes made by rats living in the space above SECTION 3.7</p>	✓

Splashbacks in good order
Check that water is not splashing
or running down behind any sink or basin
SECTION 3.13

Frames intact
Inspect all window and door frames
for water damage, rotting or signs of
termites
SECTION 3.8

Doors intact
Inspect all doors especially bottom
edges for water damage and rotting
SECTION 3.8

Drains have not subsided
Examine the ground around
gullies, soakaways and septic tanks to be
sure that the ground has not become
waterlogged and is sinking
SECTION 3.2

Water tank in good order
Inspect water tanks for evidence of
leaking, rusting or bruising
SECTION 3.14

Tank stand in good order
Inspect water tank stand especially
under the tank base for evidence of rot or
algae growth
SECTION 3.14

Clean out rainwater tank
Capsize rainwater tanks or open
drainage cocks to dispose of leaf mould,
dirt etc. inside the tank and scrub out
where possible
SECTION 3.14

2.4 After a cyclone:

Roof damage
Check roof for damage from falling trees, weakening of nails and that all flashings, capping and sheeting is in place
SECTION 3.7

Window damage
Check all windows and schedule any damage from flying debris
SECTION 3.8, 3.9

Cyclone straps intact
Inspect all roof fixings outside and inside where possible to ensure that strapping is still strong
SECTION 3.6

Water runs clean
Turn on and test all mains water services to allow any disturbed mud or dirt to wash through the system and not pollute the water
SECTION 3.10

2.5 After an earthquake:

Cracks in floors and walls
Inspect all walls, floors and visible foundations for evidence of cracking
SECTION 3.3, 3.4

Water runs clear
Turn on and test all mains water services to allow any disturbed mud or dirt to wash through the system and not pollute the water
SECTION 3.10

Drains do not leak
Inspect and test all drain pipes and waste outlets for evidence of leaking
SECTION 3.2

Re-test services one week later
Check later to be sure
SECTION 3.2, 3.10

3.0 PROBLEMS AND HOW TO DEAL WITH THEM

3.1 Termites

3.1a Termite infestation is caused by white ants that live in nests which look like balls of mud and which you can find in trees or sometimes underground. They eat the softer timbers and especially like imported pine used in older buildings and so make the timber weak so it will collapse. They also love the resin used to make masonite. They travel from nest to buildings in little brown tunnels about as big as a cigarette and can destroy whole buildings without anyone ever seeing them.

Look for little brown tunnels on the side of walls, trees and timber. They squeeze through tiny spaces and between two pieces of timber even when nailed together. They can eat an entire sheet of masonite and leave just the paint behind:

Do not immediately destroy termite nests or tunnels otherwise termites will go somewhere else and re-appear later. Call in professional termite irradiators (see the address at the end of the handbook). When the termites have been poisoned carefully remove any damaged timbers or add new timbers beside the damaged ones to make sure the building remains strong. You must completely destroy the termites otherwise they will come again.

3.1b Termites can and will attack the structure of the roof and can cause it to collapse:

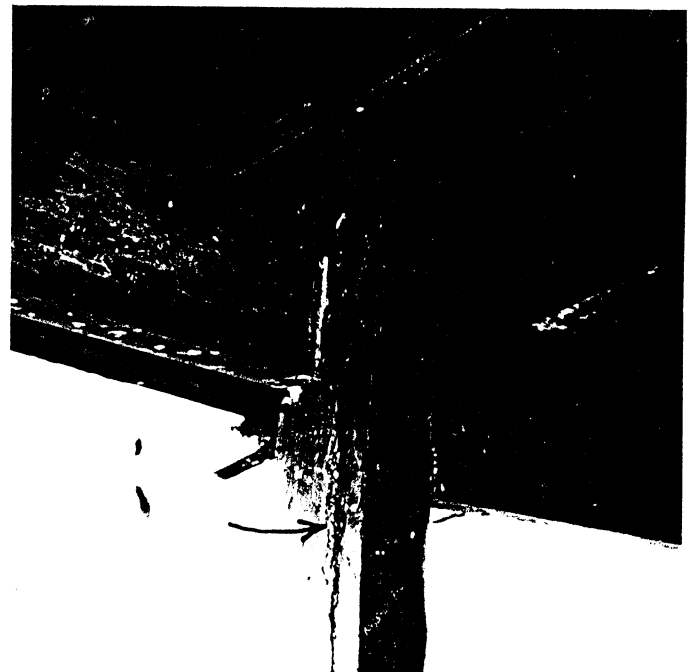
Irradicate the termites and replace or repair the roof structure.

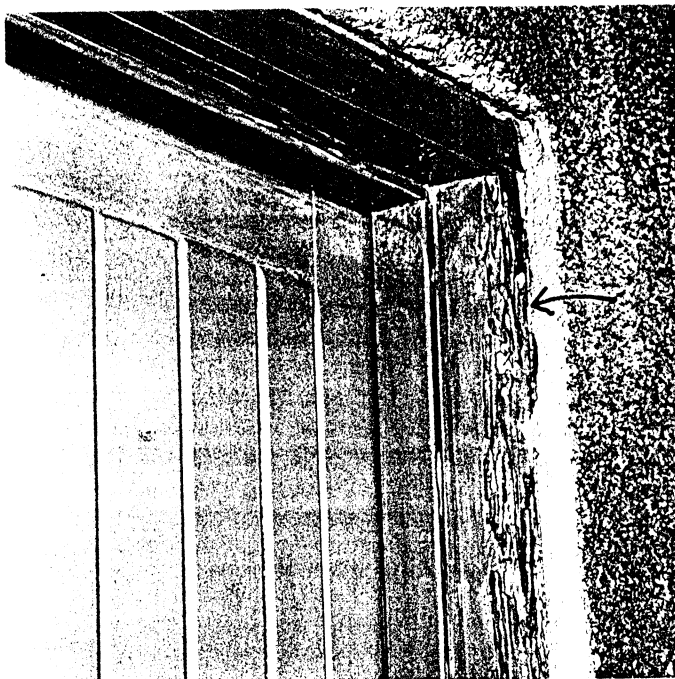
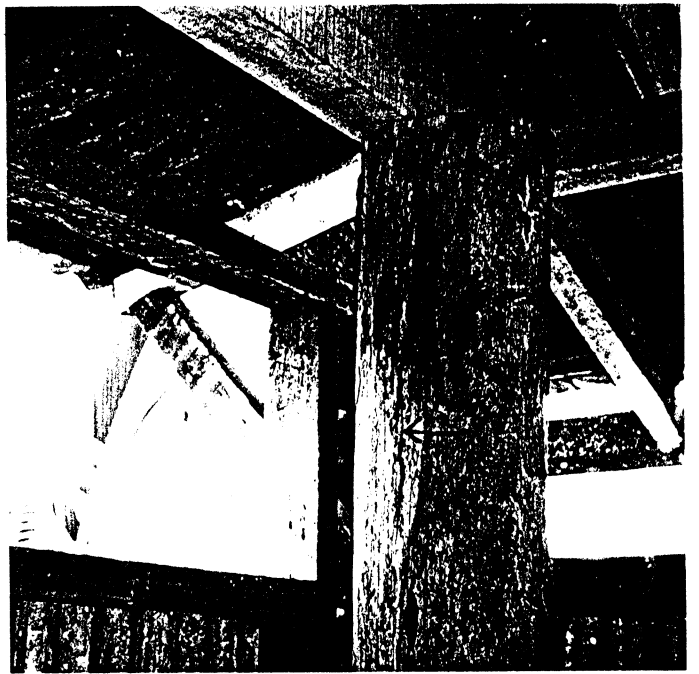
3.1c Termites love to attack masonite wall linings in particular, leaving only the skin of the paint behind. This leads to loss of privacy and holes in the wall:

Irradicate the termites and replace the masonite linings.

3.1d Termites will attack door frames and can cause the hinges to pull out:

Irradicate the termites and replace the door frame if it is badly eaten through and the hinges or locks are loose. Otherwise clean out the termite mud, fill it with wood or putty and redecorate it.





3.2 Drainage

3.6a An overflowing soakaway is usually caused by silt collecting in the soakaway and not allowing the water to drain away into the ground faster than water arrives in the tank. It may also be due to the type of ground:

First inspect the tank to see if water is up to the top. Bail this out to inspect the bottom. If necessary dig out any silt in the tank. If necessary dig around the outside edge of the tank and replace the stones with river stones or broken blocks rather than coral rocks:

If the ground is black soil or heavy red clay it may be necessary to dig a french drain or soaking trench: dig a trench straight or curved 300mm wide and 600mm deep and about 30m long starting at the soakaway, fill with river stones to 300mm, cover the top with strips of fibro or timber and fill over the top with soil. This will allow the water a chance to leach into the ground.

3.2b A blocked pipe or full soakaway can prevent a shower from draining away properly:

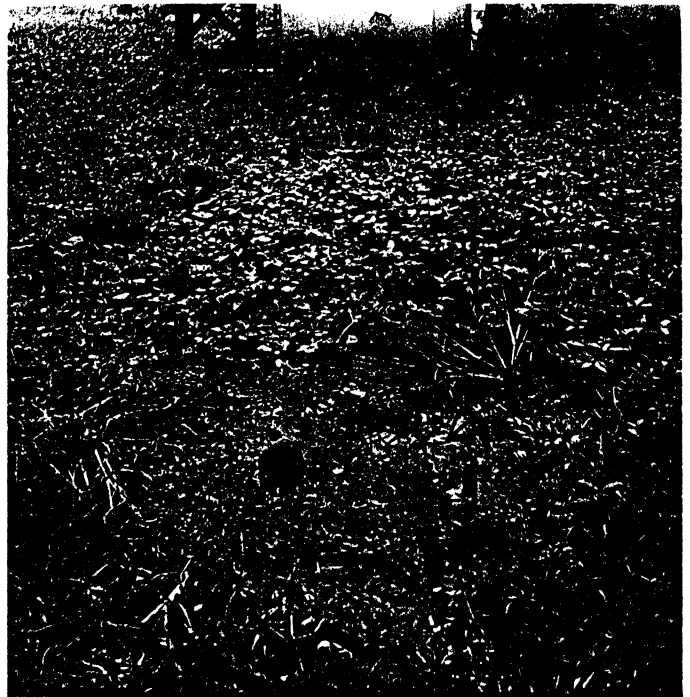
Check the soakaway first. If full it may need to be fixed. If not check the pipe to see that it is not blocked. It may need to be cleaned by rodding.

3.2c Cracked foul and waste water outfall pipes are sometimes caused by building settlement or things dropped on them if they are exposed, or earthquakes. They can spread disease, encourage mosquitoes and must be repaired immediately:

Immediately call a plumber to fix such breakage either by replacing a section of the pipe, or encasing it in waterproof concrete or wrapping it in a rubber sleeve and burying in the ground.

3.2d Gullies sometimes subside because they are cracked and the leaking water softens the ground. This can cause the ground around the gully to sink and results in ponding which encourages mosquitoes and is dangerous underfoot:

Carefully dig out around the gully to inspect and repair any leaks by cleaning and grouting in cracks and holes with strong cement. Fill back around the gully and if necessary re-cast its lip to be level.



3.3 Concrete

3.3a Cracked foundations are usually a result of soft ground conditions and earthquakes. Such cracks are not necessarily dangerous if the building remains undamaged, but they can allow rain to damage the steel inside. It is important to ensure that such cracks are 'dead':

Clean the foundation, place a piece of sticky tape or masking tape and mark a straight pencil line in two or three places across the crack. One month later check if the tape has broken or the pencil lines are moved away from each other. If so it means the ground is soft and new foundations are required. Check all cracks no matter how small after an earthquake. If the crack is not moving, clean the area with a wire brush and fill with cement render or flexible filler and decorate.

If the crack is 'alive' then extensive work may be required to the foundations and it may be necessary to call in a qualified engineer.

3.3b Foundations sit into the ground but rain can sometimes wash this ground away, expose the foundations and weaken the building. Foundations must always be protected:

The simplest way is to build a small wall of embedded river stone, coral rocks or concrete 100mm high, 600mm away from the foundations and to fill this with gravel or sand. Gutters and spouting must also be provided to stop the rain falling directly onto the ground and washing it out further.



- 3.3c Hairline cracks in a concrete floor are not dangerous except that they may harbour germs and so should be filled if they are open at all. Larger cracks may require the whole floor to be replaced especially if there is no reinforcing in the floor and the ground is soft so an earthquake can seriously damage it. Such cracks are uneven under foot and can allow damp into the room above encouraging mould, insects and mosquitoes. If you are not sure you should first check whether a crack is 'dead':

Clean the floor, place a piece of sticky tape or masking tape and mark a straight pencil line in two or three places across the crack. One month later check if the tape has broken or the pencil lines are moved away from each other. If so it means the ground is soft and a new floor may be required. Check all cracks no matter how small after an earthquake. If the crack is not moving, clean the area with a wire brush and fill with cement render or flexible filler and decorate.

If the crack is 'alive' then you should also check the foundations. Extensive work may be required and it may be necessary to call in a qualified engineer.

- 3.3d Hairline cracks in a concrete bathroom floor will allow water to damage the steel inside and possibly reach the timber floor underneath. The cracks must be filled:

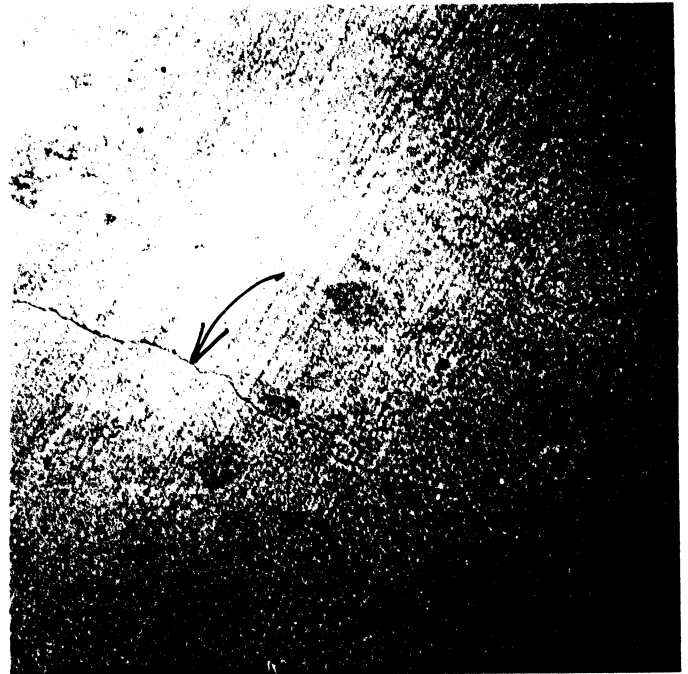
Carefully score the crack so it is a groove and seal with a waterproof flexible grout.

- 3.3e Soft ground under a concrete walkways can subside leaving only a thin shell above which can break and form a dangerous hole which must be repaired immediately:

Immediately arrange to fill the hole with concrete.

- 3.3f Over the years water can creep into a concrete columns, rust the steel and cause the concrete cover to break away. The steel must be prevented from further rusting:

Clean the area with a wire brush and cover the exposed steel with concrete to rebuild the original shape.

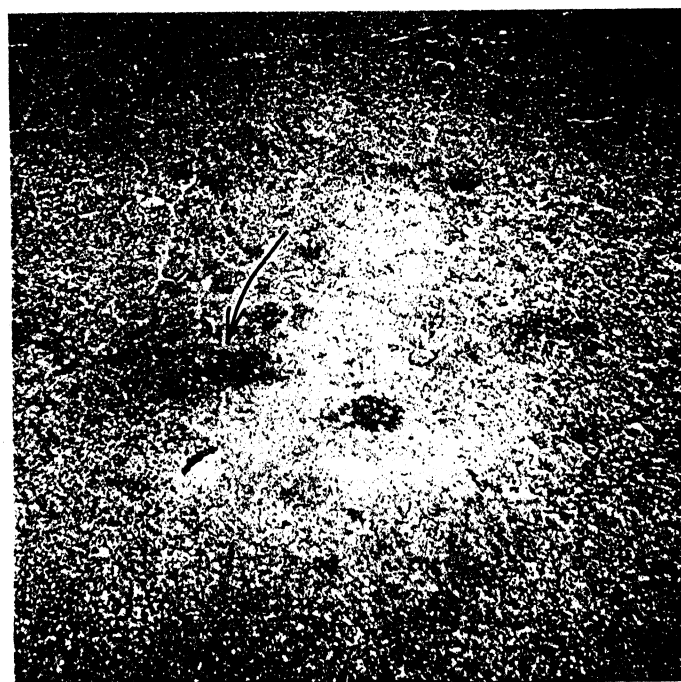
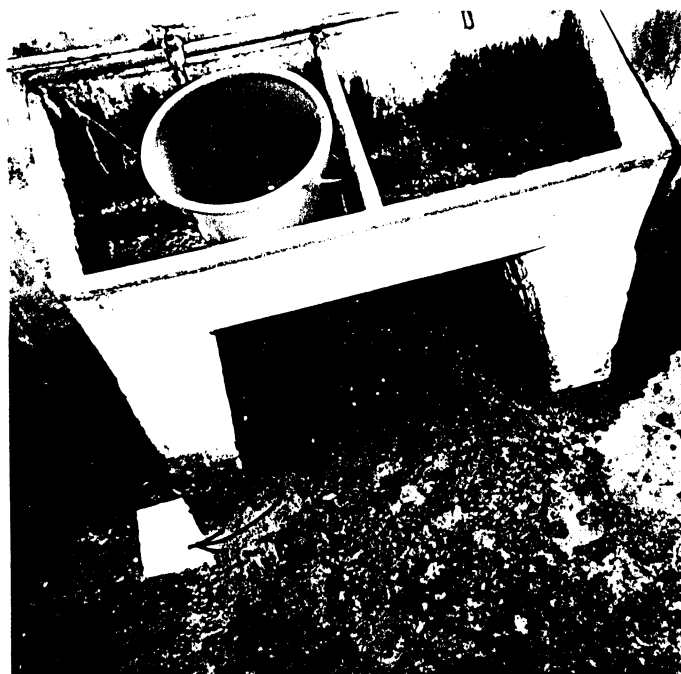


3.3g Concrete walkways that fall towards walls will trap rain, allow slippery mould to grow underfoot and encourage mosquitoes to breed. Incorrect falls must be fixed. the same applies to concrete floors that fall away from floor drains:

Scrub the floor with a wire brush, paint with a concrete bonding agent (see section on useful hints) and re-plaster the walkway to fall away from the building.

3.3h Concrete floors sometimes develop small holes where something heavy has landed on them, or stone used in the concrete has worked loose over the years. As a result the floor may be uneven underfoot resulting in twisted ankles and shaken trolley wheels. Such holes must be fixed:

Clean out with a wire brush, paint with a concrete bonding agent and fill with a strong cement render.



3.4 Blockwork walls

- 3.4a Blockwork walls usually have a concrete beam at the top to make them strong. This can crack in an earthquake if there is only a little steel in the beam but is not usually dangerous. However the crack can allow water in to damage the steel so must be repaired:

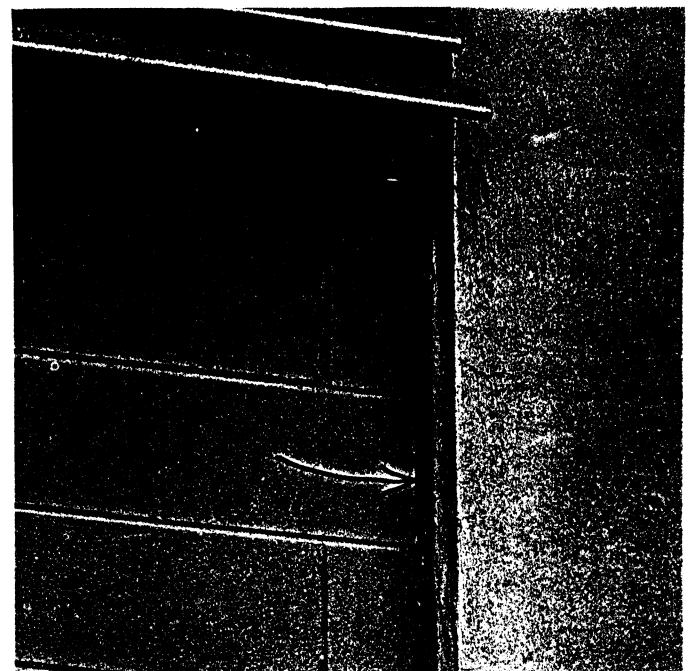
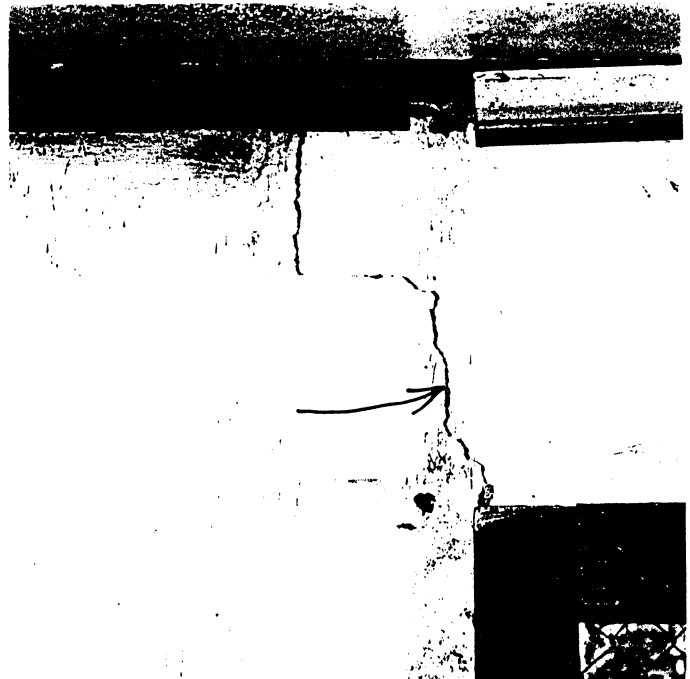
Clean out any cracks with a wire brush and seal with a flexible filler and redecorate.

- 3.4b Blockwork walls are usually reinforced with steel so they are strong. Small hairline cracks in a blockwork wall are not dangerous, but if they are large enough for you to push a nail inside they must be repaired to protect the steel. If a wall has large cracks and you can see through to the other side the wall or that part of it must be re-built. Sometimes walls will crack because the ground is soft underneath so you must make sure the cracks are not getting larger:

Clean the wall, place a piece of sticky tape or masking tape and mark a straight pencil line in two or three places across the crack. One month later check if the tape has broken or the pencil lines are moved away from each other. If so it means the ground is soft and new foundations are required. Check all cracks no matter how small after an earthquake. If the crack is not moving, clean the area with a wire brush and fill with cement render or filler and decorate.

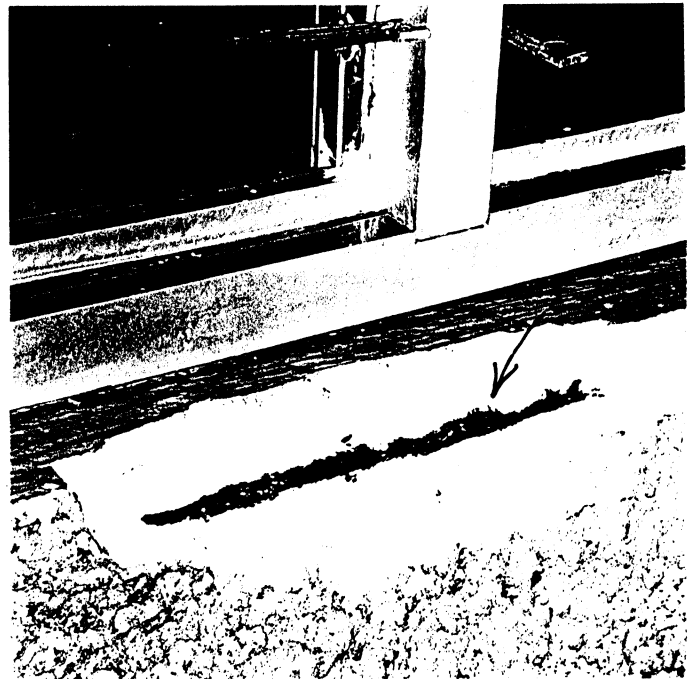
- 3.4c Concrete columns and blockwork walls are usually reinforced with steel bars, but sometimes the columns are built first and the walls afterwards and cracks can develop especially after an earthquake where the concrete and the blockwork join. These are not dangerous but the crack can let in water which can damage the steel so they must be filled:

Clean the crack with a wire brush to the bare render and fill with a flexible filler.



3.4d Blockwork walls are usually reinforced with steel inside and over time the blockwork can be damaged by a blow or an earthquake exposing the steel. The steel will rust so must be protected with new render:

Clean out any cracks with a wire brush, paint out with a concrete bonding agent, fill with waterproof render and redecorate.



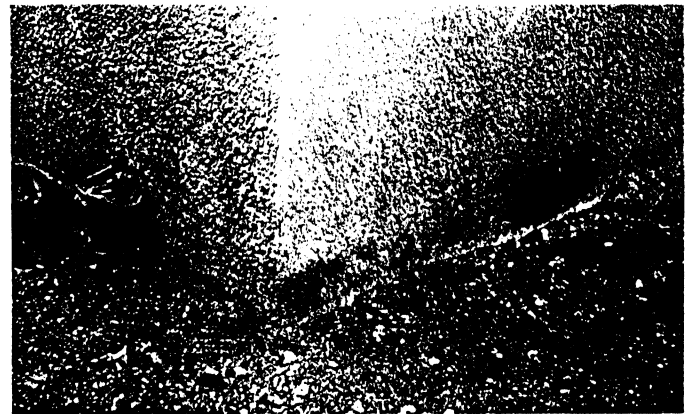
3.4e Render sometimes has little holes in where stones might have worked loose or the render fallen off a blockwork behind. This is not dangerous but is unhygienic:

Clean the holes down to the render with a wire brush, fill with spack filler if small, or cement render if large and decorate.



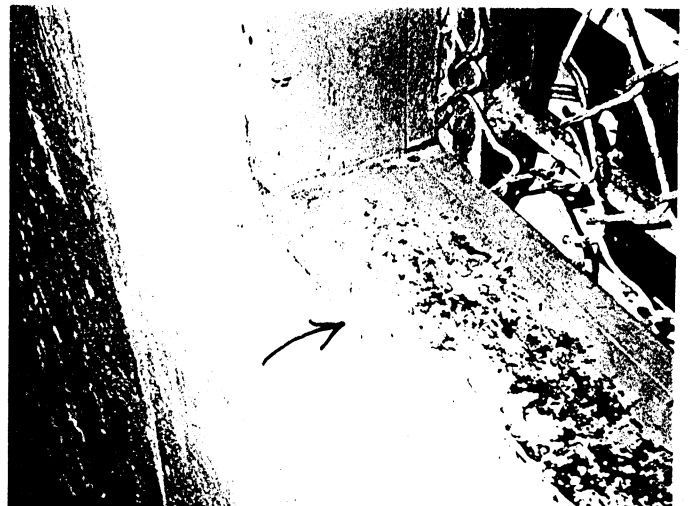
3.4f A rough type of render called 'Tyrollean' is sometimes used to seal blockwork, but often shrinks away from window frames with age and can let the water in to rot the frame. Such cracks should be filled. 'Tyrollean' render alone is NOT waterproof and should be decorated:

Carefully clean the crack with a wire brush. Make sure any frames are decorated before the crack is filled with a flexible filler.



3.4g Render can sometimes cover the groove along the bottom of a window cill and must be chipped back to let any rain run off and not damage the frame or wall inside:

Unless the window is well protected by a walkway chip away and make good the render under the cill so the weather drip is free.



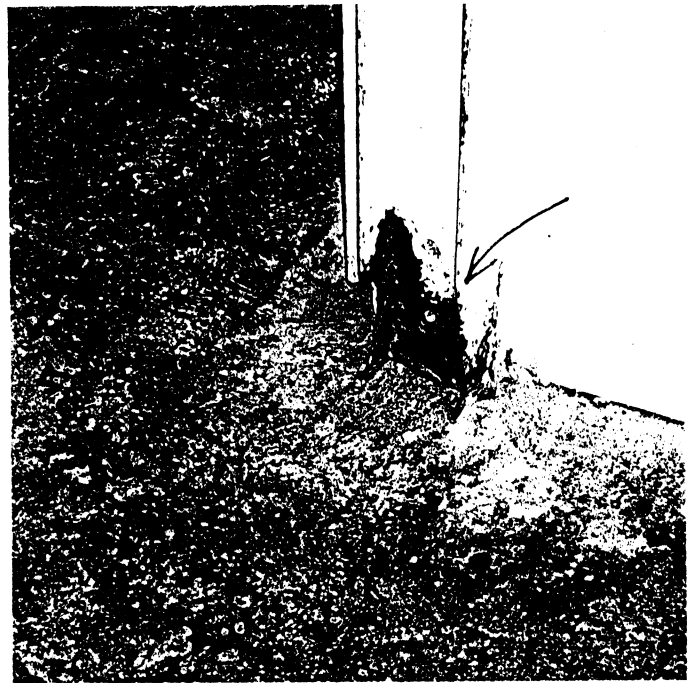
3.5 Steelwork

3.5a Steel frames become rusty when the air touches the exposed steel and if they are constantly washed or brushed away the metal becomes thinner and will eventually collapse. Rust is not dangerous unless you remove it because it stops the air reaching the fresh steel below:

LEAVE THE STEEL ALONE unless it is obvious that the steel is very thin. If rust is staining through a paint finish use a wire brush to gently clean away the paint and the rust below and overpaint with a metal primer, undercoat and gloss. If the steel is very thin drill and fix splice plates well beyond the damaged area. NEVER WELD thinning rusting steel as this will burn the steel away completely.

3.5b Unpainted steel roof trusses harbour insects and dust and are unhygienic:

It is best to cover them over with perhaps masonite sheeting on timber frame fixed to the steel so they are clean. Do not brush them back and re-paint them because they will rust through.



3.6 Timber framing

- 3.6a Undersized roof structure means the roof will sag and may collapse or fly away in a cyclone. It may also collapse if you walk on it so is dangerous and must be made stronger:

Strengthen the roof either by propping up the rafter or purlin so it bows slightly upward and then nail another timber all along one side so it makes it thicker and stronger; or replace the member completely. The same principle applies to floor structure.

- 3.6b If a roof has no cyclone ties it will be damaged in a cyclone because the wind will lift off the roof. Immediately instruct a carpenter to provide cyclone ties:

Use 600mm ties between trusses and rafter onto walls

Use 400mm cyclone ties for purlin-rafter/truss connections at the edge of the roof and over any external walls

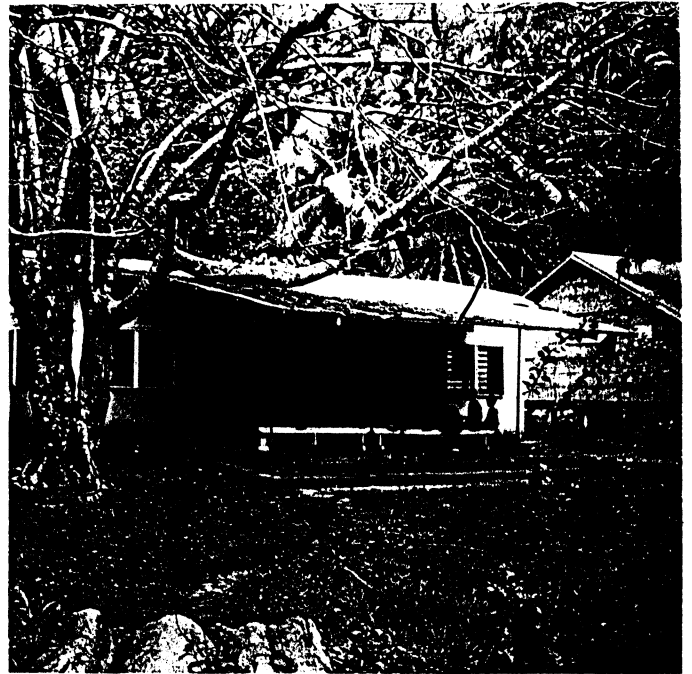
Use a 'triple-grip' for all other purlin-rafter/truss connections.

- 3.6c A strongly made truss will have probably 8 nails or a bolt or nail plates at least as wide as the truss chords holding the top and bottom truss chords together. The diagonal bracing will also have perhaps 4 nails or a bolt or nail plate at each connection. Where trusses are joined in the middle the bottom chord should not sag and the timber joining it should be at least one sixth of the width of the truss and be fixed all along with nails or at least two bolts at each end or a large nailplate both sides. If the truss is badly made it will collapse or blow away in a cyclone:

Provide or increase the fixings required to the trusses to meet these standards.

- 3.6d Gaps between timber framed walling and blockwork walling are usually due to poor construction. They must be filled or covered to stop water damaging the structure inside:

Clean and fill with a cement render if the gap is large, or a flexible filler if the gap is small and cover the junction with a fully decorated batten at least one inch each side, nailed onto the timber walling.

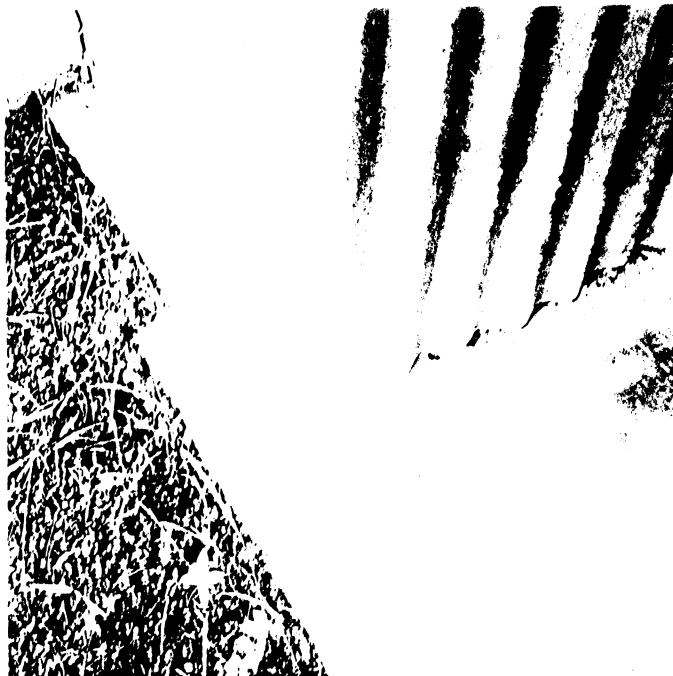


3.6e Walls that have been badly built so the edge of the floor is exposed to the outside must be changed so the floor is protected:

Add a shaped steel flashing at the bottom of the wall to cover the edge of the floor. The flashing should be at least 100mm up behind the wall and should slope away from the wall where it covers the top of the floor and cover the edge of the floor or any cladding at the edge of the floor.

3.6f Floor framing and flooring that extends beyond the face of a door will collect rainwater and eventually rot away so must be protected:

You must cut back the flooring, or add a shaped timber weather drip at the bottom of the door, or screw fix an aluminium strip along the edge of the floor under the door to stop the rain getting back inside the building.



3.7 Linings and claddings

- 3.7a Roof sheeting will gradually rust, but usually this does not mean the roof must be replaced unless the rusting makes it impossible to walk on the roof:

You should patch any obvious holes or cover sections of the roof with new roof sheeting and only replace the roof when it is critical. (See also useful hints)

- 3.7b Roofs will leak if the steel is very old or has holes made in it perhaps by pipes or nails. Rain can also blow up under the ridge cap. Just because you see water dripping in one place does not mean there is a hole in the roof immediately above there:

You must repair any obvious leaks as soon as possible with silicone or if necessary a small steel or aluminium sticky tape. If the roof pitch is less than a rise of 1 in 10 it may be necessary to carefully remove the ridge cap to turn up the valleys of the roof sheeting.

- 3.7c Roof sheeting can lift at the edges if the wind has been strong and the nail fixings have shaken loose. This can lead to rain reaching the roof structure and rotting it.

Check edges of all roofs every year, and in particular after each cyclone.



3.7d Ceilings, especially canite can be damaged as a result of a leaking roof or can sag because they are old, or be attacked by rats. Such damage is unsightly and obviously rats and dripping water are both unhygienic and unwelcome. First fix any holes in the roof which may cause leaks to damage to ceiling, then fix the holes in the ceiling:

Small holes:

Make a clean hole, fit a small strip of masonite across the top of the hole, fill the hole with a small canite plug glued to the masonite, make the joint neat and redecorate. Do not use tape across a rat hole.

Larger holes:

Cut away the canite up to the edge of the noggins, add a timber batten all around the inside of the hole, cut and fit a piece of canite to these battens, make good the joint and redecorate.

Use a whole sheet of canite only if absolutely necessary. (See also useful hints)

3.7e Wasp can build their nests onto a ceiling which can sting occupants and also are dirty:

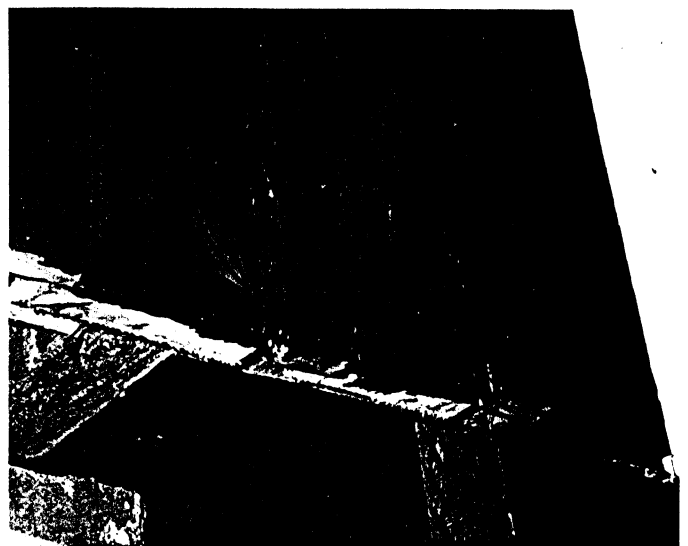
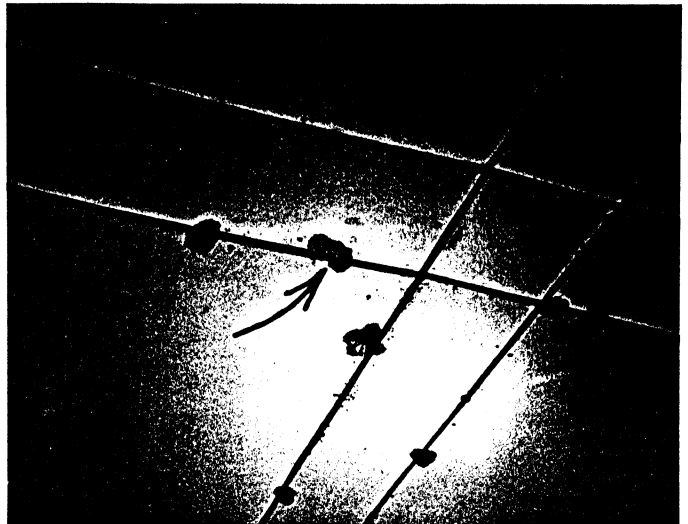
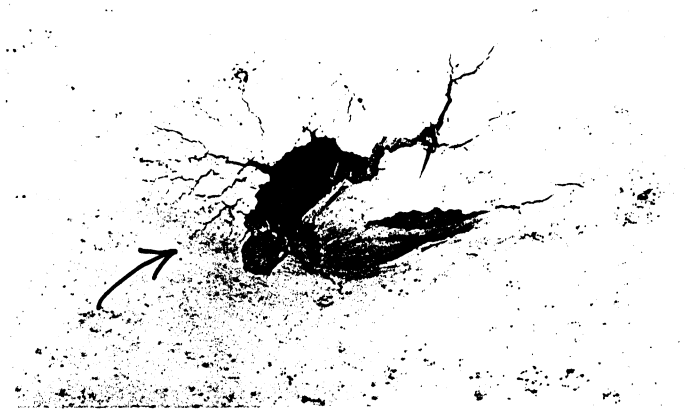
Check every month for nesting on ceilings and walls, remove the nests and clean the ceiling or walls.

3.7f Weatherboard and board and batten cladding can shrink with age leaving gaps which can let in water and damage the wall.

Remove the cladding and re-fix with joints fitted tightly.

3.7g Timber floors will gradually wear out over the years from use, especially where there are lots of people and furniture. You can often see when the floor is wearing thin because the boards begin to sag and are bouncy. You must replace the floor or that part of the floor before it is broken to avoid accidents and having a hole in the floor for a long time which is dangerous.

Carefully cut out the relevant section of floor and replace.



3.7h Timber WC and shower floors commonly get wet and rot from spilled showers and overflowing toilets. Such floors are not dangerous unless they are left for a long time during which they will become weak, collapse and encourage insects and mosquitoes so must be totally replaced. The floor structure under a wet area floor may also be damaged so must be inspected and repaired if necessary. there several steps:

To begin with:

Fix any cisterns, overflows, wastes through the floor and tap connections which are not watertight.

Lightly damaged floors:

Allow the floor to dry out, sand the surface and re-varnish with three coats of polyurethane.

Badly damaged floors:

Carefully remove the fittings, cut away the affected floor, allow the joists and bearers to dry out, remove and redundant nails, thickly coat top of joists and bearers under floor with



3.7i Fibro is brittle and can be broken by kicking or a blow from a hammer. Water can then damage the wall structure and harbour insects and germs especially in toilets and showers.

Small hole:

Try to fix a timber block behind the hole from the other side of the wall, carefully cut a piece as neatly as possible to fill the hole, make good the joint and decorate.

Larger holes:

Carefully cut away the sheet to the edge of the studwork behind, fix a batten onto the inside face of this hole, fit a new fibro sheet over the hole, make good the joints and decorate.

Replace the whole sheet only if necessary



3.7j Fibro and masonite is brittle and their edges can crack or break. This is unhygienic and can allow insects into the wall so should be repaired:

Clean the area with a wire brush. Make the damage a little larger if necessary to be able to fix a patch over it using a small piece of the fibro or masonite, make good the joints and decorate.



3.7k Steel walling will also rust over the years and needs to be sealed and patched as for the roof to stop water damaging the wall structure:

Seal any small holes with silicone sealant or aluminium tape, or cover or replace any badly corroded sections. It will also help to wash the wall and to paint it with two coats of a roofing paint.

3.7l If there is no flashing at the top of a window in a gable end wall the rain will run down the wall and onto the top of the window frame and from there into the building damaging the walls:

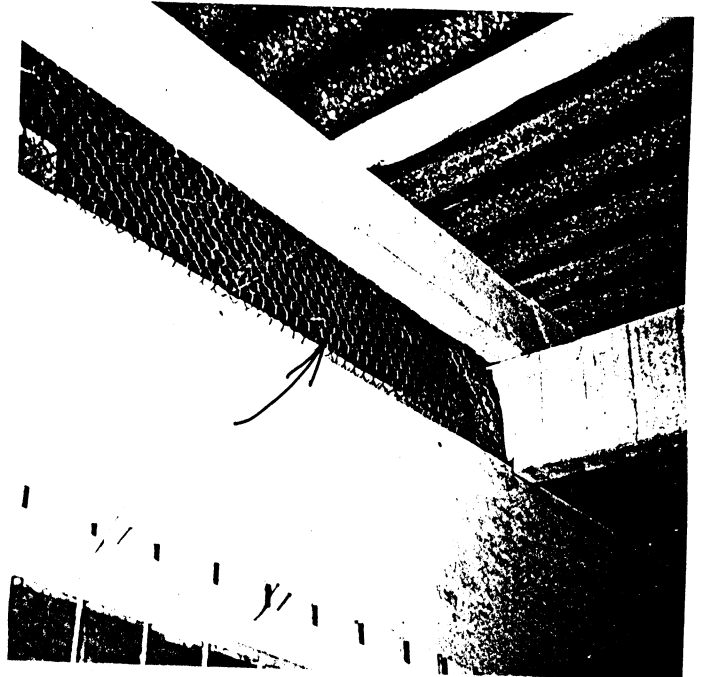
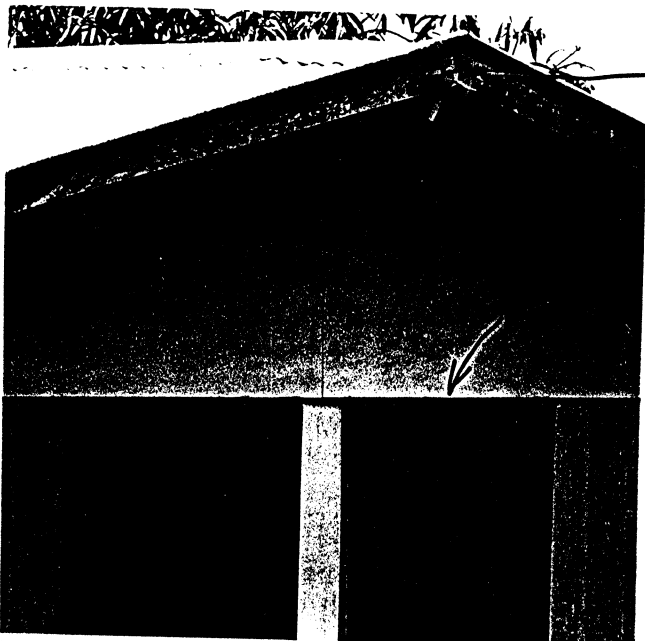
Add a galvanised steel flashing at least 25mm up the inside of the wall over the window and sloping away across the top of the frame. If it is difficult to remove the wall to fix the flashing, use a non-setting mastic pointing.

3.7m If there is a gap at the side of a window or door frame rain can enter and damage the wall. The gap must be closed:

The easiest way is to add a fully decorated cover batten

3.3n Where there are no fly or rat screens insects, rats and birds can enter a room which is unhygienic and can spread disease. It is important to provide proper screens especially at the top of the walls between the roof trusses:

Provide battens as necessary and insect screens as required. Always have a batten between an insect screen and cyclone, copra or weldmesh wire.



3.8 Frames, doors, cabinet work

- 3.8a Poorly decorated door frames will be damaged by water splashing up from a shower floor:

Either cut such frames short so they are clear of the floor and decorate the cut end with primer, undercoat and gloss, or replace the frame completely.

- 3.8b Window and door frames can rot at the corners because the frames were not properly decorated or filled resulting in water rotting the ends of the frames.

If the damage is small, clean the damaged area with a wire brush, allow to dry and fill with a flexible filler before decorating:

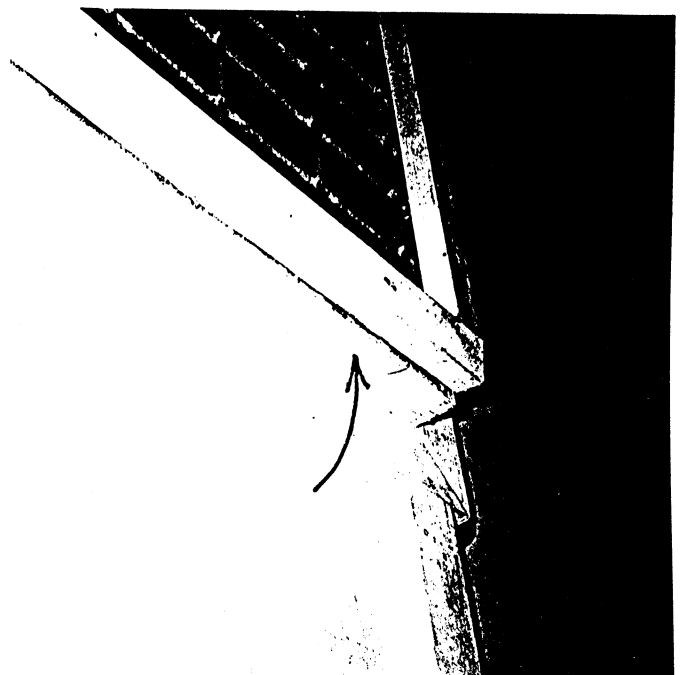
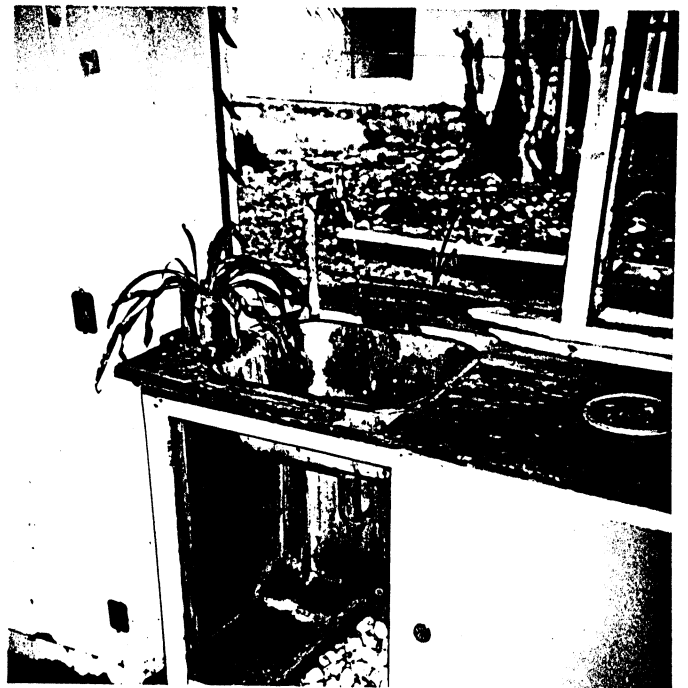
If the damage is serious and the frame is feels loose then replace the frame.

- 3.8c Window cills will rot out behind sinks because of the damp and need to be repaired before fitting a proper splashback:

Carefully remove the tapware to give free access to the cill, cut away any damaged timber in preference to replacing the whole cill and replace with a tailored filler glued and pinned and planed to match the existing. Fill any joints with flexible filler and decorate. Provide a splashback

- 3.8d Windows without weathering drip under their cills can allow rain to run back under the doors and damage the inside of the wall:

Unless the window is well protected under a covered walkway use a chisel to carefully cut a groove along the underside of the cill and decorate this with primer and/or undercoat and top coat.



- 3.8e Because of their frequent use doors are often damaged and need regular attention. resulting in a loss of privacy and weathertightness:

Lightweight doors often lose the plywood face through age, water and scraping on the ground. As a result the door will become weak, allow water into the building and is unsightly:

If the skin is lightly damaged:

Carefully remove the door from the frame, peel back the plywood skin as close to where it is still fixed to the door as possible, clean the back of the skin and the frame underneath, glue the skin back to the frame - DO NOT USE NAILS -, replace the door in the frame and adjust as required so it does not scrape on the floor.

If the skin is badly damaged and cannot be glued back:

Carefully remove the door from the frame, remove the entire outer skin making sure not to disturb the paper core in the middle of the door. Clean the frame, measure and cut a sheet of masonite to fit, skim with glue on the back face and glue it to the frame and paper core. Add panel pins around the edge.

If the hinges are loose:

Replace short screws with longer ones or add rawl plugs to the old holes and re-screw. As a last resort relocate the hinges. Replace the hinge if the hinge rattles.

If the timber is rotting or falling apart:

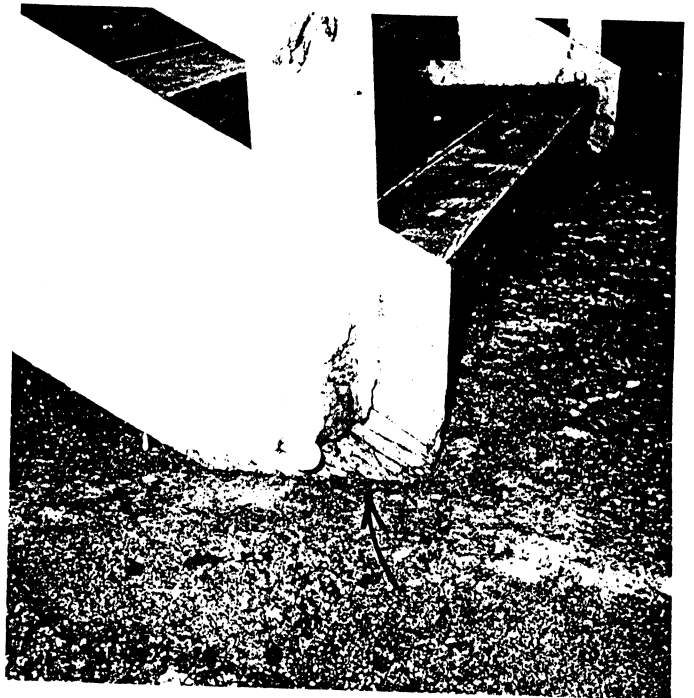
Replace the rotting timber and ensure the door is properly decorated with primer, undercoat and top coat.

If the door drags on the floor or the frame:

Adjust the hinges, replace the screws with longer ones if necessary, and as a last resort trim or plane the bottom of the door so it swings clear.

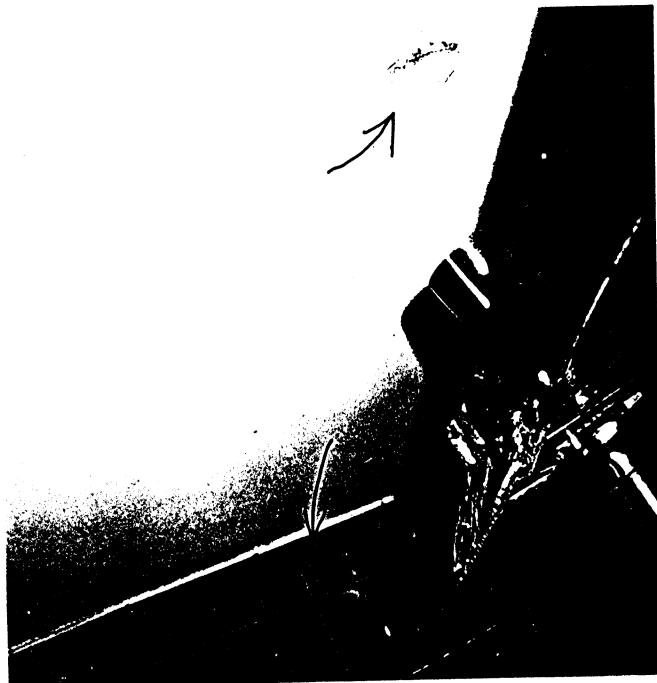
- 3.8f Timber staircases will often rot out at the base because they are built directly onto a concrete base and are attacked by water:

Cut off the bottom part of the string and build a small strong cement plinth under the bottom of the string. Make sure you decorate the bottom of the string before fixing. Replace the string if necessary.



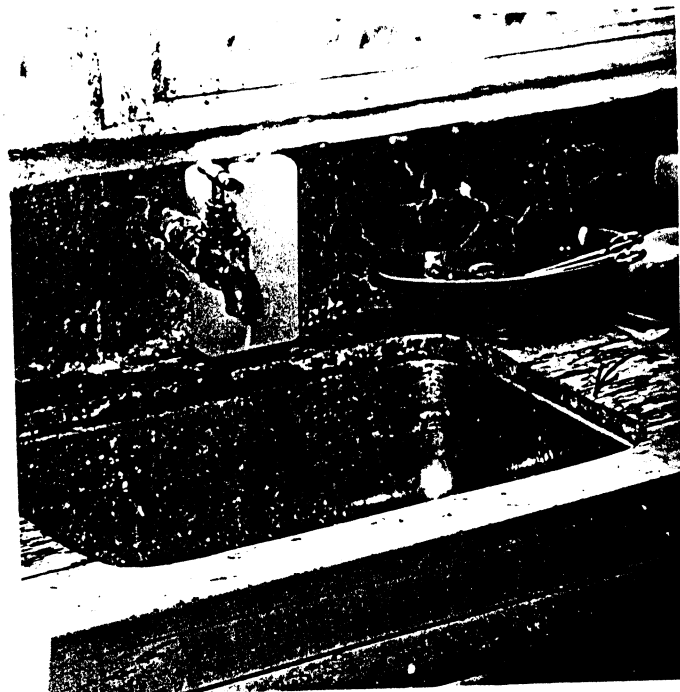
- 3.8g Door handles will often damage the wall lining behind them, or be damaged themselves because there is nothing to stop the door hitting the wall:

Provide rubber door stops either fixed to the skirting at the bottom of the wall, or to the floor if there is no skirting, or to the back of the door if the floor is concrete. Make sure the stop is fixed close to the end of the door and is long enough to stop the door handle from hitting the wall.



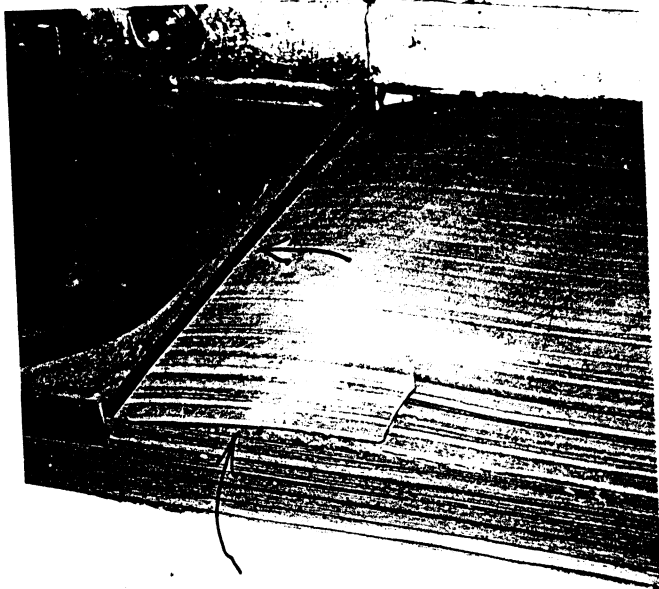
- 3.8h Worktops with sinks and basins can be easily damaged by splashing water, especially if there is not waterproof surface or the sink is not sealed into the worktop or the laminate is badly fixed:

Where any sink sits into raw timber or plywood, carefully remove the sink and allow the top to dry or replace if rotten. Add fibro sheathing over any existing top and trim to a square and neat edge all round. Add Formica laminate to the top and front edge. If the sink is set into the worktop leave a 3mm gap around the edge of the fibro for a silicone seal under the formica. Silicone seal the sink to the worktop when replaced.



- 3.8i Kitchen and basin worktop frames can rot out because of lack of splashbacks and waterproof surfaces so water collects on the floor and rots up the legs:

Any badly rotten legs should be replaced. All timber legs onto a floor should be kept clear of the floor ideally by drilling a 6mm hole 12mm into the bottom of the leg and sitting it over a 50mm concrete nail driven 25mm into the floor. the bottom of these legs must be primed, then thickly coated with undercoat before being decorated to a finish.



3.8j A missing fascia will mean the rain will reach the roof structure and rot it:

Arrange for fascias to protect the edges of all timber roofs

3.8k Where fascias and bargeboards are rotting out this can allow the rain to reach the roof structure and rot it:

Check every year, replace any rotted boards and re-decorate.

3.8l Where fascia ends rot back this can allow the rain to damage the roof structure.

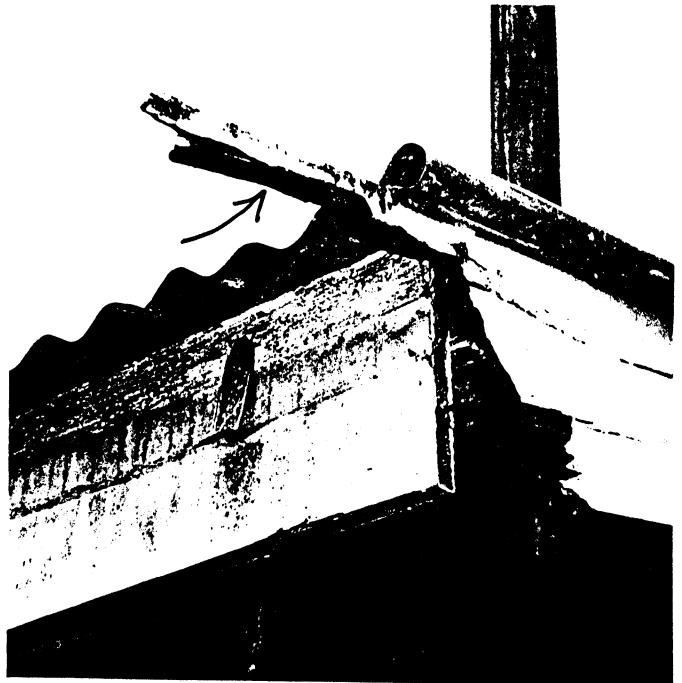
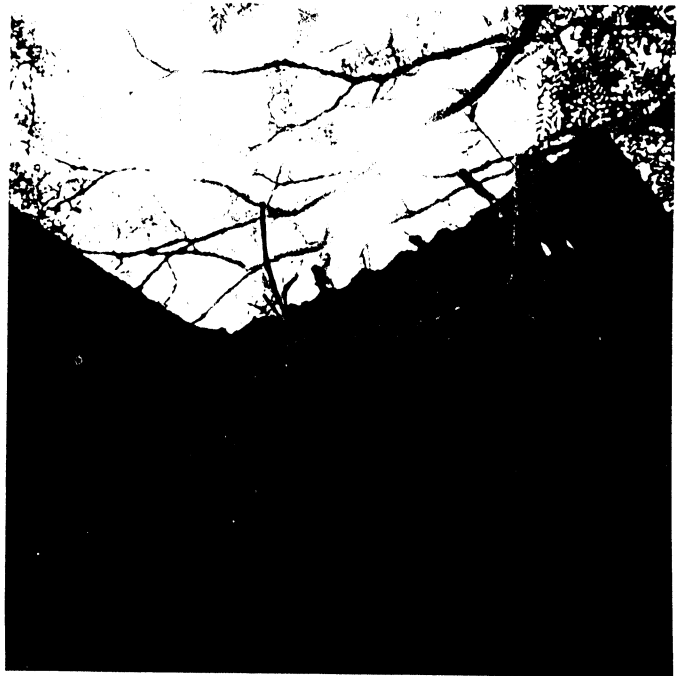
Clean back, fill and redecorate any rotting fascia ends.

3.8m If there is a gap where fascias are joined this can allow the rain to damage the roof structure:

Wire brush clean, fill and decorate any joints. If necessary or easier, provide a timber cover piece over the joint.

3.8n Holes left in a fascia for cables can allow the rain in to rot the board and eventually damage the roof structure:

Fill and decorate any such holes.



3.9 Hardware and glazing

- 3.9a Door handles are used all the time and break frequently leading to loss of use of the door:

Regularly check and oil door locks. Replace any locks and handles that are missing (See section on useful hints for lock specification) and regularly check and tighten bolt and screw fixings. Bolts may sometimes need to be replaced. If screws work loose fit rawl plugs into the old holes and re-fix the screws.

- 3.9b Rust will attack louvre mechanisms and stop them working properly:

There is little to be done except regularly oil and keep the mechanisms moving. If they become totally inoperable they have to be replaced.

- 3.9c Missing louvre glass leads to loss of weathertightness so must be replaced:

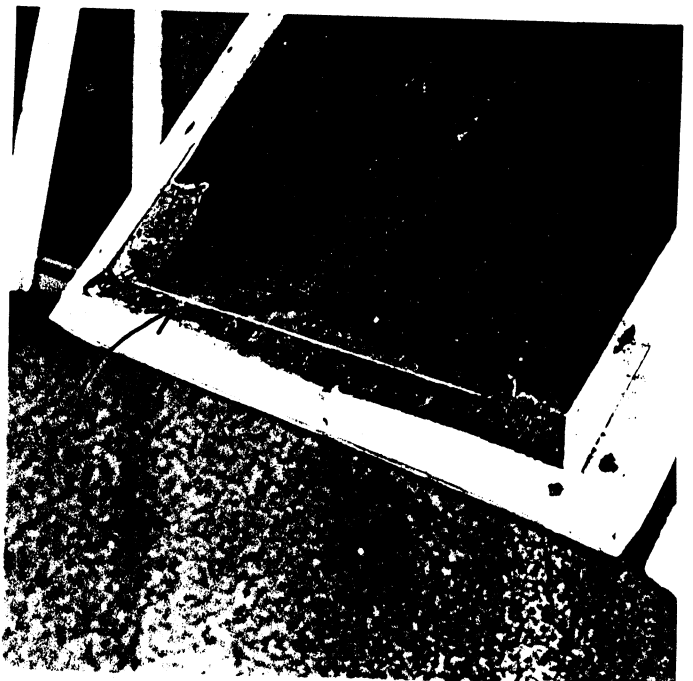
If the louvre glass is not a typical width then measure up the length and carefully cut a length to suit making sure to use wet-or-dry grit paper to smooth the ends and edges.

- 3.9d If louvre glass is too small it can fall out of the mechanism, or slip or and tear the insect screening:

Replace all louvre glass that can move from side to side more than 4mm.

- 3.9e Torn edges or holes in insect screens let in insects and should be repaired or replaced:

Small occasional holes can be patched with a small off-cut of matching insect screening. Otherwise carefully remove any screen battens, remove the insect screening and carefully replace the battens. Green treated insect screening is better than all the others.



3.10 Plumbing and fittings

- 3.10a Pipework that passes through a wall but is not sealed in place can allow insects and water in to damage the wall:

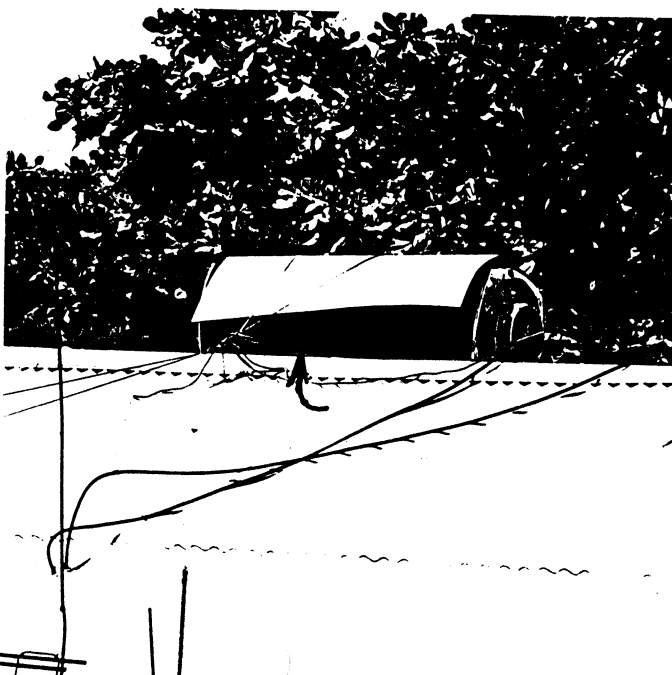
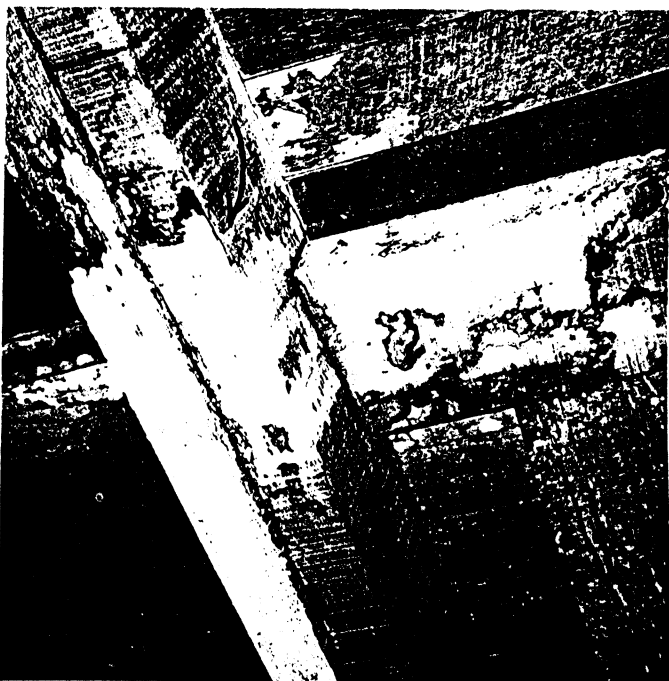
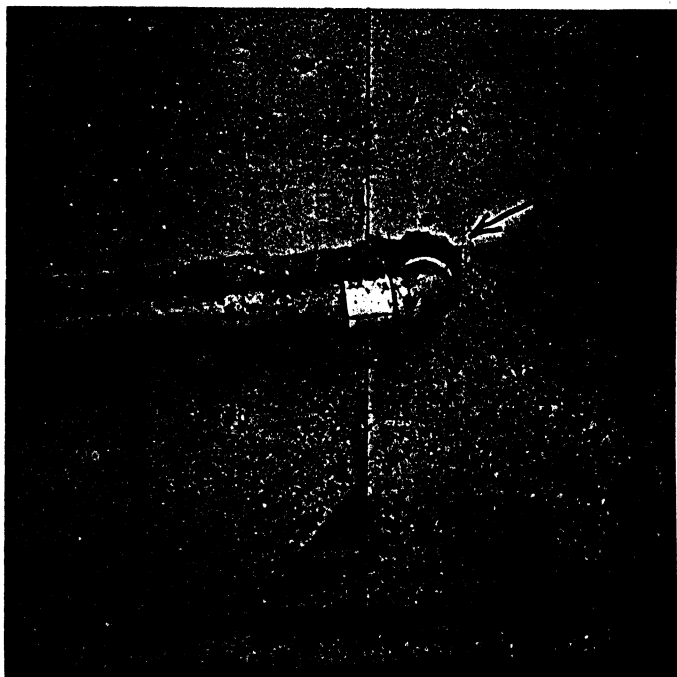
A simple solution is to cut two fully decorated pieces of fibro or timber to fit tightly around the pipe, cover the hole and be fixed back to the wall.

- 3.10b Pipework can sometime begin to leak through age and damage following earthquake. There is no easy way to know this except that damp patches may appear on a blockwork wall and water may appear at the bottom of a wall and of course the water reaching any fitting may be very poor:

This may require significant building work and you should contact the Provincial works officer immediately.

- 3.10c Solar hot water units will often leak because the seal around the pipes grows old and weak in the sun. Water dripping off the roof below the solar hot water unit is often a clear sign:

You must contact the Provincial works officer immediately because the repair work may be difficult.



3.10d WCs are specialised fittings that need attention on a regular basis. The following problems are common and need to be fixed:

3.10e Cistern overflow pipe is too short or too low:
This results in water overflowing onto the WC floor and can damage it.
Either adjust the ball valve so it shuts off before the water level reaches the overflow
Or add a short PVC pipe to run the overflow 150mm through the wall of the floor
If a cistern is to be replaced specify one with an internal overflow.

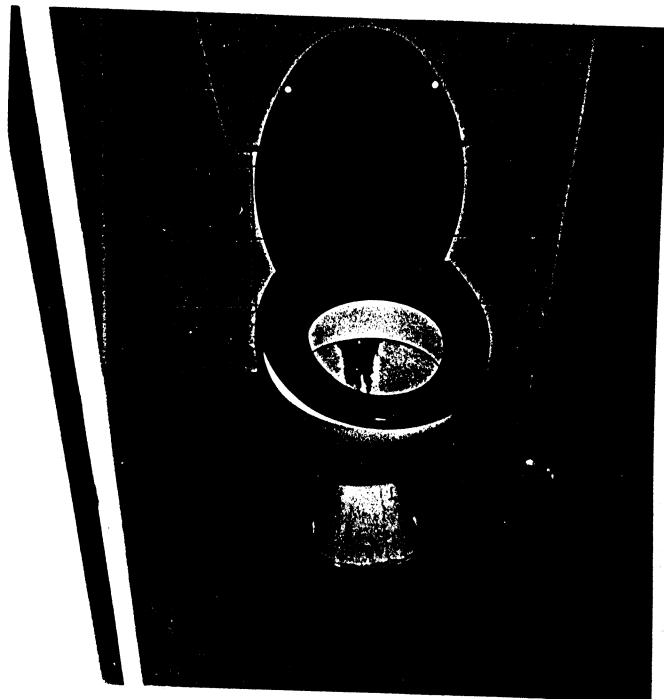
3.10f Toilet pan is cracked:
The toilet pan must be replaced. Make sure the correct pan is ordered: 'S' trap goes straight down, 'P' trap goes through the wall.

3.10g Seat and or cover is missing:
Should be replaced when missing and fixed back with 'vandal-proof' nuts which are easier to clean. The only reason why it is better to have a seat is because it is easier to use the toilet pan.

3.10h Cistern seals into the back of the WC sometimes fail and leak onto the floor whenever the toilet is flushed:
These should be replaced immediately.

3.10i Toilet is blocked up because the tank is full of the pipe is blocked:
First inspect the septic tank and empty it if it is full. If it is not full, open the sewer pipe inspection manhole or access points between the tank and the toilet starting nearest the tank and try to clear whatever is blocking it with a rod or stick. If you cannot find the sewer line or manhole immediately call for a plumber.

3.10j Toilet cisterns fall off the wall usually because the fixings have worked loose:
First try to fit a wooden rawl plug in the old holes and re-screw. If the wall is broken then it may be necessary to take the cistern off the wall and screw it to a fully decorated timber board that is fixed to the wall on the studwork behind. The feed pipe into the WC pan will also have to be adjusted.



- 3.10k Sometimes basins or sinks are supplied with tap holes, but if only one tap is fitted the other hole or holes are left open. These can allow water to drip onto the floor below and are difficult to clean:

Provide and fit proprietary ceramic stoppers to redundant tap holes and grout into place.

- 3.10l Some older fittings are made of steel with an enamelled paint finish which sometimes breaks or is damaged when things fall on it, or a tap is constantly dripping on it:

You can prevent damage by making sure that the taps above the bath close properly. there is a proprietary enamel repair kit which can be ordered, but it will not last long. in the long run it will be necessary to replace the fitting.

- 3.10m Floor wastes will not allow water to drain away properly if they are proud of the floor resulting in ponding and rusting of the shower tray or rotting of the floor:

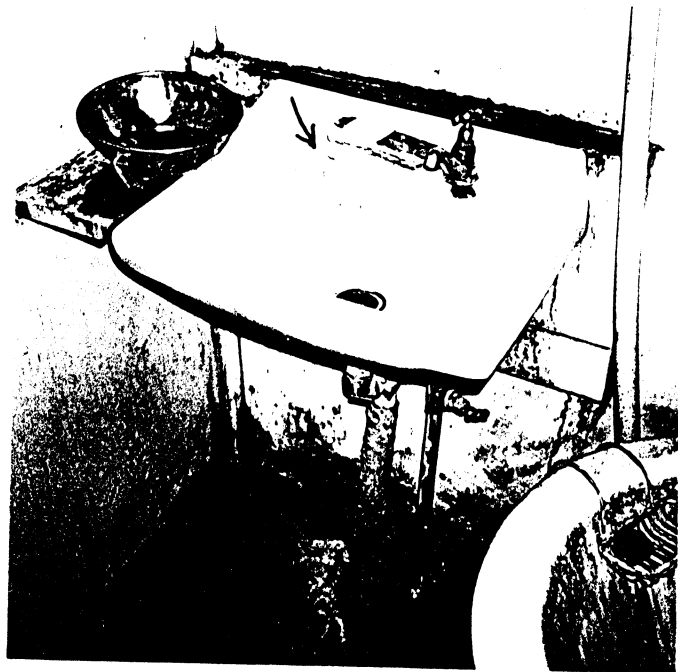
Unscrew the fitting and re-set it properly into the hole. If it is the wrong size then replace it with the correct size. Cut away the floor if necessary to let the waste sit flush with the floor tiling.

- 3.10n Taps regularly cause problems because they are used regularly and are wet. the following are common problems to tapware and other sanitary ware fittings:

Replace any missing tap handles to be sure the tap can be properly used and turned off. There is usually a little screw under the plastic pop-in cap which fits into the top of the tap, or one at the side of the tap.

Dripping taps usually require a new washer or the seat of the tap to be re-ground flat. In either case it is best to call a plumber unless you know how to do these things because you need a special spanner. Call a plumber to fix dripping taps as these waste water and spoil sinks and basins.

Shower roses reduce the amount of water used in a shower, control the water so it does not splash against the door and make it easier to shower properly. They should be replaced when necessary.



3.11 Electrical works

- 3.11a Light switches which are loose or coming away from the wall are dangerous because the wires can be exposed and touching these can kill you:

Arrange for an electrician to repair these immediately

- 3.11b Light switches which have been pushed out of their face plates are dangerous and can kill:

Arrange for an electrician to repair these immediately.

- 3.11c Open light switch boxes allow insects into the wiring and walls and can cause short circuits:

Arrange for the electrician to provide a cover plate if the box may be used in the future, or fill up with render and decorate.

- 3.11d Light pull cords become dirty through use and age and can transfer germs:

Clean these cords every day if possible, and replace them at least once a year

- 3.11e Dirty light fittings mean less light and also harbour insects and rust through faster:

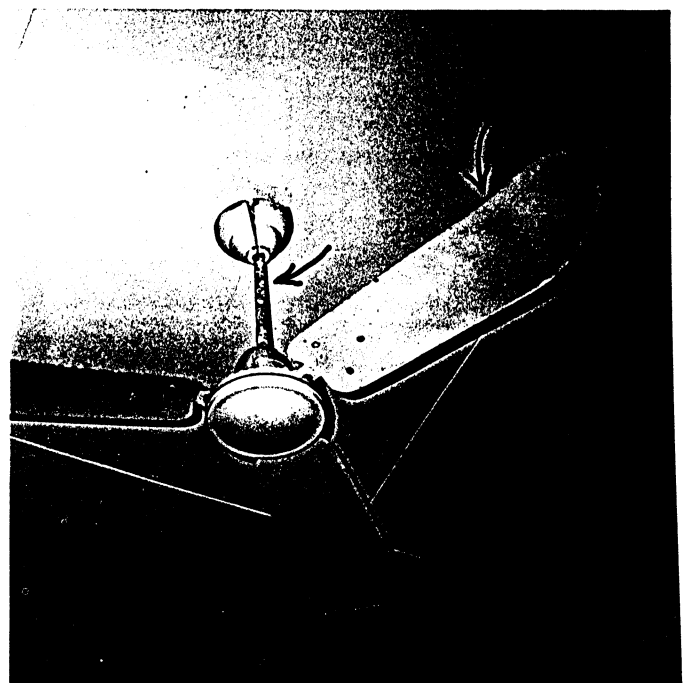
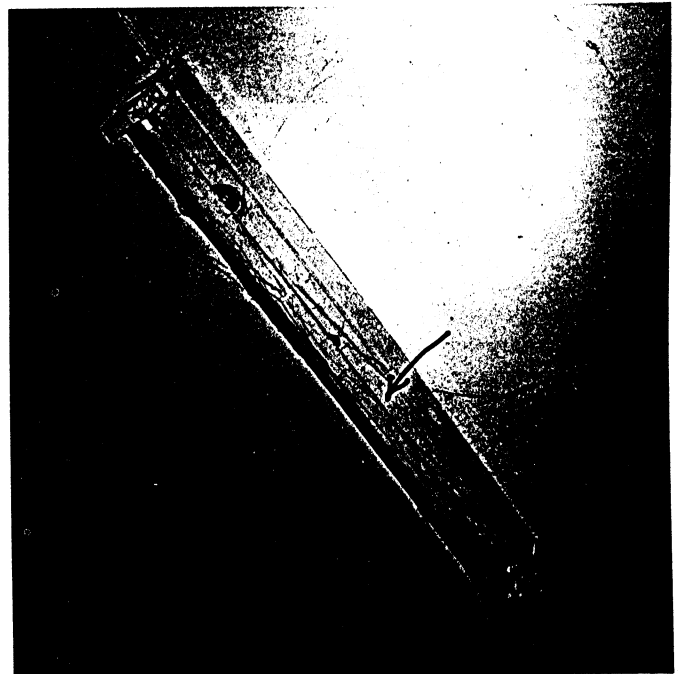
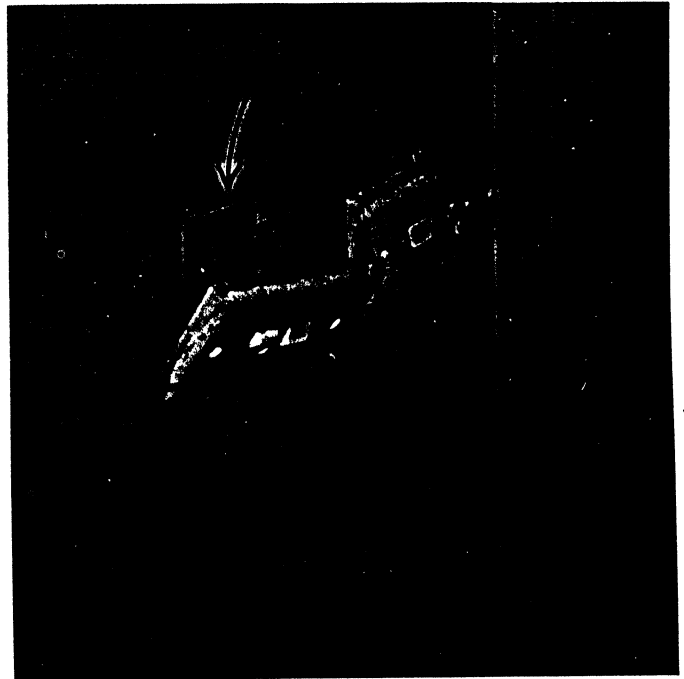
Clean all light fittings once a month.

- 3.11f Dirty ceiling fan blades harbour dirt and insects and spread them around:

Clean all fan blades once a month.

- 3.11g: A missing ceiling fan or fan blade means the fan cannot operate properly. it is dangerous to use a ceiling fan with one of the blades missing or loose.

Check all blades are properly fixed once a month. Replace any missing parts as soon as possible.



3.12 Painter

- 3.12a If you can see raw timber under a top coat of paint it means the timber has not been primed or undercoated before being painted to a finish. As a result the paint will peel off and the timber will be damaged by the weather:

Wire brush back any timber which has only been top-coated to an even rough surface where at least half of the wood can be seen then prime, undercoat and top coat it.

- 3.12b Only gloss paint should be used for joinery and cabinet work, otherwise the paint may peel off and the timber be damaged and the work look unsightly:

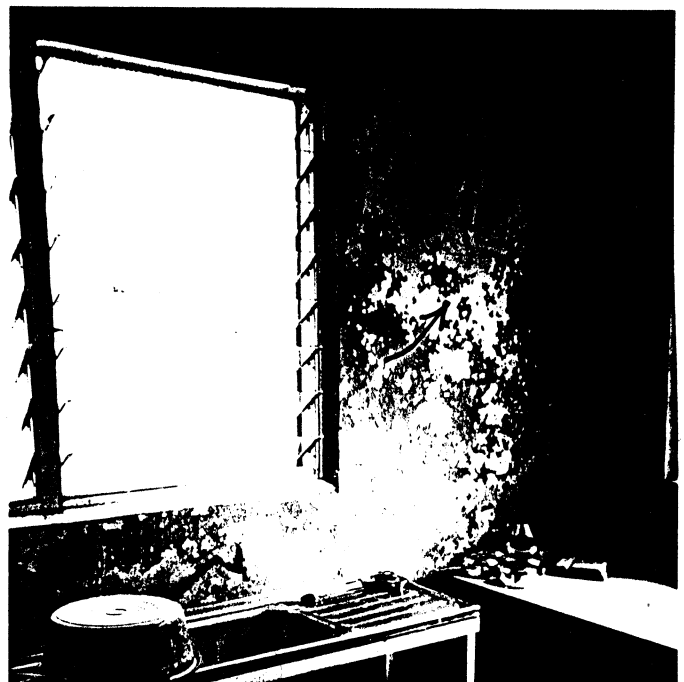
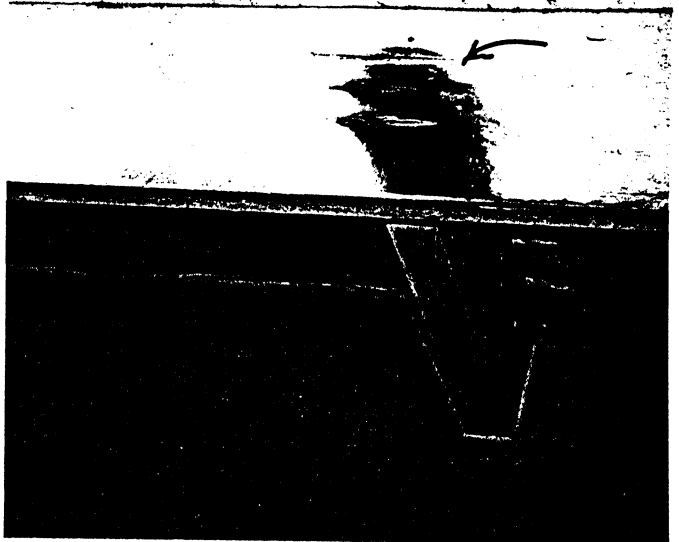
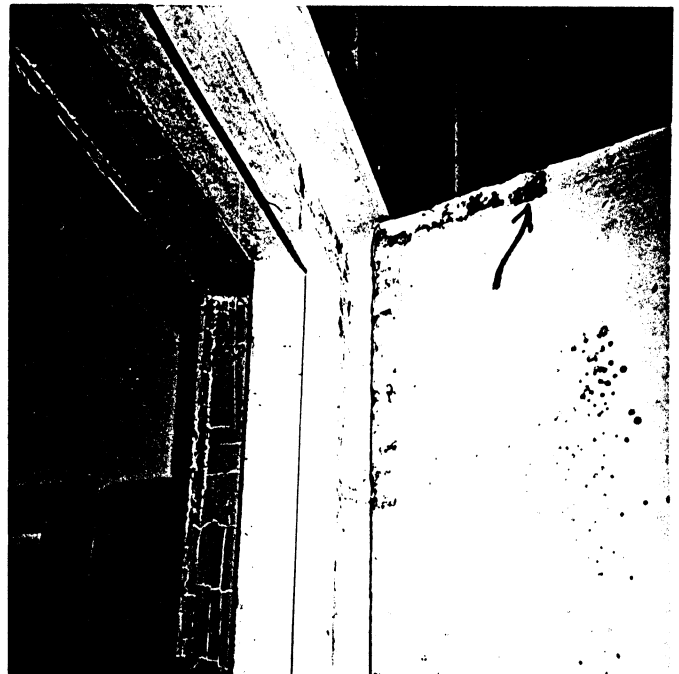
Sand back to a keyed surface any matt or semi-gloss paint finish on shelving, door and window frames, fascias and doors, and redecorate with a gloss top coat.

- 3.12c Nail fixings in joinery work should always be punched and puttied over before decorating otherwise they will rust through and eventually fail:

Where rust stains are grinning through a painted surface punch the nail into the timber, fill the hole with flexible filler or putty and touch up the decoration.

- 3.12d If paint is peeling of the wall it is usually because the wall is either damp or the wrong type of paint has been used, commonly water based paint on top of oil. This is unsightly and unhygienic as paint flakes will fall off the walls and the marks will trap dirt from hands:

Use a wire brush to clean the wall so that the surface is scratched and rough. Redecorate with a general purpose undercoat first, then a good wall paint. Gloss paint is good as it is easy to wipe clean. NEVER use matt paint.



3.12e Damp parts of a building always encourage the growth of mould especially in the corners, the bottoms of walls and on doors especially in showers and toilet areas. This is unhygienic, encourages mosquitoes and must be cleaned regularly:

Check every month and scrub back moulding areas with a nylon brush and soapy water.

3.12f Fibro is not waterproof and so can stay damp and allow mould to grow. This is not dangerous but is unhygienic and unsightly especially for sun-screens:

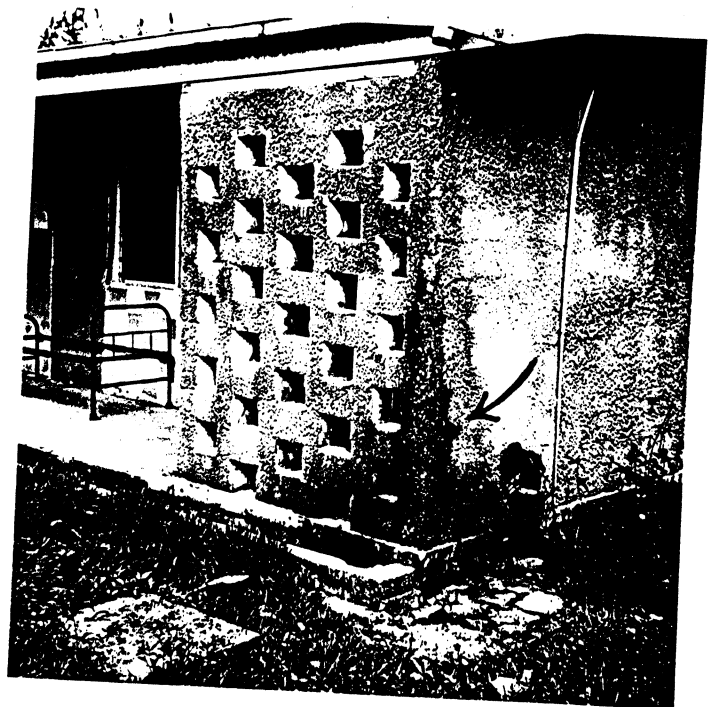
It is best to scrub the mould off the fibro and to paint it with a good wall paint.

3.12g Existing painted surfaces do not last forever because the paint becomes old and brittle. This can lead to paint flaking off, loss of watertightness and is both unsightly and unhygienic.

Where overpainting is required the surfaces should first be scrubbed back with a nylon brush and washed with soapy water if really dirty. Surfaces should then be sanded lightly so the new paint will stick. Take the time to fill up any holes with spakfiller or putty or 'No more gaps' (NEVER use silicone sealant if you are going to paint over it).

If you want to use water based paint over oil based paint you must first undercoat the surface with general purpose undercoat.

You may use oil based paint over water based paint.



3.13 Tiler

3.13a Vinyl tiled floors are damaged either by the failure of the concrete underneath, or the rotting away of any timber or masonite underneath. They should be replaced because they are dangerous underfoot, unhygienic and can allow the floor to be further damaged by trapping water:

If on concrete:

Carefully remove any damaged tiles, scrub the floor with a wire brush, paint out any holes with a concrete adhesive, fill with strong mortar and replace the tile. Small holes can be wire brushed out, the holes painted with a concrete bonding agent and filled with strong mortar.

If on timber:

Carefully cut away around the damaged area to the next whole tile and where there is no apparent damage to the floor. Scrub back with a wire brush, seal the floor with undercoat, lay 4.5mm fibro, seal the edges with silicone and replace tiles.

If the floor is badly rotten:

Completely remove all tiling and underlay, scrub back the floor with a wire brush, thickly paint out with undercoat, lay polythene sheeting as a waterproof membrane, overlay with fibro, silicone seal joints in fibro sheeting and overlay with new vinyl tiles.

3.13b It is essential to have a splashback at least 1 course of tiles at the back of any sink:

Check that any tapware to be fitted through a splashback will still be fixed to the pipe if it is 10mm away from the wall. If not, you must get a plumber to provide an extension to the pipe.

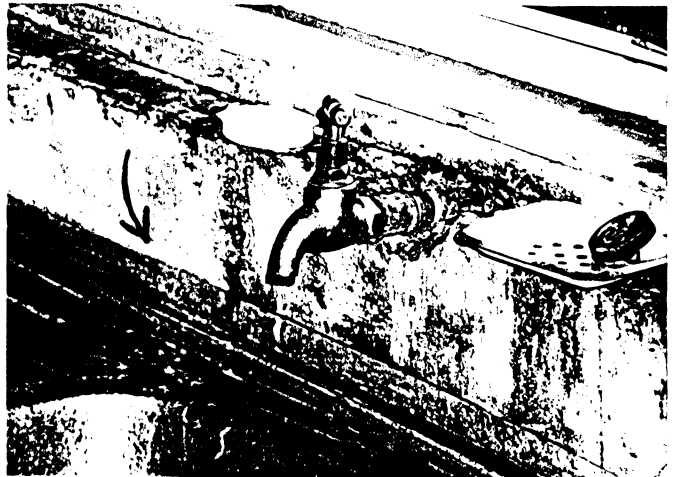
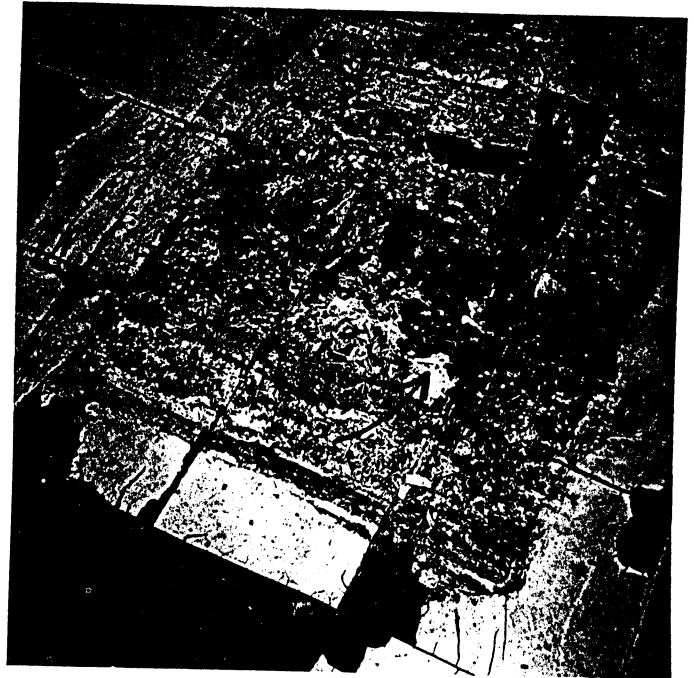
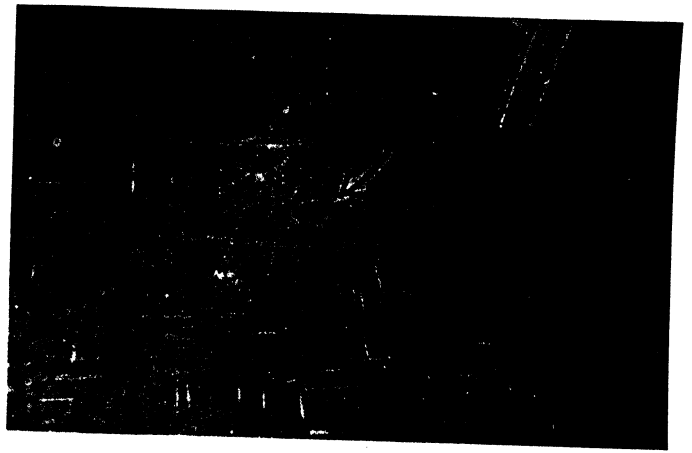
If the sink is hard against a masonry wall: Scratch the wall with a wire brush to key the surface, add a single course of tiles finishing 6mm above the top edge of the sink and grout all edges and joints.

If the sink is away from a wall:

Run a fibro backing sheet between the back of the steel lip of the sink and the wall to finish 6mm smaller all round than any tile. Add a tiled splashback as before.

If the sink is hard against a timber wall:

Run a fibro backing sheet over the steel lip of the sink to finish 6mm above the sink, run a silicone bead at the bottom edge of this sheet and add a tiled splashback as before.



3.14 Guttering, water tanks, landscaping

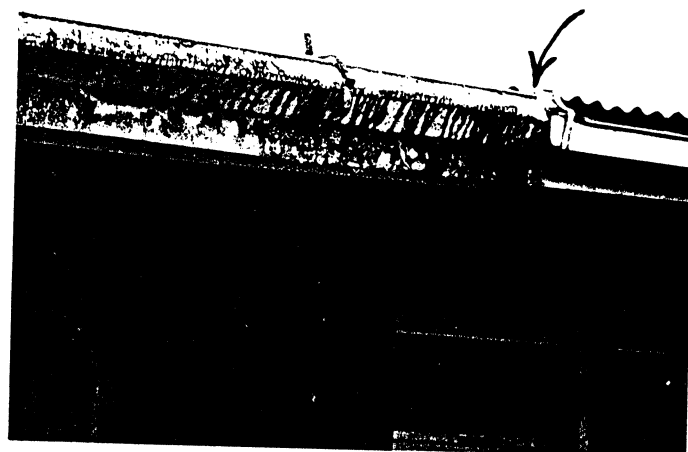
3.14a Roofs without gutters can erode the ground around the edge of a building and expose pipes resulting in a risk of damage to those pipe:

Provide a gutter and spouting as a first measure. If the building is on steel on concrete legs then build a small stone pathway around the outside of the building with embedded river stones, coral rocks or concrete and fill with gravel to cover the pipes. If the building has a concrete slab build the pathway up against the side of the building sufficient to covert the pipes, but never less than 150mm below the floor level.



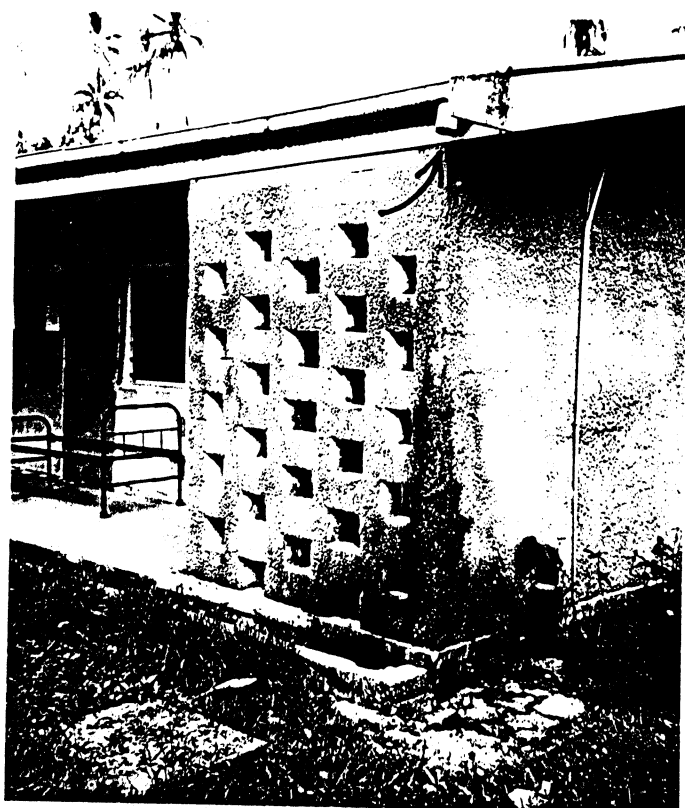
3.14b Where gutters leak this can rot the fascia and lead to the collapse of the gutter. The fascia will also rot away and allow the rain to damage the roof structure:

Arrange for a plumber to fix the gutters with rivet and silicone joints and to add new or replace the gutter straps so the gutter is held firmly against the fascia.



3.14c Gutter spouting will rust through with age because the water is always washing the galvanised coating and rust away:

Fix any obvious holes with silicone or aluminium tape, or replace the spouting in part or in whole. You must always have a spouting from a gutter to the ground to stop the water from damaging the building or the ground.



- 3.14d A rain water tank base will rot if it is badly built and un-painted. Badly maintained downpipes will leak onto the base, and when the tank is full it may also overflow onto the base:

Carefully lift the tank off the base, clean the wood and thoroughly stain it. Arrange for a plumber to fit a proper overflow pipe to spout the rainwater away from the tank to a stone pit (not just onto the ground as this will rot. Check the downpipes every month.

- 3.14e Leave that fall on roofs will trap water and can lead to rusting of the roof, the rusting and collapse of the gutter straps and blockage of the gutter:

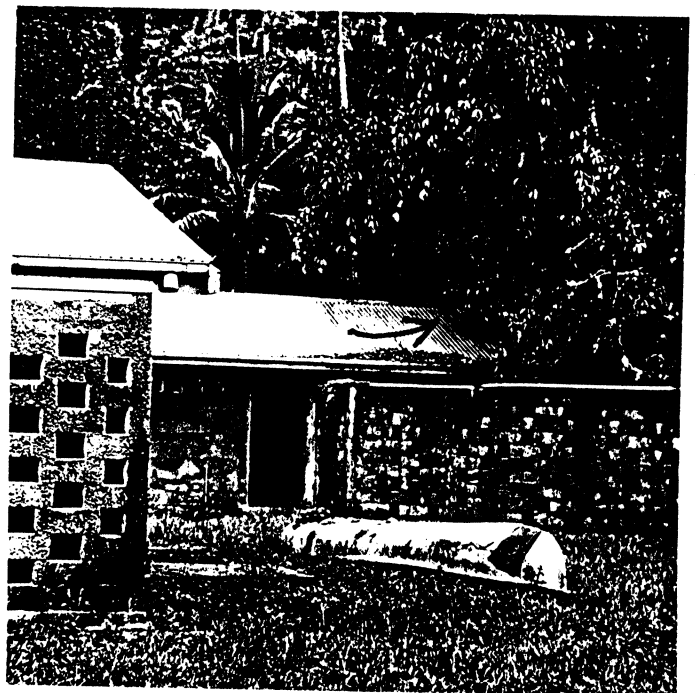
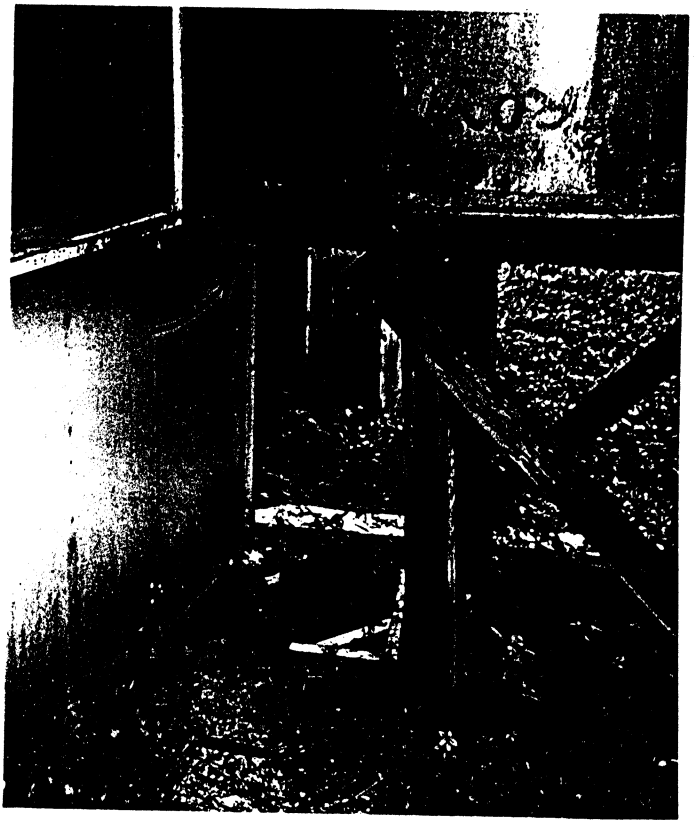
Make sure the roofs are cleaned every month and the gutters regularly swept clean.

- 3.14f Trees that overhang roofs drop leaves that fill gutters and can cause damage when the wind blows them against the building or branches break off and damage the building:

Check every year and remove any branches which overhang any roof. Small branches can be cut with saws but must never be cut with a bushknife or axe because they can damage the tree. Cut the branches off and wrap them with a copra sack

- 3.14g Lighting fires at the base of trees will burn them and they can collapse without warning and kill you or damage a building:

NEVER light a fire at the base of a tree. Build a proper fire pit to burn rubbish away from trees and buildings.



4.2 Tips for better building

3.1 Termites:

- Termite killers: Island Pest Control, P.O.Box 364, HONIARA
Tel. 30152
Facsimile 30188

3.2 Drains:

- Use river stones or broken blocks to fill outside soakaways, not coral.
- Drain pipes should fall 1 ft in every 60 ft.

3.3 Concrete:

- Always mix concrete by volume.
- Make a mixing box or use an empty 4l (1 gallon) paint tin.
- 1 tin cement, 2 tins sand, 4 tins gravel in a strong mix for concrete.
- Add a quarter of a cup of white PVA wood glue to this mix to make the concrete water-resistant.
- Mix 1 cup of PVA adhesive with 1 cup of water to make a concrete bonding agent.
- Always lap two pieces of reinforcing rod by 40 x the size of the rod (i.e. 12mm = 480mm).

3.4 Steelwork:

- Unless you are going to paint over it, leave rust on the steel.

3.5 Blockwork:

- Always wet blocks before you lay them.
- 1 tin cement, 4 tins fine sand is a good mix for plaster.
- Always wet blockwork before you add render.
- Always fill all the holes in the blockwork.

3.6 Timber framing:

- Vasa is the best timber to avoid termites.
- Always put plastic between a wooden wall and concrete floor.
- Paint all the joists and bearers underneath and all the timber wall framing in a shower or toilet area with undercoat before finishing the wall or floor.
- Use more than 1 nail every time you nail studwork together.
- Always use washers with bolts.
- Make a proper saw horse to cut timber square a clean.
- Always file or sand rough edges off sawn timber before nailing in place.
- Choose roof timbers which have a slight bow upwards.
- Use at least 4 galvanised nails to each end of any cyclone strap.

3.7 Dry Linings

- Surface nailed timber floors are easier to keep strong.
- Always paint the underside of roof sheeting where it laps another sheet.
- Use a timber block under the hammer to avoid damaging the roof or weatherboard or wall lining if you are removing nails.
- Turn up the valleys of the roof meeting to stop rain blowing in.
- Stain the top edge and ends of weatherboard strips before you fix them.
- Stain boards of board and batten cladding before adding the batten.
- Use the machined edge at the bottom when lining out a shower.
- Paint the back of all wall linings in showers, WC, bathrooms and kitchen.
- Punch all nails in weatherboard or board + batten cladding.
- Fill all punched nail holes with putty.
- Use galvanised nails wherever possible.

3.8 Joinery

- Paint the ends of all frames with undercoat before nailing them together.
- Paint outside edge of frames with undercoat before fitting in openings.
- Provide weather drips along the bottom edge of all window cills.
- Always mark timber with a proper square.
- Always use a saw-horse to cut neat ends.
- Always lightly sand the end of cut ends to remove fur.

3.9 Hardware

- Fit hardware only after frames and doors have been decorated.
- Use a proper glass cutter to cut louvre glass.
- The following are the most common types of lock used:
 - 'Lockset': handles both sides, locked from both sides with a key.
 - 'Entrance lockset': handles both sides, key in the middle of the outside handle and button on the inside handle to lock the door.
 - 'Bathroom lockset': handles both sides, button inside to lock the door and a groove in the outside handle to unlock the door without a key.
 - 'Nightlatch': opens with a key from the outside and a button inside
 - 'Rimlock': as per lockset, but is fixed to the inside face of the door not chiselled into the door.
 - 'Deadlock': double cylinder opens with a key from both sides, single cylinder outside and a knob inside and only stays closed when locked.

3.10 Plumber

- Be sure to use an isolator tap on WC cistern feeds.
- Test all water pipes before closing up walls

3.11 Electrician

- Fill any holes around lights, switches and power points.

3.12 Painter

- Always use undercoat on any new timber to be painted.
- Make sure the tops and bottoms of all doors are properly painted.
- Paint all doors and frames before fixing hardware.
- Rub sandpaper over surfaces to be painted, even if already painted.
- You can use oil-based paint over water-based paint.
- You can use water-based paint over oil-based paint only if you key the surface hard with sandpaper and seal with general purpose undercoat.
- The most useful paints that you will commonly use are:

Red-oxide metal primer (oil)	For unpainted steel
Pink wood primer (oil)	For unpainted wood in wet areas
General purpose undercoat (oil)	For unpainted wood
Matt or flat white	For ceilings
Gloss white	For cabinet work
Solid woodstain	For weatherboard and cladding
Semi-gloss emulsion	For internal walls in offices
All-weather gloss	For internal walls in wet areas and external walls
Semi-gloss polyurethane	For timber floors
Solid decking stain	For external timber floors
- The only sealant you can paint over is 'Sellys No-more gaps'

3.13 Tiler

- Mix tile adhesive so it looks like porridge.
- Use matches to keep the tile joints even and open.
- Use silicone sealer between tiles and the top of worktops.
- A wet finger will push the silicone into the gap.
- Fix sinks and basins over the top of worktops onto a silicone bed.

3.14 External works

- Silicone seal all gutter joints.
- Use twice as many straps or brackets as you think you need for gutters.
- Keep roof sheeting overhanging 2" over gutters.
- Always use a saw, never an axe or bush knife to chop branches.
- Cover the end of cut branches with a copra sack.
- Cut all the pieces required for a watertank stand and stain them thoroughly before fixing them together.

4.3 Rules of thumb for estimating materials

To estimate the amount of:	
Weatherboard	Area ÷ 0.12 gives the total length in metres, with 12% for loss
Flooring	Area ÷ 0.075 gives the total length in metres, with 12% for loss
Roofing	Width ÷ 0.75 gives the number of sheets
Internal linings	Area ÷ 2.5 gives the number of sheets
600mm studwork	Area ÷ 0.35 gives the total length in metres with 5% for joints
600mm joists	Area ÷ 0.45 gives the total length in metres with 10% for joints
1m ³ of render:	Uses 8 bags of cement and 1m ³ of sand and covers both sides of 400 6" blocks
1m ³ of cavity fill:	Uses 6 bags of cement and 1m ³ of mixed gravel and fills 400 6" blocks
1m ³ of mortar:	Uses 6 bags of cement and 1m ³ of sand and is enough for 700 6" blocks
1m ³ of concrete 100mm thick	Covers 10m ²
1m ² of roof	= 4.5 ft run of roof sheeting
Steelwork	Total length required ÷ 5 gives number of bars
The most useful lengths of door frame is	2.1m
You need 1 box of 'Nu-way' nails for every	40m ² of roof
1 gallon of paint covers approximately	40m ² of sealed wall
To build a standard septic tank + soak away you need	200 6" blocks
1m ² of wall contains	14 6" blocks
1m ² = 11ft ²	
1 foot = 300mm	
100mm = 4"	
75mm = 3"	
50mm = 2"	
38mm = 1+1/2"	
32mm = 1+1/4"	
25mm = 1"	

4.4 Recommended minimum tool kit

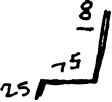
- Cross cut saw
- Rip saw
- Hack saw and blades
- Claw hammer
- Spirit level
- Carpenter's square
- 1/2" chisel
- Long-handled cross-head screw driver
- Long-handled screw driver
- Nail punch
- Hand drill
- 2" short stock plane
- Rasp file
- Stiff wire brush
- Stiff nylon brush
- Silicone sealant gun
- Tube white silicone sealant
- 750ml bottle PVA wood glue
- 2Kg packet 'Spak filler'
- 250grm packet putty
- 250mm bottle lubricating oil
- Tin of 100mm j/h nails
- Tin of 75mm j/h nails
- Tin of 50mm j/h nails
- Tin of 50mm galvanised j/h nails
- Tin of 32mm cut fibro nails
- Tin of 19mm masonite panel pins
- Tin cut blue tacks (for insect screens)

4.5 Sample checklists

2.0 REGULAR INSPECTION

2.1 Preliminary inspection

<p>Termite attacks Examine the trees, walls, ceilings, cabinet work and frames for evidence of termite attack SECTION 3.1</p>	<p>See attached list of materials required Roof of pharmacy collapsed. Termite attacks in many walls, some masonry eaten through. Nests seen in trees. Big job. Needs pest control.</p>
<p>Roof sheeting and flashings in place Inspect all the roofs and all edges and changes of pitch and direction of the roofs to confirm that the edge of the roof is dressed against the bargeboards with proper flashings to stop rain from blowing under the roof SECTION 3.7</p>	<p>Corner of roof of maternity ward is loose. Needs roofing nails (10)</p>
<p>Fascias and bargeboards are in place Look at all the roofs to be sure that the ends of rafters and purlins are protected from the weather by timber boards SECTION 3.8</p>	<p>Some ends are rotting. 1 length 8ft of 6"x1" fascia needed for outpatients</p>
<p>Guttering is in place Check all roofs that rainwater either falls to a gutter or onto the ground where there are proper ground drains to prevent erosion and flooding SECTION 3.14</p>	<p>Need guttering over outpatients new sitting area. 12.5m, 2 stop ends, 1 outlet, 2 bends, 3.0m pipe</p>
<p>Roof structure properly built Examine how trusses have been built and rafters and beams connected together to be sure they are strong and well-built SECTION 3.6</p>	<p>Trusses only nailed together - no nail plates or timber plates to join the top chords to the bottom chords Needs 150x150 nail plates - 20.</p>
<p>Cyclone strapping Examine the roof and how the walls are tied to the floor or ground to make sure there is proper strapping and reinforcement SECTION 3.6</p>	<p>No cyclone straps to the outpatients Needs 47 triple grips plus nails.</p>
<p>Steel frame is in good order Examine all steel frames especially close to the ground to see if they are rusting through SECTION 3.5</p>	<p>Some rusting, truss in medical ward is exposed and dirty. OK.</p>
<p>All bolts are fully tightened Test each and all bolts used to be sure they remain tight and in good condition SECTION 3.5, 3.6</p>	<p>Some loose bolts were found and tightened. 2 bolts missing from the outpatients verandah post tops. - 175mm x 12mm</p>

<p>Cracks in walls, floors and foundations are monitored Make a record of where any cracks appear and test them for further movement if they appear to be getting bigger SECTION 3.3, 3.4</p>	<p>Crack in the kitchen floor needs to be tested as we can see right through it.</p>
<p>Gable end windows have head flashings or sun screens Look along the tops of all windows where there is no proper roof overhang to be sure that a proper flashing or metal drip has been placed along the top of the window SECTION 3.7</p>	<p>3 double windows need flashing 6ft/1.8m long, see sketch</p> 
<p>Wall cladding finished with battens Inspect all of the joints between fibro cladding and where fibro abuts blockwork on the outside of the building to be sure that they are properly protected from the weather SECTION 3.7</p>	<p>6 battens 50x25 required, 3.0m long</p>
<p>Wall cladding properly watertight Inspect all weatherboard and board and batten cladding for shrinkage that can expose gaps between the boards SECTION 3.7</p>	<p>Weatherboard on pharmacy wall has gaps and some is loose.</p>
<p>Render correctly done Look at window and door frames to be sure that the render is not covering any weather grooves to bottom of all cills SECTION 3.8</p>	<p>Windows to medical ward have no grooves but the walkway roof covers them to OK.</p>
<p>Window, door frames in good order Inspecting all frames especially where they are close to or touching the floor or the ground to be sure they are not rotting and have been properly decorated SECTION 3.8</p>	<p>6 toilet and shower doors broken but can be repaired. 2 doors rotten but can be trimmed. 1 door missing. Needs 20m ex 150x25 T+G, 150x25 framing and 2" nails.</p>
<p>All doors are in good order Check that each door closes properly and is fully decorated especially along the top and the bottom edges SECTION 3.8</p>	<p>1 door needed for the pharmacy as termites have eaten it. Door frame opening is 2050 x 825</p>
<p>Hardware functional Check all handles and louvre windows to confirm all are in good working order SECTION 3.9</p>	<p>3 locksets needed for medical, 6 bolts for toilet + showers, 1 deadlock needed for the pharmacy</p>

<p>All screws provided to hinges and louvres Inspect all door hinges and louvres to be sure all screw fixings have been properly provided and are in place SECTION 3.9</p>	<p>Some screws missing - need 20</p>
<p>Redundant work non-critical Are any holes drilled by mistake likely to cause problems of rotting SECTION 3.8</p>	<p>Holes in fascia over outpatients. Needs new piece of fascia 200x30mm 1.2m long plus nails + paint.</p>
<p>Sink worktops in good condition Inspect all worktops to be sure that water is not leaking under or behind the sink and rotting the worktop, or onto the floor and rotting the legs SECTION 3.8</p>	<p>All sinktops need replacing. Need 3 sheets 20mm block board, 3 sheets formica, formica glue, 2" nails, silicone, silicone gun, sandpaper,</p>
<p>Splashbacks in place Check that some form of tiling or boarding is provided behind the sink to stop water splashing on the wall and running down SECTION 3.13</p>	<p>All sinks need splashbacks. Need 52 6" tiles, 1 sheet fibro, tile adhesive and grout.</p>
<p>Services are properly installed and protected Examining how pipes and electricity lines enter the buildings to be sure they cannot be vandalised or exposed by washing out of the ground around the building SECTION 3.10, 3.11</p>	<p>Water main behind outpatients exposed due to flooding. Will repair with stone wall and gravel (both available).</p>
<p>Waste outfalls OK Inspect floors near to floor wastes and gullies to ensure any water properly drains away SECTION 3.2</p>	<p>Maternity unit gully is sinking and ground is soft. Needs a bag of cement to stabilise the ground.</p>
<p>Decoration properly done Look at window and door frames, doors and cabinets to be sure that the timber has been properly decorated with primer, undercoat and top coat, and the tops of doors and hidden faces are properly sealed SECTION 3.12</p>	<p>Needs to repaint outpatients door because of gaps in raw timber. Need medium sandpaper, undercoat + gloss. Maternity needs redecoration - 3 gallons wall paint - water-based off white.</p>
<p>Nail fixings are not rusting through Inspect all cabinet work, shelving to confirm that nail fixings used are not rusting through paintwork SECTION 3.8</p>	<p>Rusting through in Pharmacy. Needs punch, putty sandpaper, undercoat and gloss white.</p>

2.2 Monthly inspection list:

<p>Trim trees Examine trees near the building for overhanging or dangerous branches SECTION 3.14</p>	<p>Trim mango tree by pharmacy</p>
<p>Gutters and roof clear of leaves Check all gutters and spouting are in good order and sweep all gutters and roofs of leaves and other debris SECTION 3.1</p>	<p>Done.</p>
<p>Nesting insects Look at all ceilings and walls and clean away any nesting insects, wasps etc. SECTION 3.7</p>	<p>Done.</p>
<p>Doors in good order Test all doors that they close properly, do not drag on the floor and are intact SECTION 3.8</p>	<p>One door to maternity is broken and must be replaced. Frame opening 2050x820</p>
<p>Door handles in good order Inspect all doors, test all locks and handles to be sure all handles are firm and operate properly SECTION 3.9</p>	<p>maternity will need 1 new lockset</p>
<p>Louvres in place and not broken Test all windows to check operation and that all glass is in place SECTION 3.9</p>	<p>3 Louvres needed, 812mm long</p>
<p>Insect screens intact Examine insect screens for holes, tears and damage to battens SECTION 3.9</p>	<p>1 piece 4ft x 3ft needed for pharmacy plus nails to fix and re-fix battens.</p>
<p>Taps not leaking or missing Inspect all tapware to check all fittings, handles and spouts are in place and taps are not dripping SECTION 3.10</p>	<p>Plumber needed to fix constantly running tap in medical ward.</p>
<p>Toilet seats are in good order Inspect all toilet fittings to be sure seats and covers are firmly fixed, intact and clean SECTION 3.10</p>	<p>OK</p>

<p>Basin wastes are not leaking Run your finger under the pipe to ensure waste pipes are not leaking or dripping SECTION 3.2</p>	<p>Plumber need to fix waste leak behind outpatients basin.</p>
<p>Soakaway not blocked or full Inspect the ground around soakaway, the speed of toilet and shower drainage for evidence of problems with the soakaway SECTION 3.2</p>	<p>Soakaway was full but has been bailed out. Can plumber check if we need a new one</p>
<p>Light fittings clean and working Inspect and clean all light fittings and exposed bulbs and listed any missing bulbs SECTION 3.11</p>	<p>OK. 4 60w bulbs required plus 1 4ft fluorescent tube (striplight).</p>
<p>Ceiling fans in good order Examine and clean all fans and fan blades and check all blades are firmly fixed SECTION 3.11</p>	<p>Fans cleaned.</p>
<p>Decoration in good order Inspect frames and doors especially for scratches and peeling. Clean mould where seen to occur SECTION 3.11</p>	<p>Wall behind maternity sink still damp and peeling. Needs medium sandpaper, undercoat and wallpaint- gloss white.</p>

Have you:

1. Swept the gutters? ✓
2. Oiled the louvres and door handles? ✓
3. Cleaned the ceiling fan blades? ✓
4. Cleaned the light fittings? ✓
5. Scrubbed off mould growths? ✓

2.3 Annual inspection:

<p>Termite attacks Check for evidence of termite trails and nests in, on or nearby the building SECTION 3.1</p>	<p>OK</p>
<p>Inspect roof for rusting Check over all roof for signs of serious rusting or discolouration around fixings, flashings, capping or pipes passing through the roof SECTION 3.7</p>	<p>Small leak around WC vent. Needs flashband tape.</p>
<p>Gutters in good order Examine gutters, downpipes and fixings to the roof for signs of rusting SECTION 3.14</p>	<p>Gutter to outpatients is loose after ladder learnt on it. Needs new bracket (2) and solvent cement to fix joint break. This is 'stormcloud' guttering.</p>
<p>Fascias in good order Examine all fascias front and back for signs of rotting, water damage or algae growth SECTION 3.8</p>	<p>Edge of fascia above pharmacy needs redecorating. Need fine sandpaper, undercoat and gloss white.</p>
<p>Floors not pitted Inspect concrete floors especially where in constant use or subject to heavy loads such as in kitchens to schedule any pitting in the floor SECTION 3.3</p>	<p>Some pitting in the kitchen. Needs a little cement to make up a mix to fill the holes.</p>
<p>Floors not rotting out Closely inspect timber floors to bathrooms, showers and toilets from on top and underneath to check for water damage, rot or algae growth SECTION 3.7</p>	<p>Maternity bathroom floor rotting because of dripping tap. Needs plumber to fix tap and to make a list of what is needed for the floor - vinyl tiles, fibro, nails, undercoat as we don't want to damage the</p>
<p>Vinyl tiles in good order Examine all tiled floors to record any missing or broken tiles SECTION 3.13</p>	<p>2 tiles needed for outpatients. Colour sample attached.</p>
<p>Ceilings do not sag Check all ceilings and fixings are in good condition SECTION 3.7</p>	<p>Pharmacy ceiling sagging. Needs Gonn 50x12 battens, 2" nails, undercoat and gloss, sandpaper and spade filler.</p>
<p>No rat damage to ceilings Check all ceilings for holes made by rats living in the space above SECTION 3.7</p>	<p>New rat hole above kitchen. Can be patched - no materials required.</p>

<p>Splashbacks in good order Check that water is not splashing or running down behind any sink or basin SECTION 3.13</p>	<p>Silicone seal behind outpatient's sink is leaking. Needs new silicone and silicone gun.</p>
<p>Frames intact Inspect all window and door frames for water damage, rotting or signs of termites SECTION 3.8</p>	<p>Water damage to end of windows to outpatients. Need sandpaper, undercoat and gloss white. Do it now to avoid it getting worse.</p>
<p>Doors intact Inspect all doors especially bottom edges for water damage and rotting SECTION 3.8</p>	<p>Generator room bottom edge is rotting. Cut off. Needs medium sandpaper, undercoat and gloss 'mission brown'</p>
<p>Drains have not subsided Examine the ground around gullies, soakaways and septic tanks to be sure that the ground has not become waterlogged and is sinking SECTION 3.2</p>	<p>Ground around soakaway is always damp. Probably needs a new rubble drain. Plumber to inspect and advise.</p>
<p>Water tank in good order Inspect water tanks for evidence of leaking, rusting or bruising SECTION 3.14</p>	<p>Bottom lip of tank is leaking. Needs solder and metal primer and wet or dry sandpaper.</p>
<p>Tank stand in good order Inspect water tank stand especially under the tank base for evidence of rot or algae growth SECTION 3.14</p>	<p>Leak from tank is spoiling tank base. Needs medium sandpaper and woodstain.</p>
<p>Clean out rainwater tank Capsize rainwater tanks or open drainage cocks to dispose of leaf mould, dirt etc. inside the tank and scrub out where possible SECTION 3.14</p>	<p>OK.</p>

2.4 After a cyclone:

<p>Roof damage Check roof for damage from falling trees, weakening of nails and that all flashings, capping and sheeting is in place SECTION 3.7</p>	<p>Mango tree fell on pharmacy roof. Extensive damage. Please send a works team to assist.</p>
<p>Window damage Check all windows and schedule any damage from flying debris SECTION 3.8, 3.9</p>	<p>Insect screen and Louvres damaged. Needs 57 louvre blades, 12.0m insect screening, Nails for mesh and 2" nails for battens. We can repair this.</p>
<p>Cyclone straps intact Inspect all roof fixings outside and inside where possible to ensure that strapping is still strong SECTION 3.6</p>	<p>OK</p>
<p>Water runs clean Turn on and test all mains water services to allow any disturbed mud or dirt to wash through the system and not pollute the water SECTION 3.10</p>	<p>All OK except medical ward - we think mud may have blocked the pipe. Please send a plumber.</p>

2.5 After an earthquake:

<p>Cracks in floors and walls Inspect all walls, floors and visible foundations for evidence of cracking SECTION 3.3, 3.4</p>	<p>Hairline crack now in maternity floor - will test and advise.</p>
<p>Water runs clear Turn on and test all mains water services to allow any disturbed mud or dirt to wash through the system and not pollute the water SECTION 3.10</p>	<p>All OK except medical ward - we suspect main's water has broken - please send a plumber.</p>
<p>Drains do not leak Inspect and test all drain pipes and waste outlets for evidence of leaking SECTION 3.2</p>	<p>There is a strong smell and the ground is soft and wet near the ablution block. We think the drain may be cracked. Please send a plumber to help.</p>
<p>Re-test services one week later Check later to be sure SECTION 3.2, 3.10</p>	<p>OK, but medical still blocked.</p>

MATERIAL LIST

ITEM	UNIT	AMOUNT	RATE	COST
DAR 200x38 Fascia	2.4m	2		
Pink wood primer	4L	1		
Exterior wall emulsion, brilliant white	4L	4		
75mm joint head nails	Kgs	5		
Portland cement	40kg bag	12		
150x150 white ceramic tiles	Tiles	38		
20mm blockboard 2.4x1.2	Sheets	2		
Formica laminite - white, 2.4x1.2	Sheets	1		
Sawn 100x50 Wall panning	Random	75m		
Sawn 200x75 Vasa Bearers	3.6m	2		
Sawn 150x50 Joists	3.3m	12		
4.5mm Fibro 2.4x1.2	Sheets	2		
Clear silicone	Tube	1		
Silicone gun	Guns	1		
Flexible tile adhesive	20kg bag	1		
24G roof sheeting, plain round	3.8m	12		
	3.2m	6		
	1.8m	2		
Ex 100x25 T+G flooring	Random	140m		
5mm clear louvre glass 812mm	Glass	32		
Bright steel louvre screens	Box 100	1		
50ø PVC 'S' trap Sink waste		1		
50ø PVC pipe	6.0m L	1		
PVC solvent cement	250ml	1		
Pryda nailplates 100x200mm	Nailplate	30		
Green treated insect screen 900mm	m	12.5		
Blue tacks for insect screen	Box	2		
60mm 'Nu-way' roof nails	Box 300	1		
24G galvanised flashing - see sketch	1.8m	3		
Ex 150x25 T+G boarding Toilet door	Random	120m		
150mm concrete blocks Soakaway	Blocks	20		
140mm series concrete blocks Walls	Blocks	60		
60W Lightbulbs	Bulbs	4		
100mm flashband tape Roof repair	30m roll	1		
Island Pest Control termite treatment		1		
M12 bolts x 175mm	BOLTS	8		