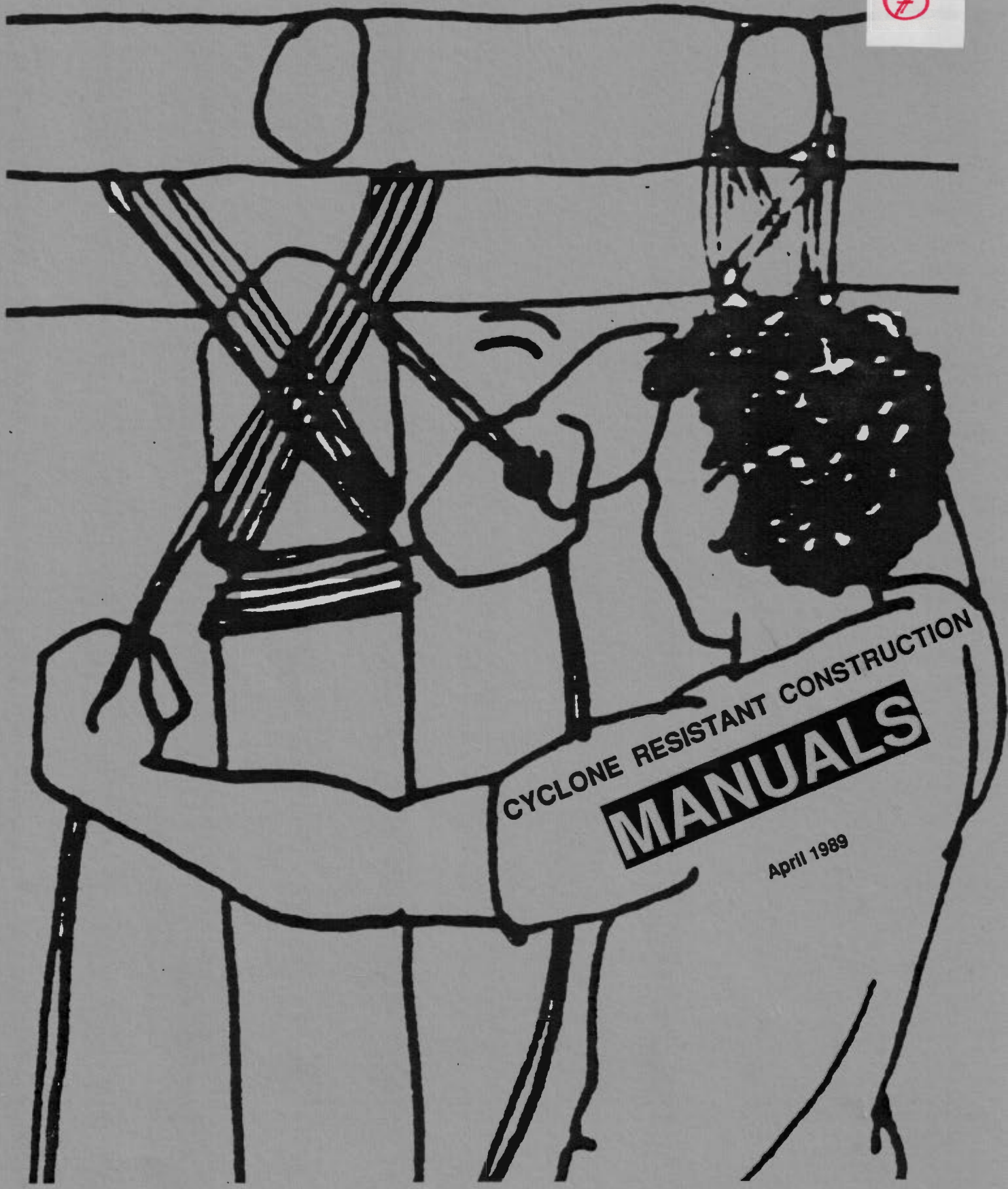
Disaster preparedness and rehabilitation in Binh Tri Thien Province, Vietnam
Sử bảo vệ chống thăm-hoa thiên-nhiên ở tỉnh Bình Trị Thiên, Việt Nam

VIET/85/019

CHUYỂN GIAO KỸ THUẬT XÂY DỰNG NHÀ CHỐNG GIÓ BÃO
DEMONSTRATION OF STORM RESISTANT BUILDING TECHNIQUES



CYCLONE RESISTANT CONSTRUCTION
MANUALS

April 1989

Development Workshop

Viện Thiết Kế Nhà Ở - Công Trình Công Cộng, Hànội
Institute For Housing and Public Building Design

Xí Nghiệp Thiết Kế Khảo Sát Xây Dựng, Huế
Institute For Building Investigation and Design

GRET

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SUMMARY

Presentation

A key objective of project VIE/85/019 - Demonstration of storm resistant building techniques - is to develop ways of communicating ideas about cyclone resistant builiding techniques to the people doing most of the building in Binh Tri Thien province : the village builders, the house owners, the building brigades.

One way of communication that is often tried has been to produce construction manuals which explain the problems and wich show how to build safely. Many such manuals have been produced in the past for different countries effected by cyclones.

In this dossier we have selected a few examples to illustrate some different approaches. We hope that by examining this selection together it will help us to identify what sort of manual showing cyclone resistant building techniques would be most effective in Vietnam.

The dossier is divided into three parts :

* Part 1 presents a manual which has been prepared by IHPBD in Hanoi after the 1985 cyclones.
* Part 2 presents a manual prepared by Juliana Marek (INTERTECT, Dallas, USA) for the U.S. Agency for International Development and where the user wins points if he takes the correct action to improve the safety of his building.
* Part 3 presents extracts from several manuals, showing different methods of presentation, and highlighting some specific ideas.

Part 1 : A vietnamese manual

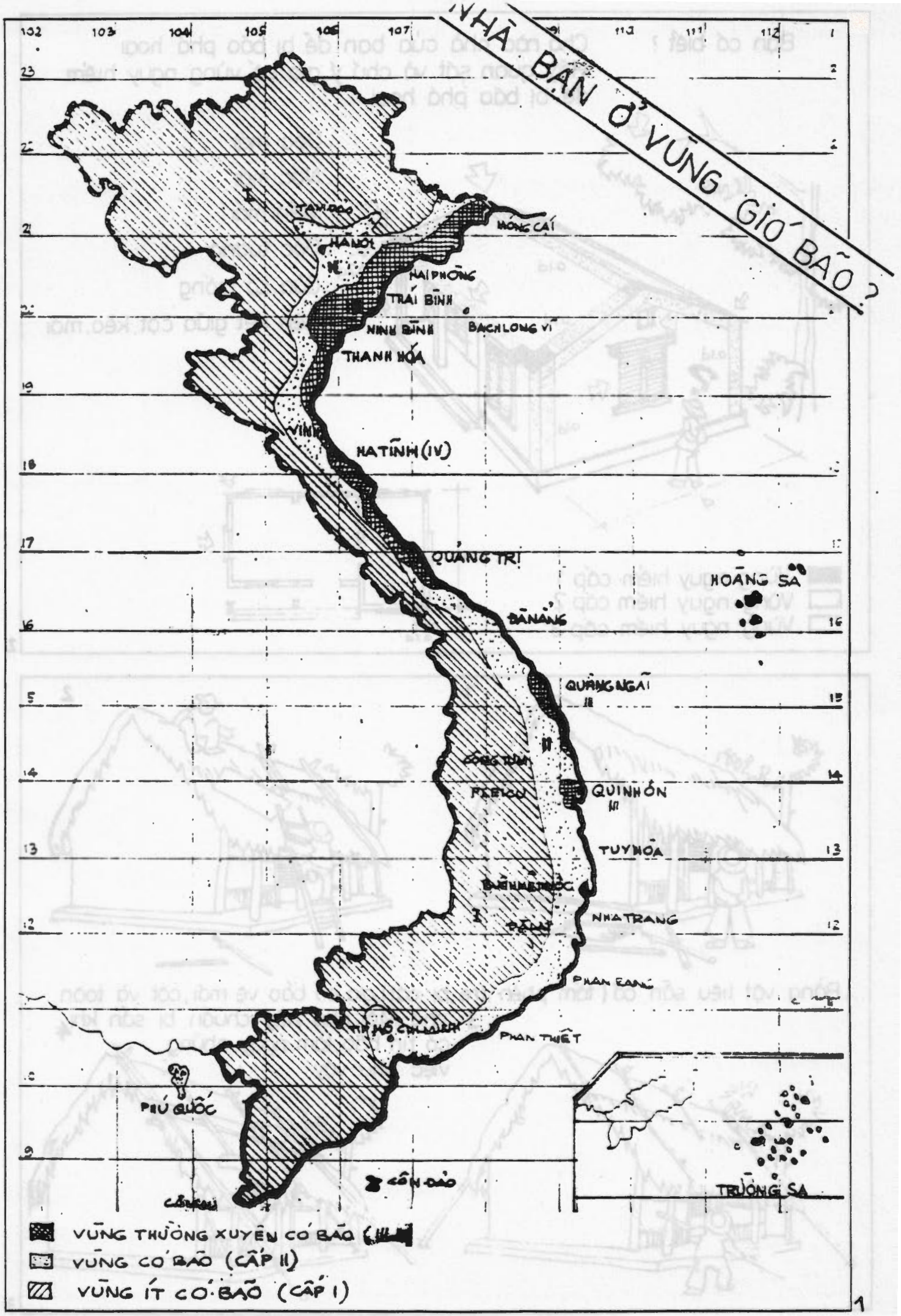
SÁCH PHỔ THÔNG

NGÔI NHÀ VÀ GIÓ BÃO

NHỮNG BIỆN PHÁP ĐƠN GIẢN
ĐỂ HẠN CHẾ TÁC HẠI CỦA BÃO
ĐỐI VỚI NHÀ Ở CỦA NHÂN DÂN

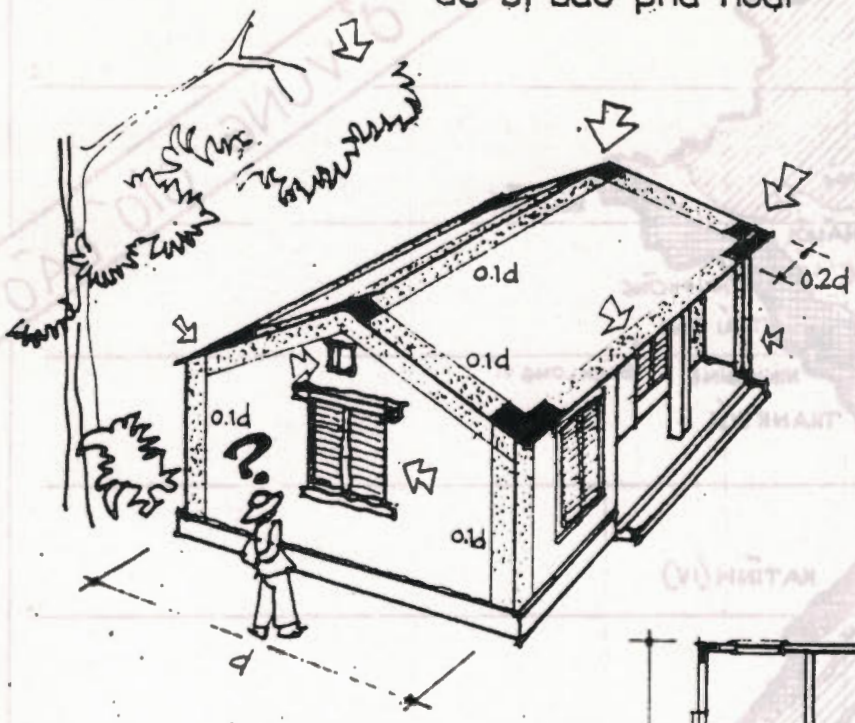
CHƯƠNG TRÌNH NGHIÊN CỨU
KHOA HỌC VỀ NHÀ Ở 38.01.02

NHÀ BẠN Ở VÙNG GIÓ BÃO ?

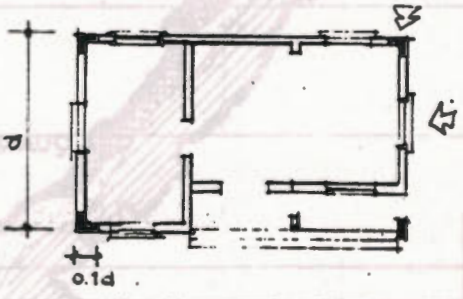


Bạn có biết ?

Chỗ nào nhà của bạn dễ bị bão phá hoại
Hãy quan sát và chú ý gia cố vùng nguy hiểm dễ bị bão phá hoại



- Góc mái
- Nóc mái
- Viền mái
- Góc tường
- Cửa. Lỗ trống
- Liên kết giữa cột, kèo, mái



Vùng nguy hiểm cấp 1
Vùng nguy hiểm cấp 2
Vùng nguy hiểm cấp 3

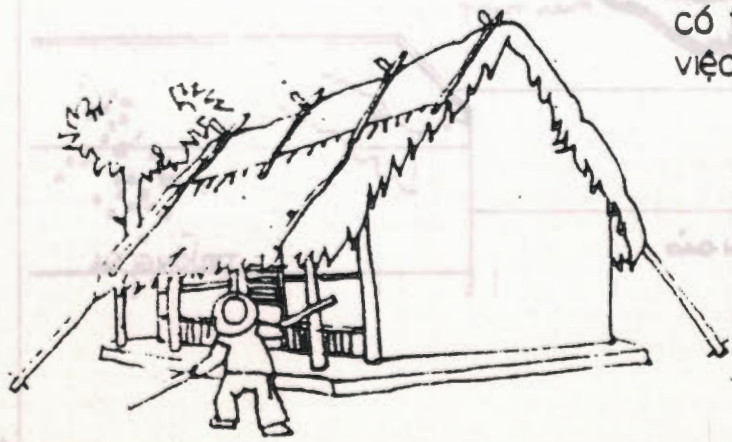
2

1

2

. Bằng vật liệu sẵn có (tấm phên, tre, bị cát), gia cố bảo vệ mái, cột và toàn nhà. Mỗi nhà hãy chuẩn bị sẵn khi có tin bão, làm ngay những việc như vậy

3



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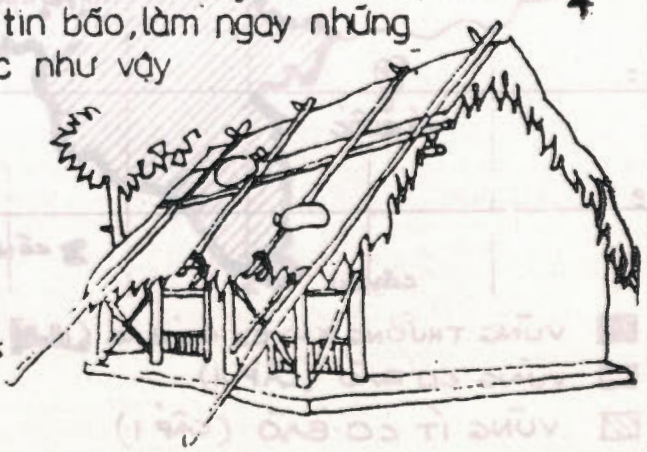


3

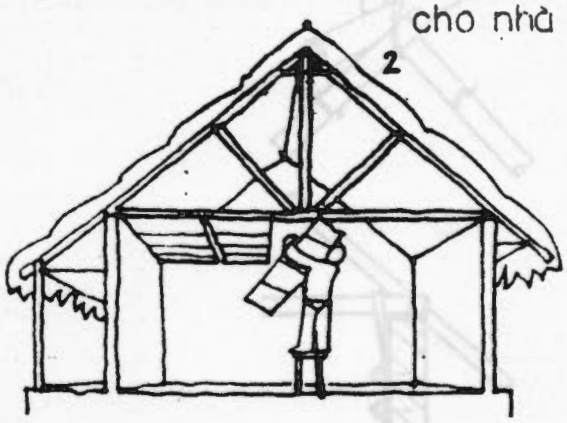
1

1. Gia cố vì kèo - Với nhà tre, khoảng cách a không lớn hơn 1,5m khi a>1,5m thì thêm thanh đứng b

2. Trần nhà có tác dụng làm tăng từ 40-80% khả năng chống bão của ngôi nhà tùy độ cứng của loại trần. Có thể làm trần bằng cót tre, cót ép, gỗ tấm, Carton

3. Chống đỡ bên trong nhất là các góc nhà, cột nhà, rất quan trọng khi có bão cho nhà tre, nhà gỗ.

2



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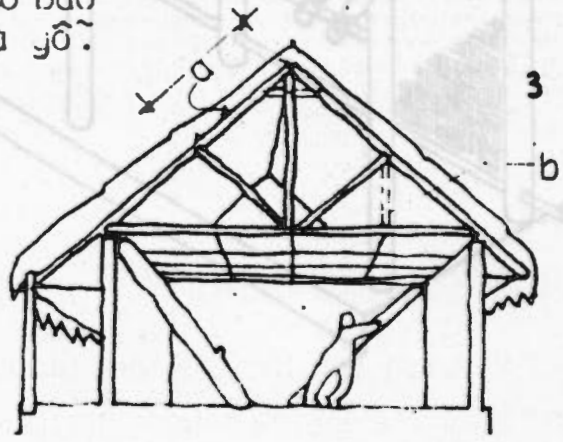

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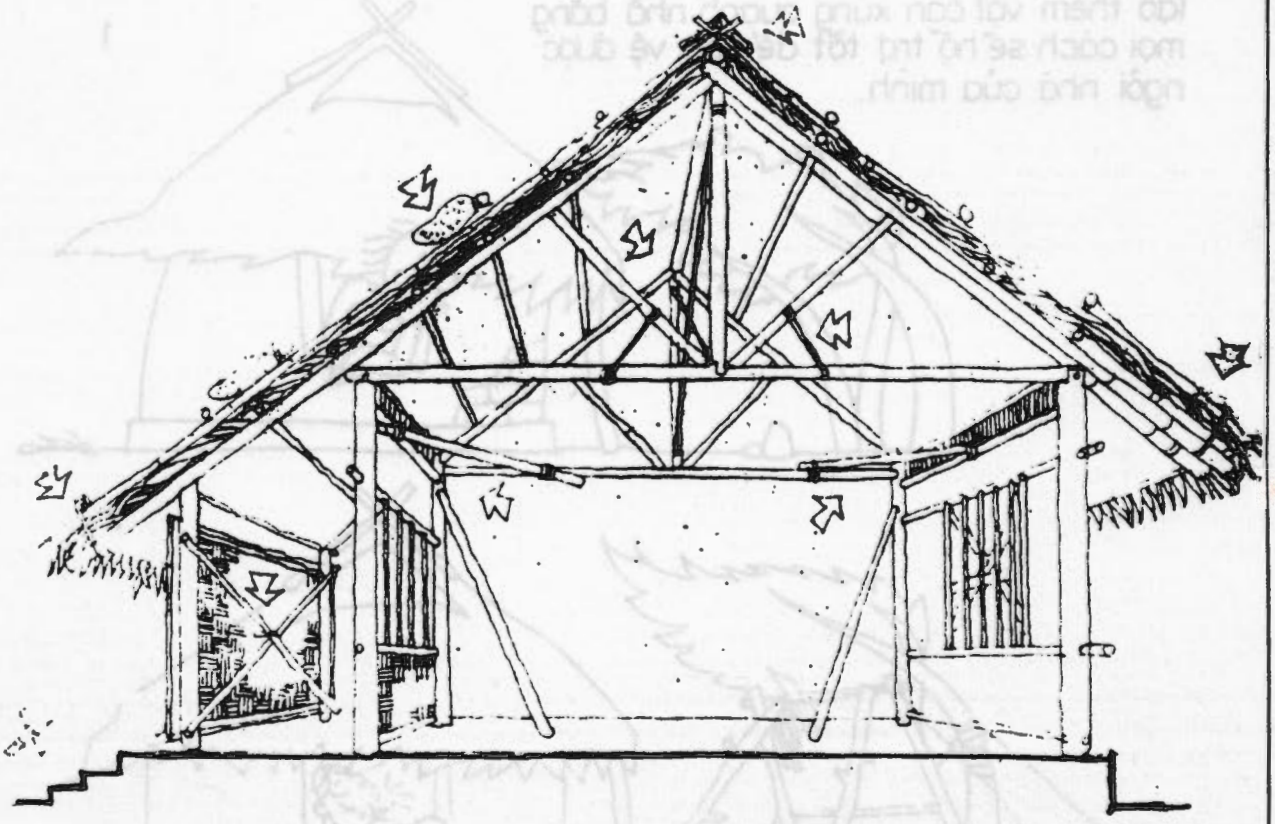
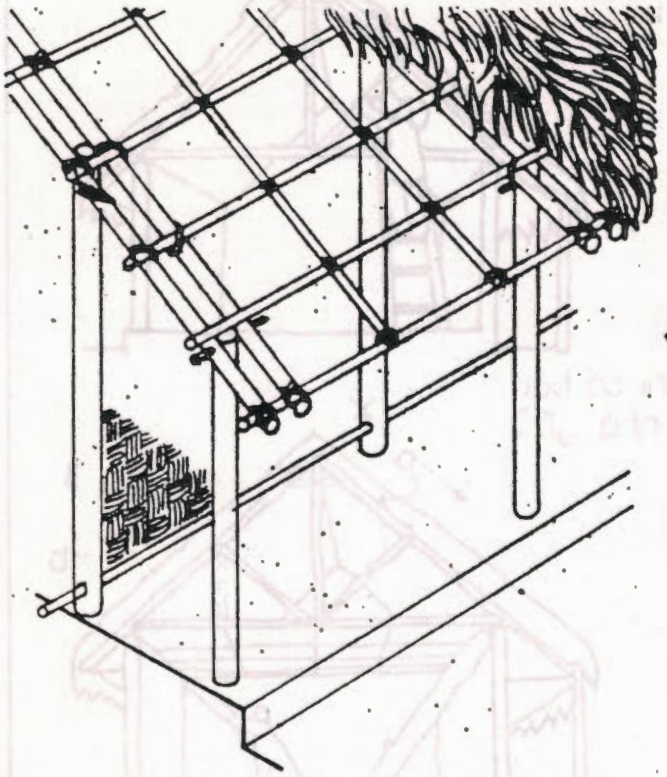
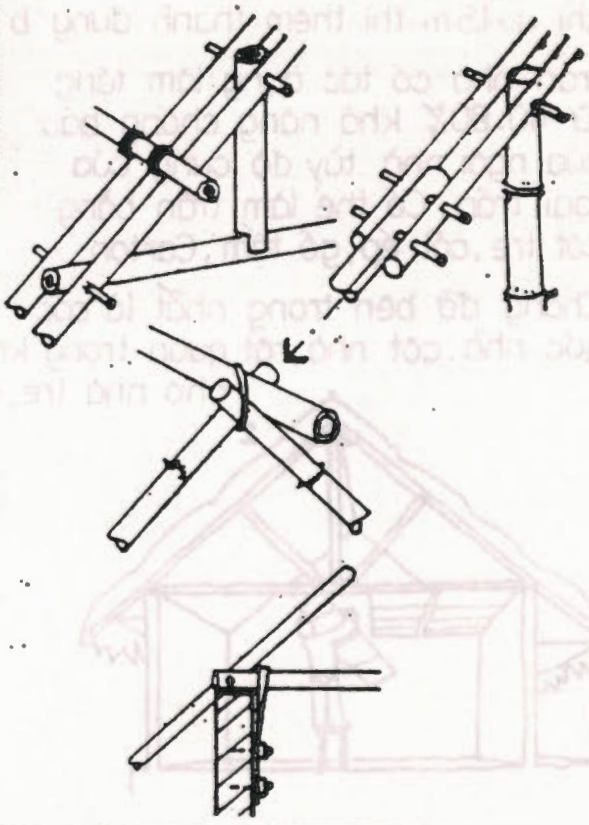


Bạn hãy làm những việc cần thiết cho ngôi nhà khi có bão.

5

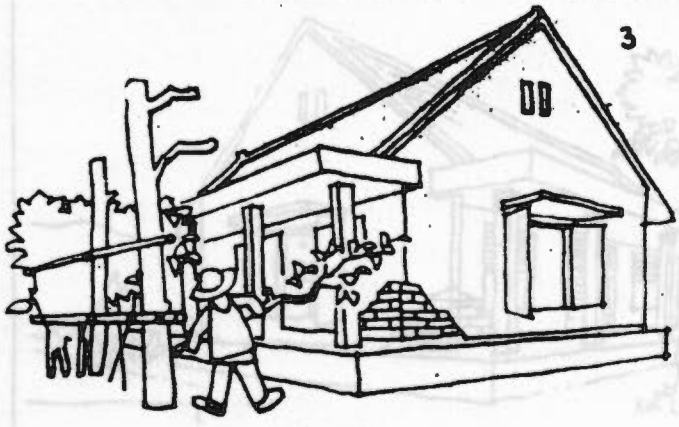
Buộc chặt các mối nối khi có bão dùng tạm liếp để cản gió

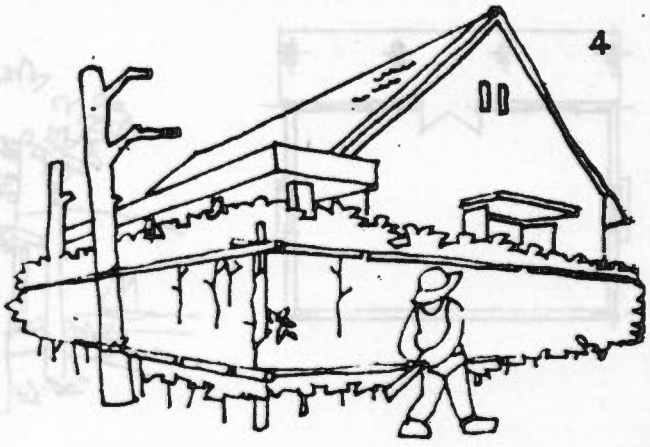


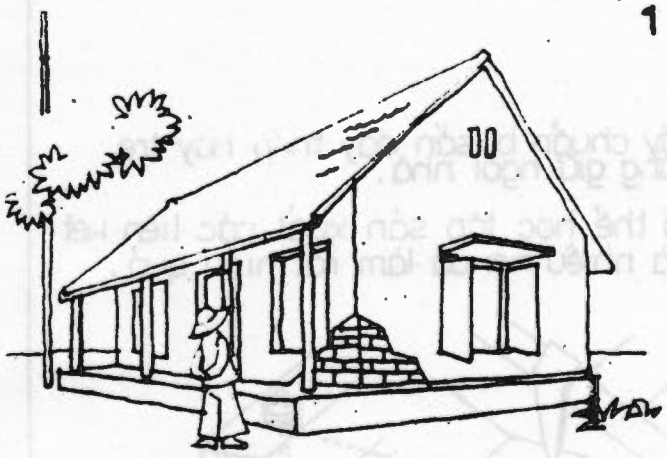


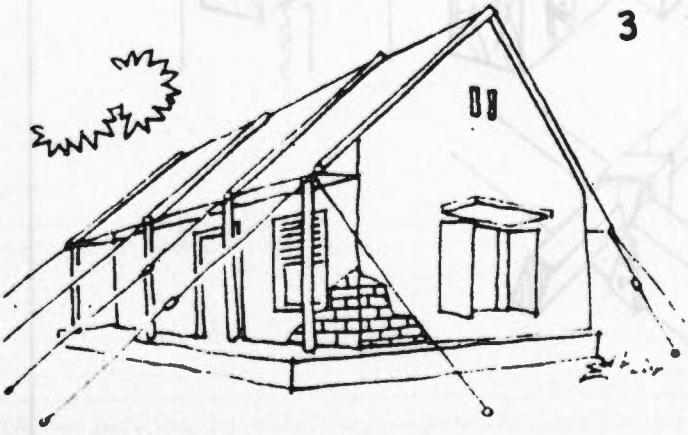
Tạo thêm vật cản xung quanh nhà bằng mọi cách sẽ hỗ trợ tốt để bảo vệ được ngôi nhà của mình.

Chặt bớt cành cây có lá rậm để cây không đổ lên nhà. Lấy cành cây làm rào cản gió, ngôi nhà sẽ chống chọi gió to tốt hơn.









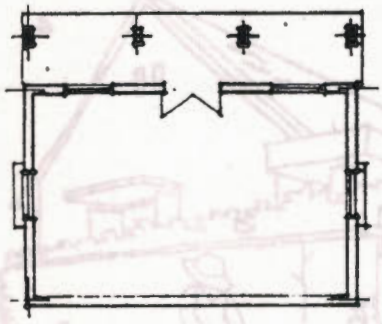
Đừng chủ quan với ngôi nhà gạch mái ngói. Phải bảo vệ mái nhà, xây thêm vì kèo gạch cách nhau 0,9 - 1,2 m và dùng dây thép, tre gỗ giằng chống nhà.

. Ở vùng có bão lớn không để mái thò ra ngoài dương để bị phá hoại.

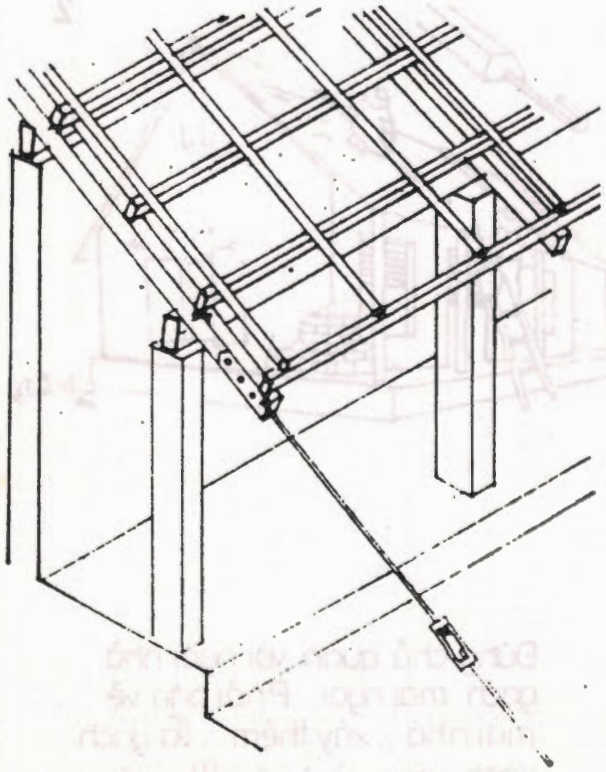
. Có thể xây thêm hiên mái bằng làm vật bảo vệ cho ngôi nhà

Các viền mái phải xây bờ, trát vữa kỹ.

A

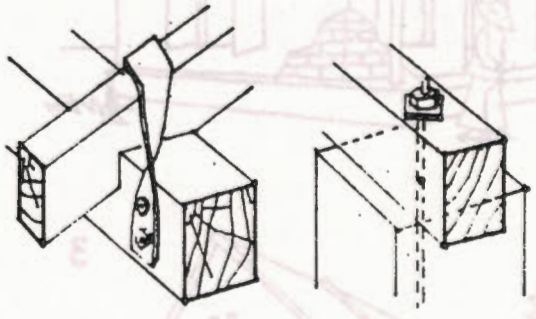


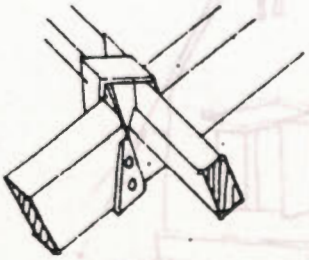
B

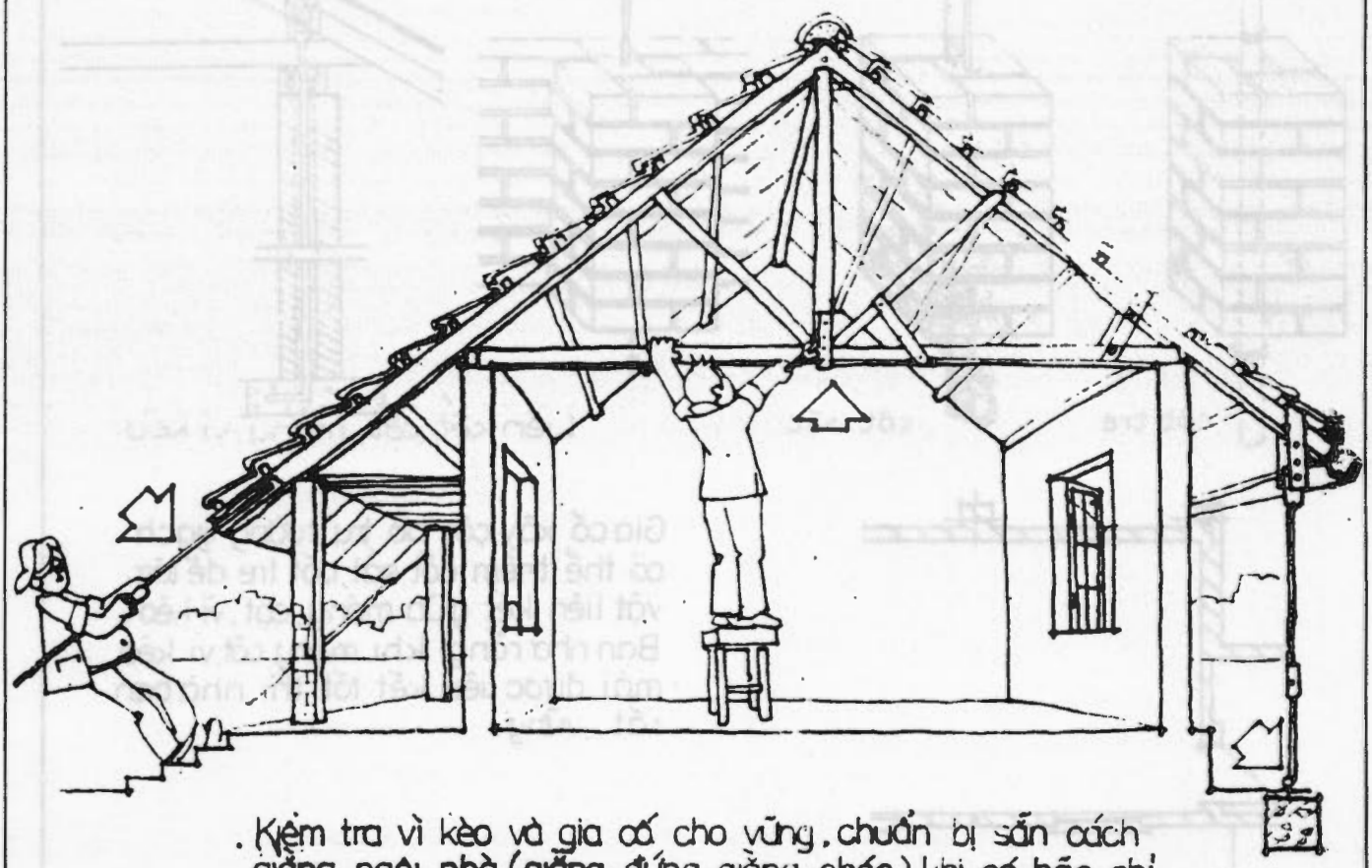


. Hãy chuẩn bị sẵn dây thép hay tre giằng giữ ngôi nhà.

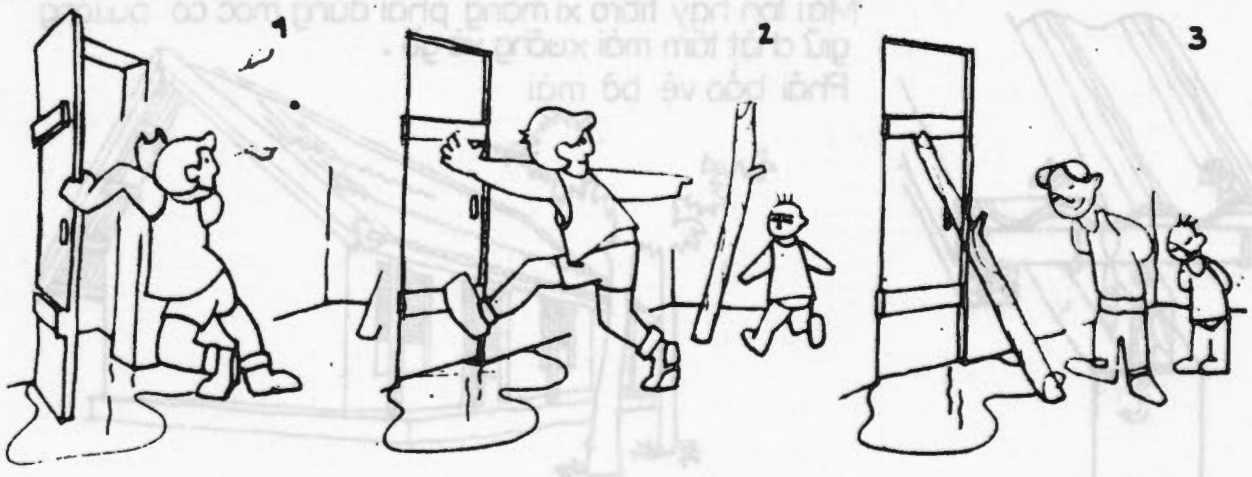
. Có thể học tập sản xuất các liên kết mà nhiều nơi đã làm rất hiệu quả.



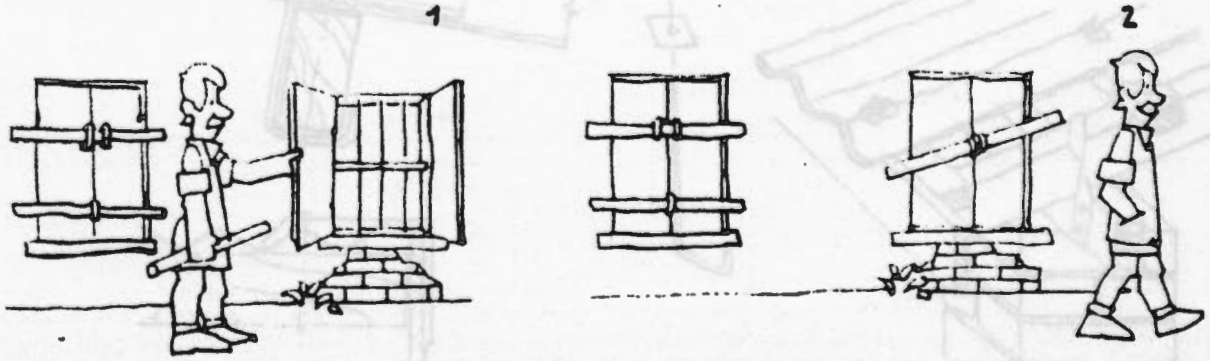


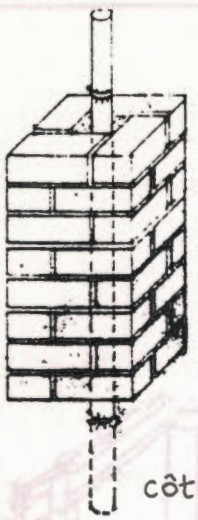


. Kiểm tra vì kèo và gia cố cho vững, chuẩn bị sẵn cách giằng ngôi nhà (giằng đứng, giằng chéo) khi có bão chỉ cần móc vào là có thể yên tâm ngủ được.

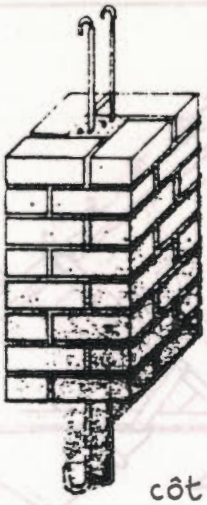


Buộc chặt và đóng kín cửa đi, cửa sổ, các lỗ trống là việc không được quên khi có bão. Phải kiểm tra cửa của nhà mình.

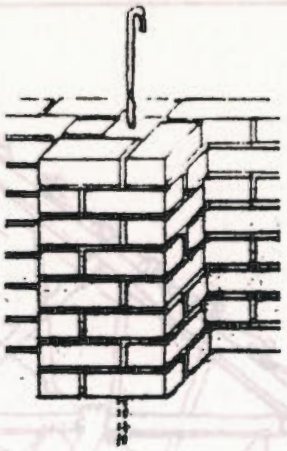


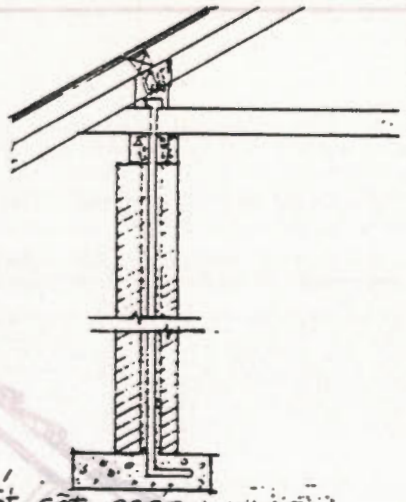


cột tre

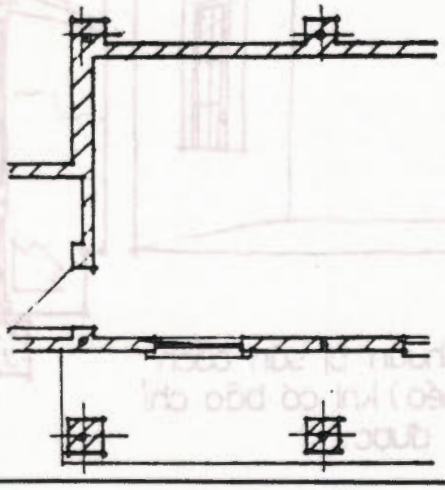


cột sắt





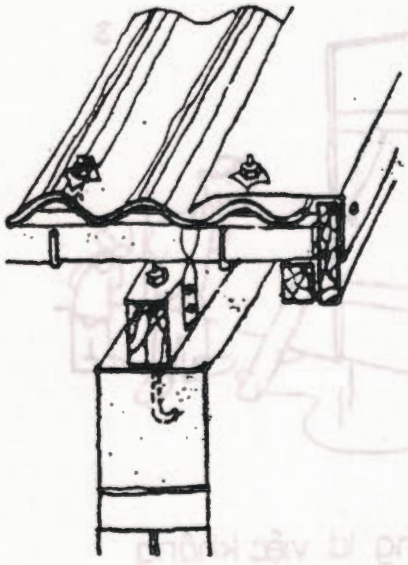
Liên kết cột, móng, vì kèo

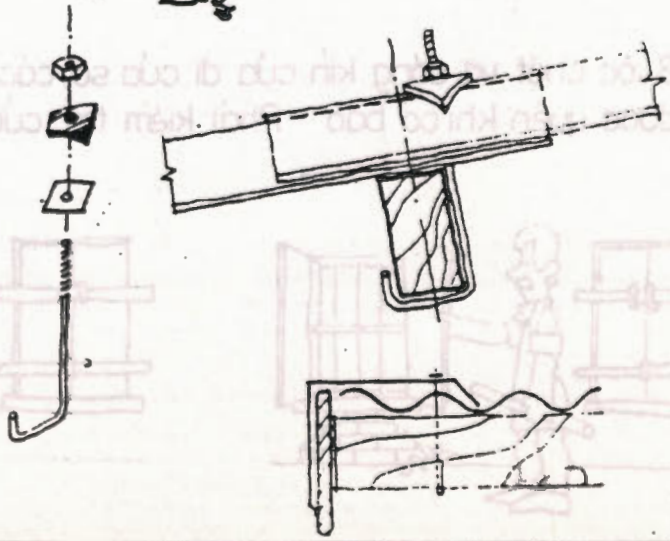


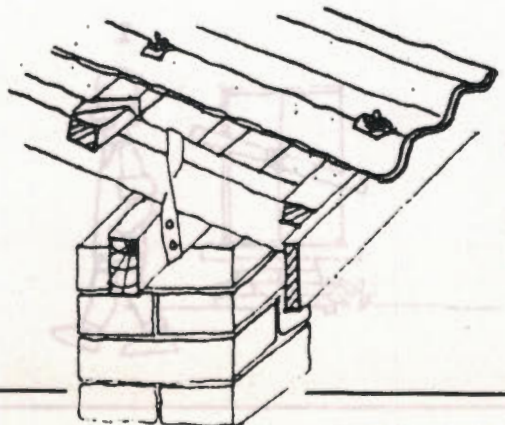
Gia cố xây cột bổ trụ tường gạch có thể thêm cốt sắt, cốt tre để làm vật liên kết giữa móng, cột, vì kèo. Bạn nhớ rằng khi móng, cột, vì kèo. mái được liên kết tốt thì nhà bạn rất vững.

Mái tôn hay fibro xi măng phải dùng móc có đuôi giữ chặt tấm mái xuống xà gồ.

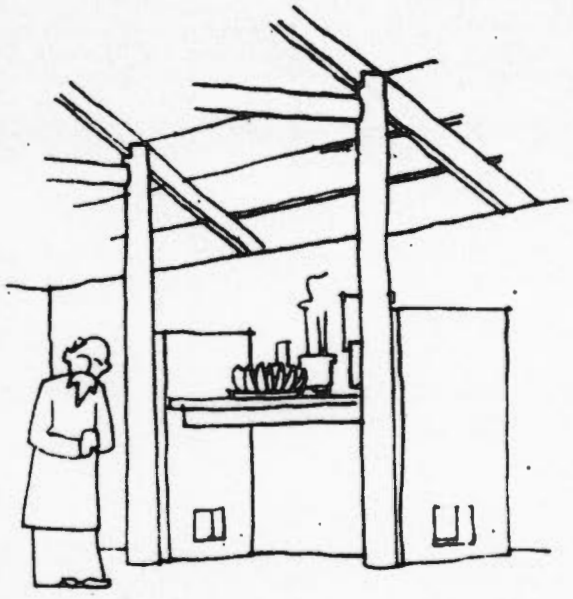
Phải bảo vệ bờ mái

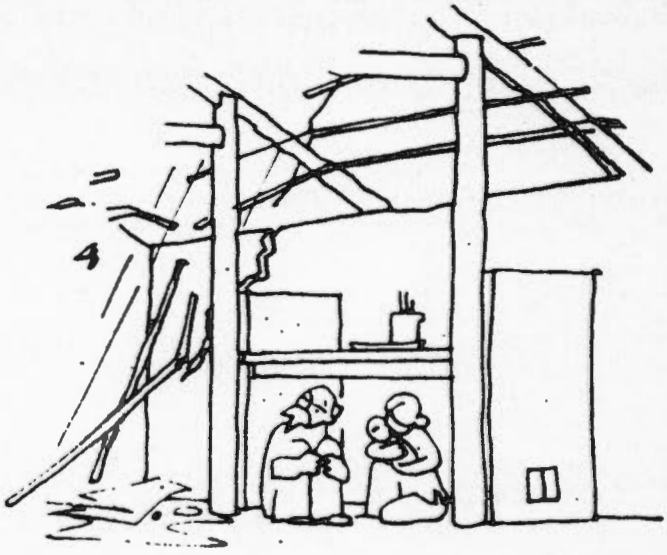






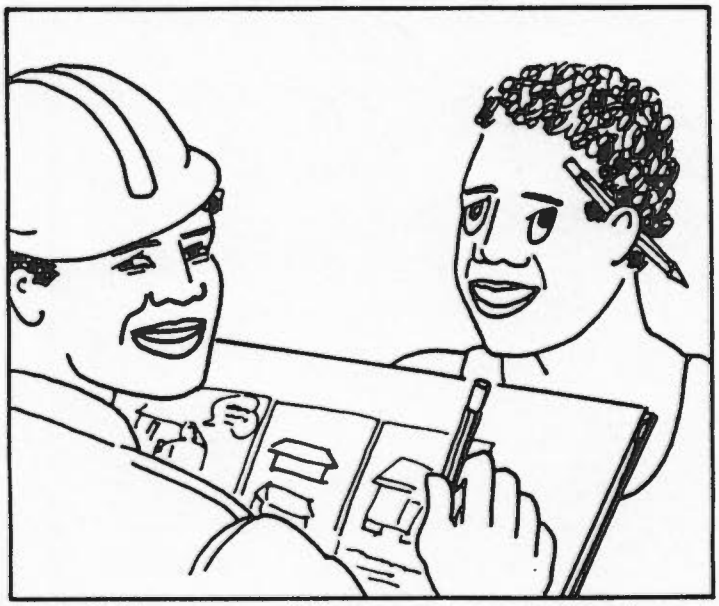
Xây tường chắn bàn thờ áp mái để làm nhà thêm cứng
Khi nguy nan có thể làm nơi ẩn nấp tạm thời.





Part 2 : "Will your house stand up ?" Guide by INTERTECT

WILL YOUR HOUSE STAND UP?



WITH
JACK HAMMER AND STONEY JONES

Manual prepared by Juliana Marek
INTERTECT, Dallas, Texas

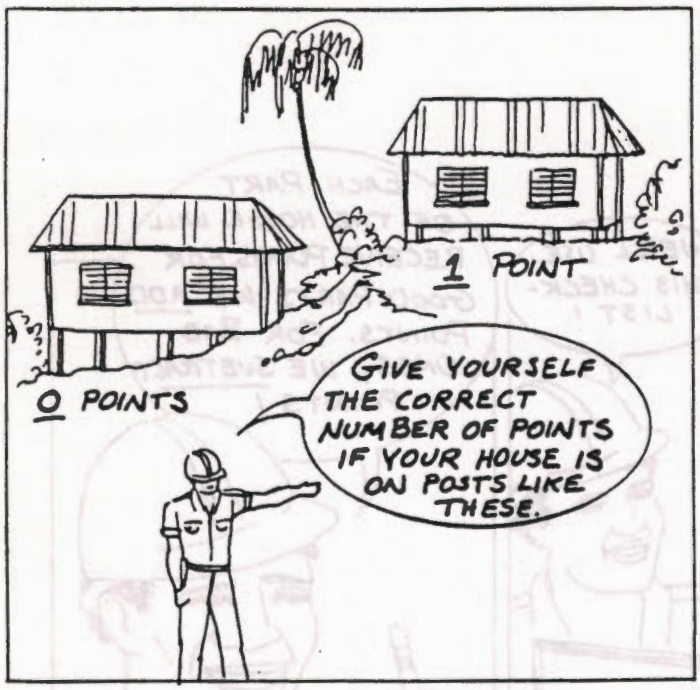
This manual was prepared under
contract number PRC532-83-89
of the U.S. Agency for International Development

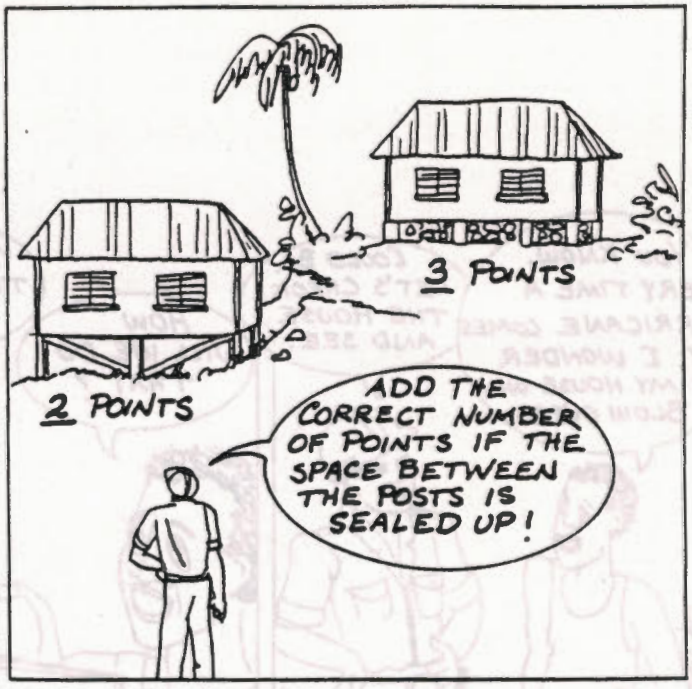

YOU KNOW, EVERY TIME A HURRICANE COMES BY, I WONDER IF MY HOUSE WILL BLOW OVER.
COULD BE. LET'S CHECK THE HOUSE AND SEE.
HOW WILL WE DO THAT?
WE'LL USE THIS CHECK-LIST!
EACH PART OF THE HOUSE WILL RECEIVE POINTS. FOR GOOD PARTS WE ADD POINTS. FOR BAD ONES, WE SUBTRACT POINTS!

1


AT THE END OF THE LIST, ADD UP THE POINTS TO SEE HOW STRONG THE HOUSE IS.
USE YOUR CHECKLIST AND GO THROUGH YOUR HOUSE WITH US! PUT THE NUMBER OF POINTS AT THE BOTTOM OF EACH PAGE.

2

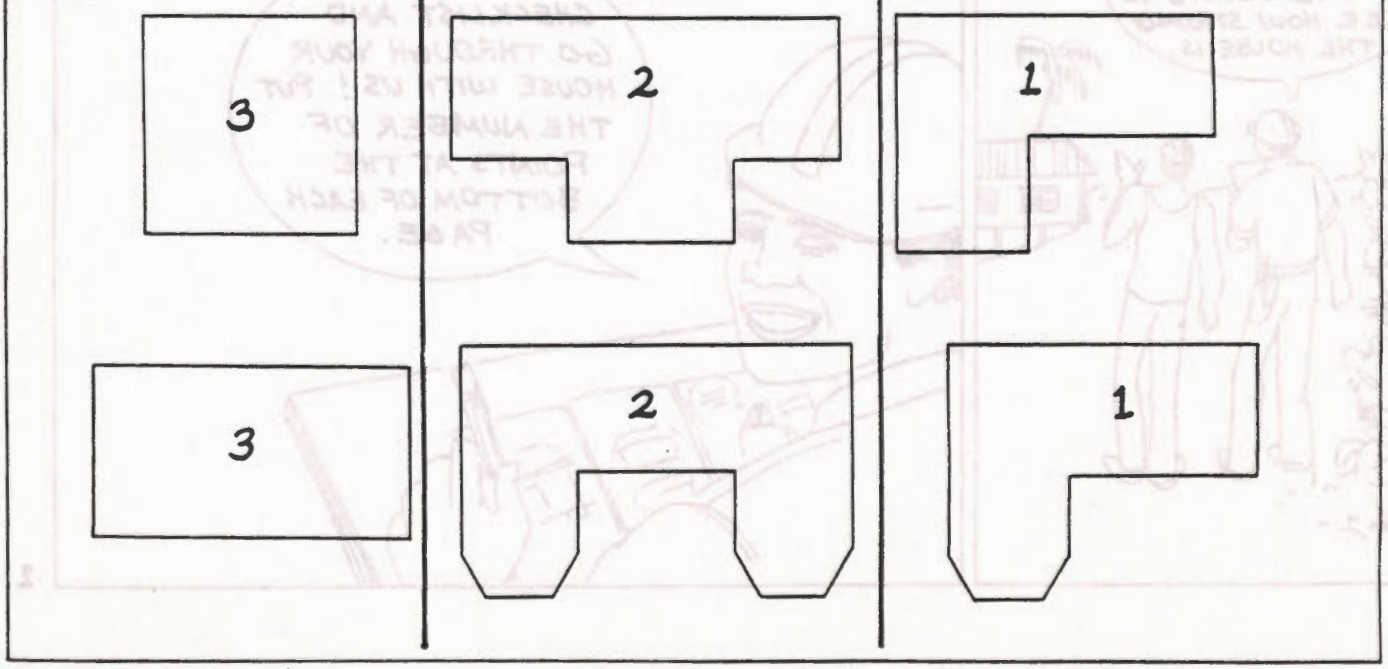




3

TOTAL POINTS _____

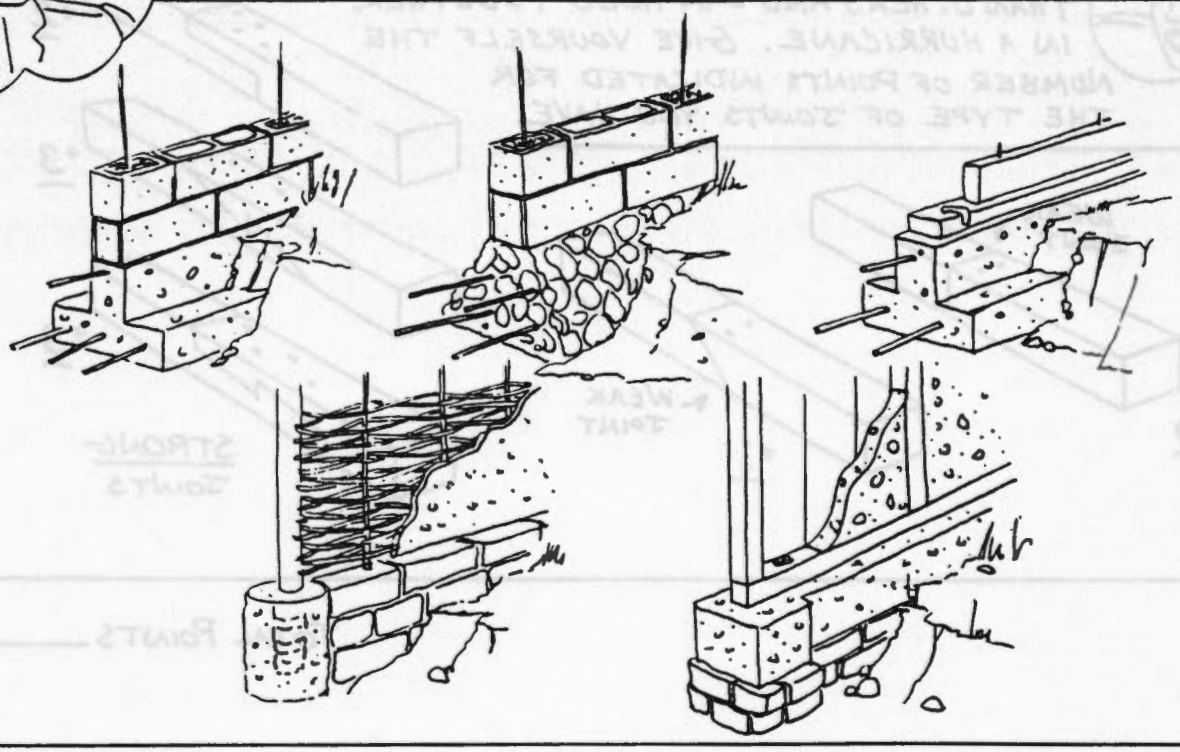
THE SHAPE OF YOUR HOUSE IS VERY IMPORTANT. CHOOSE YOUR HOUSE SHAPE AND GIVE YOURSELF THE CORRECT NUMBER OF POINTS.



4

TOTAL POINTS _____

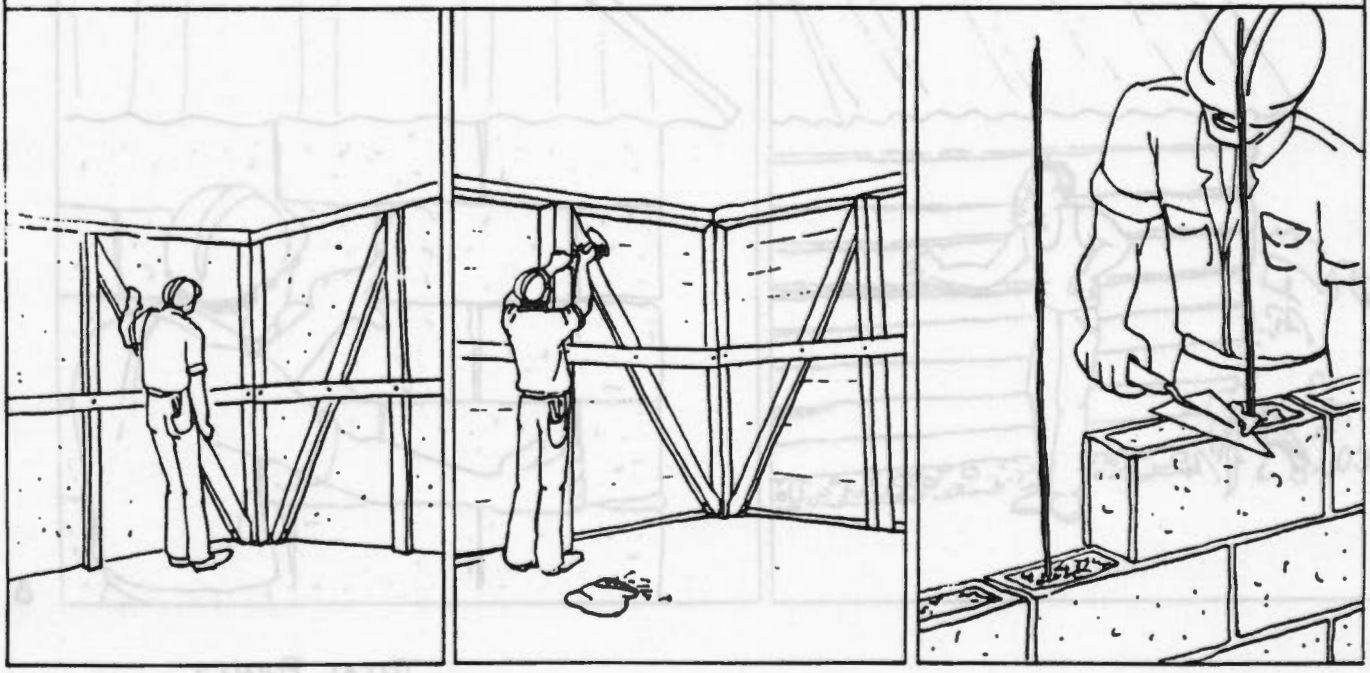
IF THE WALLS OF YOUR HOUSE SIT ON A FOUNDATION BUILT LIKE ONE OF THESE, GIVE YOURSELF 3 POINTS.



5

TOTAL POINTS ____

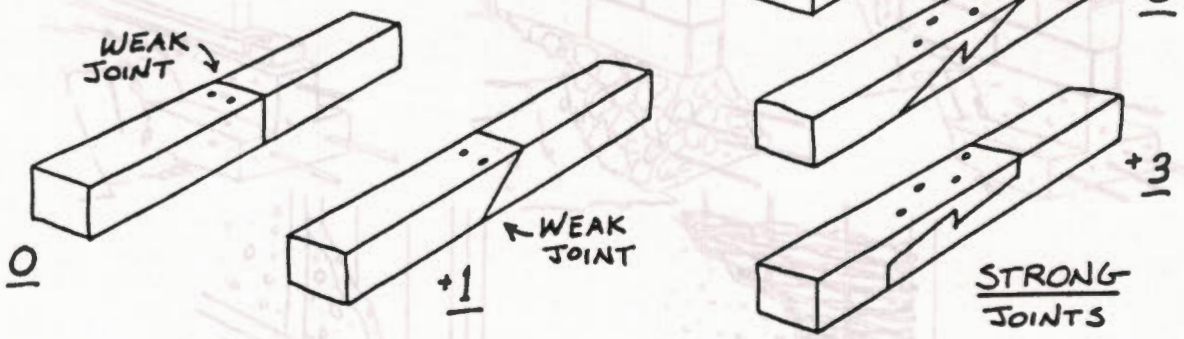
IT IS IMPORTANT TO REINFORCE YOUR WALLS. IF YOUR WALLS ARE REINFORCED LIKE THESE, GIVE YOURSELF 3 POINTS.



6

TOTAL POINTS ____

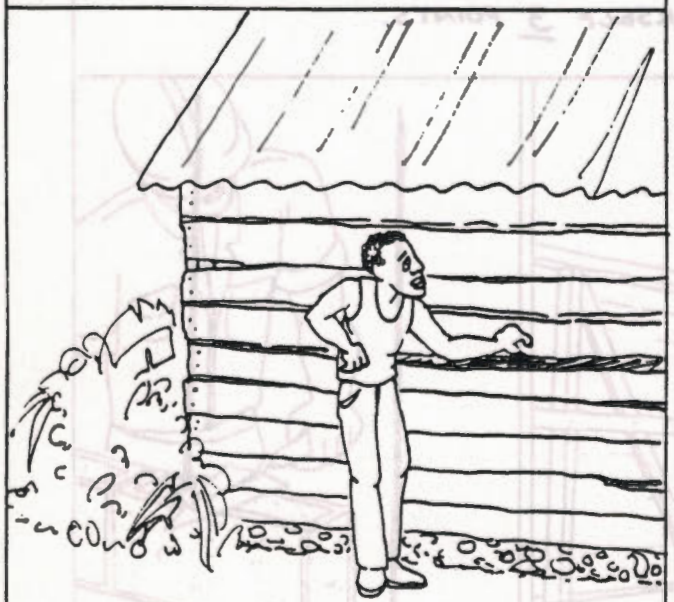
SOME WOOD JOINTS ARE MUCH STRONGER THAN OTHERS AND CAN HOLD TOGETHER IN A HURRICANE. GIVE YOURSELF THE NUMBER OF POINTS INDICATED FOR THE TYPE OF JOINTS YOU HAVE.



7

TOTAL POINTS _____

SOME WALLS ARE BUILT BADLY. IF YOU CAN SEE BETWEEN THE BOARDS, SUBTRACT 2 POINTS.



IF THE CONTRACTOR ONLY PUT A LITTLE CEMENT BETWEEN THE BLOCKS LIKE THIS, SUBTRACT 2 POINTS.

8

TOTAL POINTS _____

THE LOCATION OF DOORS AND WINDOWS IS VERY IMPORTANT. IF A WINDOW IS LESS THAN 18 INCHES FROM THE CORNER, SUBTRACT 1 POINT.

IF ALL YOUR WINDOWS ARE AT LEAST 36 INCHES FROM THE NEAREST CORNER, GIVE YOURSELF 3 POINTS.

9

TOTAL POINTS _____

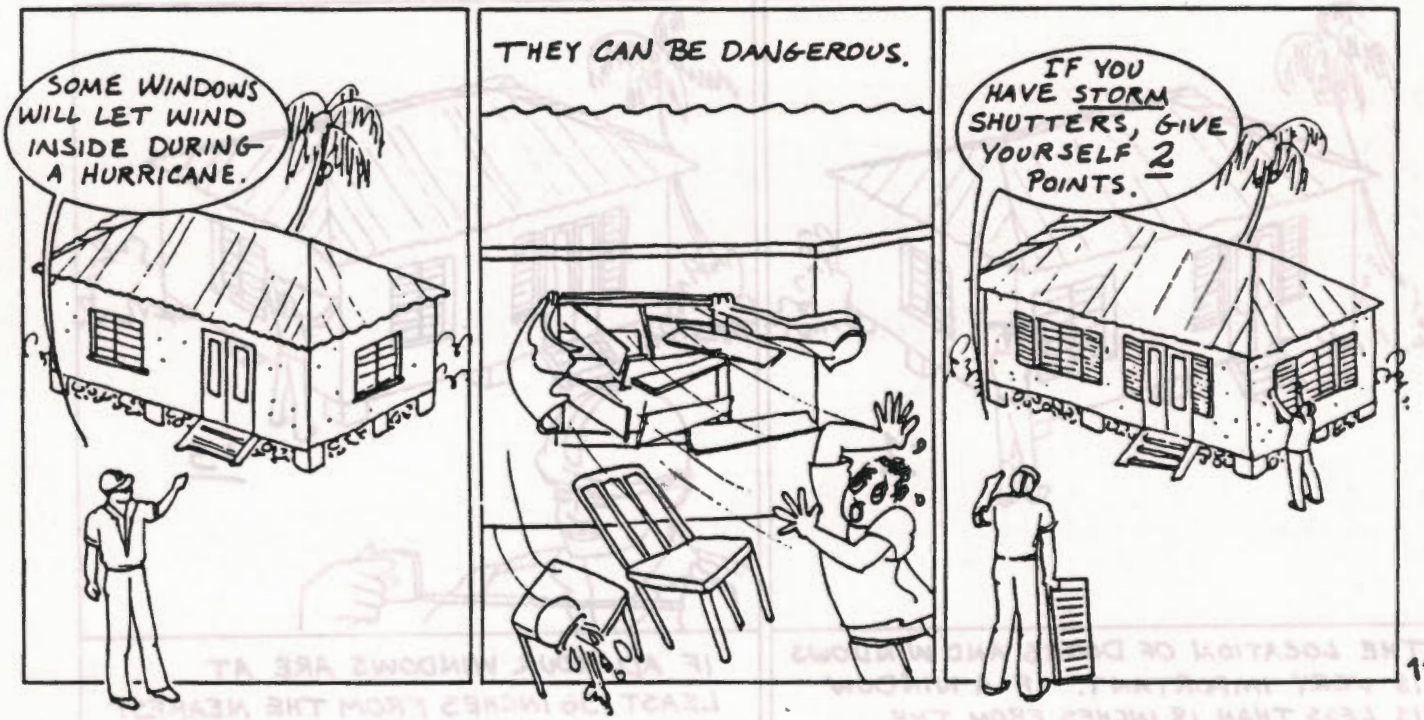
THERE IS AN OPEN SPACE BETWEEN THE ROOF AND WALLS.

IN A HURRICANE, WIND WILL GO IN THERE AND BLOW OFF THE ROOF.

IF YOUR ROOF IS SEALED UP LIKE ONE OF THESE, GIVE YOURSELF 3 POINTS.

10

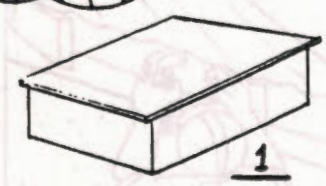
TOTAL POINTS _____



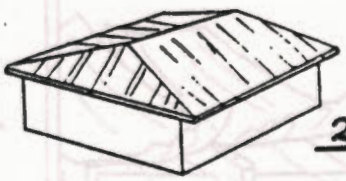
11

TOTAL POINTS _____

THE PITCH OF THE ROOF IS VERY IMPORTANT. CHOOSE THE SHAPE LIKE YOURS AND GIVE YOURSELF THE CORRECT NUMBER OF POINTS.

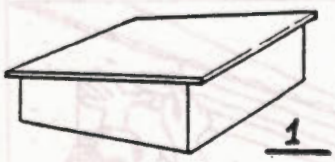


1

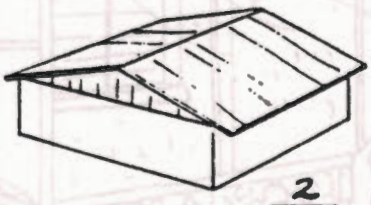


2

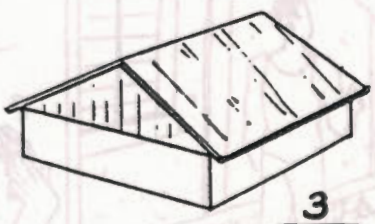
3



1



2



3

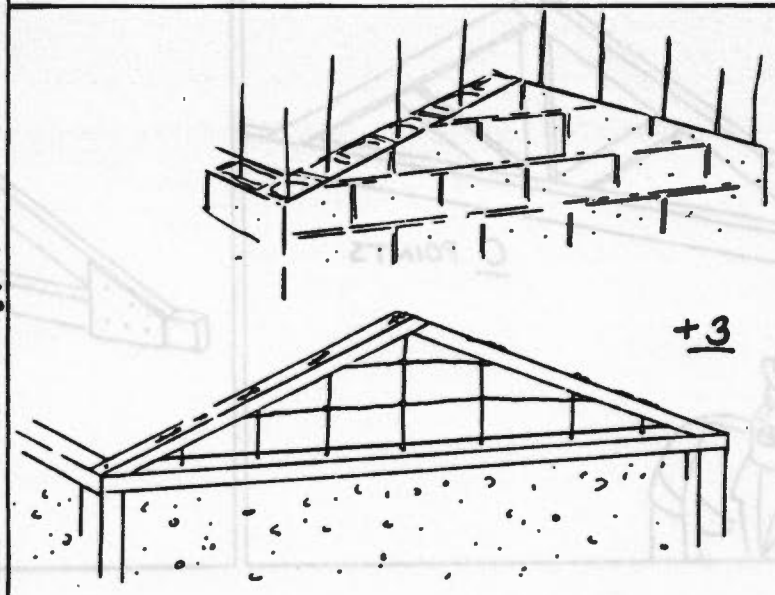
12

TOTAL POINTS _____

UNREINFORCED GABLES ARE DANGEROUS IN A HURRICANE. THEY WILL BREAK AND FALL. SUBTRACT 3 POINTS.

-3

IF THE GABLES ON YOUR CONCRETE BLOCK OR NOG HOUSE ARE REINFORCED, ADD 3 POINTS. OR REPLACE THE NOG GABLE WITH A WOOD GABLE.



+3

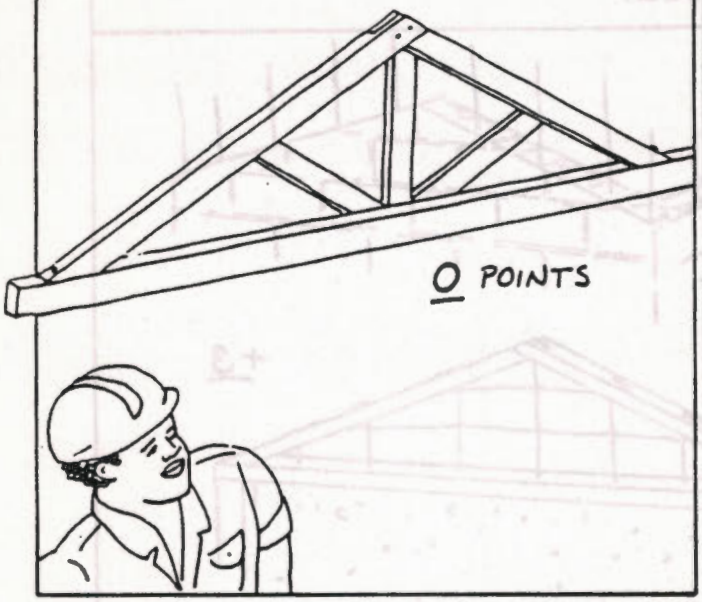
13

TOTAL POINTS _____

14

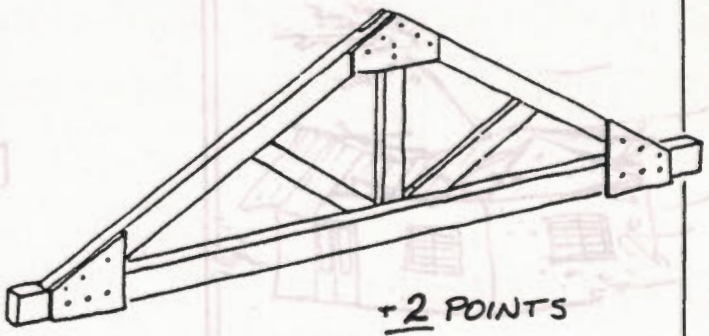
TOTAL POINTS _____

THESE GABLERS ARE WEAK. THEY ARE ONLY NAILED TOGETHER. IN A HURRICANE THEY WILL NOT HOLD.



0 POINTS

GUSSETS MAKE THE GABLERS STRONG. IF YOU HAVE GUSSETS ON YOUR GABLERS, YOU GET 2 POINTS.



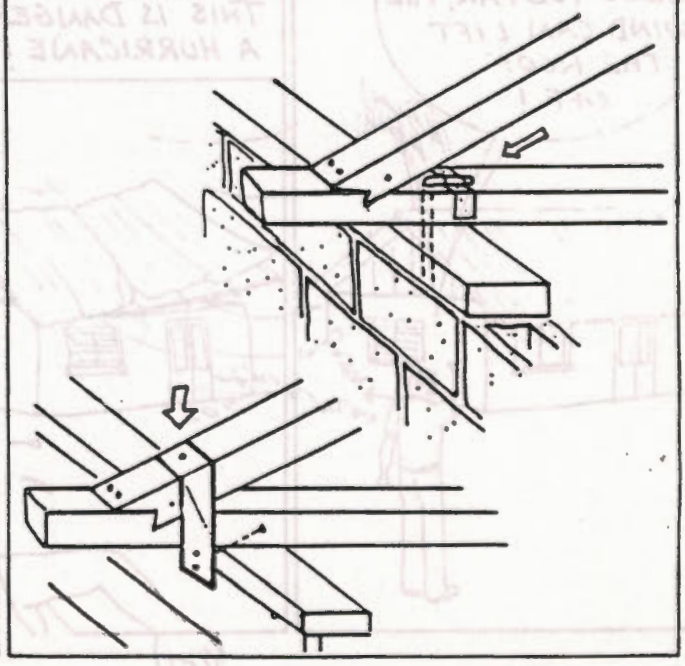
+2 POINTS

15

TOTAL POINTS ____

CHECK TO SEE HOW THE ROOF TRUSSES ARE FASTENED TO THE WALL. IF IT IS LIKE ONE OF THESE, YOU GET 0 POINTS.

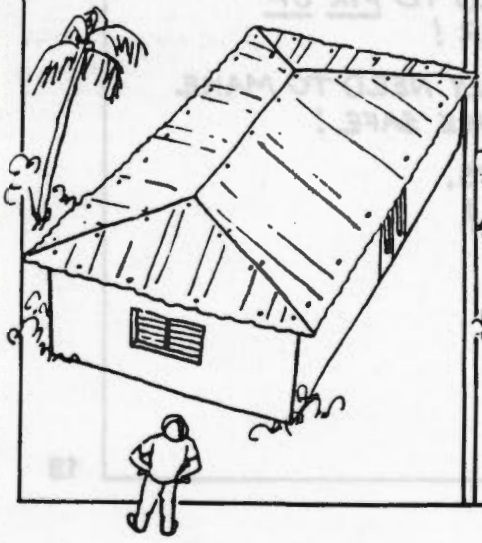
IF YOU HAVE HURRICANE STRAPS OR FASTENERS LIKE THESE, GIVE YOURSELF 3 POINTS.



16

TOTAL POINTS ____

IF THERE ARE ONLY A FEW NAILS IN THE ZINC ROOF, THE SHEETS WILL PEEL OFF IN A HURRICANE. SUBTRACT 2 POINTS!



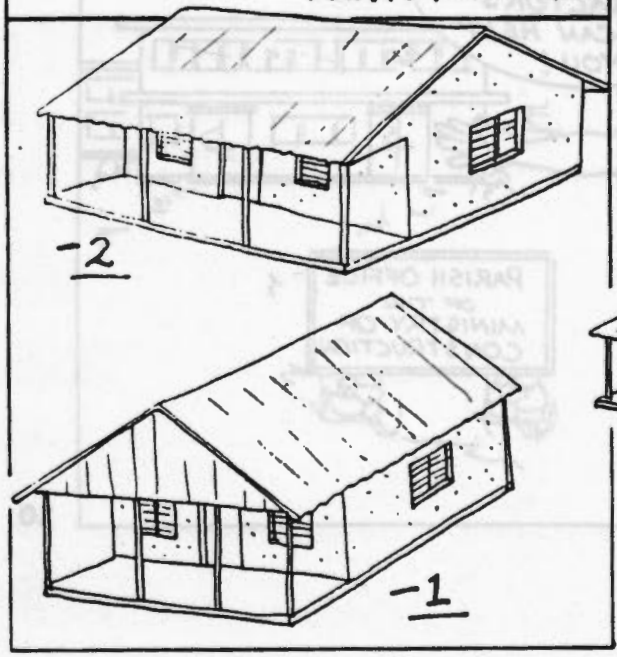
IF THE ZINC IS NAILED DOWN ALL THE WAY AROUND, GIVE YOURSELF 3 POINTS!

IF THE NAIL HEADS ARE TOO SMALL OR DON'T HAVE WASHERS, SUBTRACT 2.

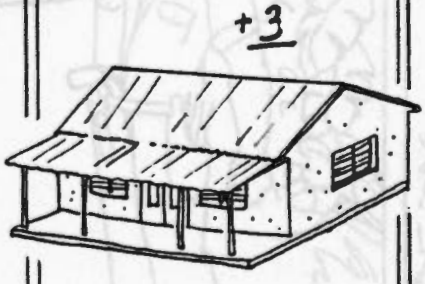
17

TOTAL POINTS _____

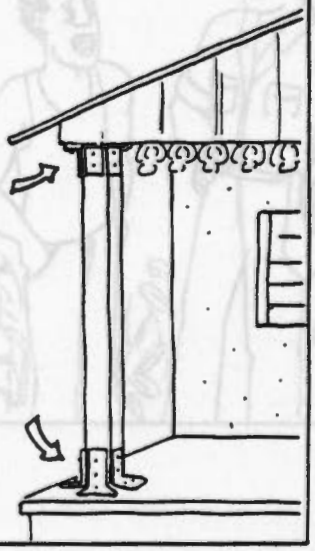
SOME PORCH ROOFS ARE NOT SAFE. IF YOUR PORCH ROOF IS LIKE ONE OF THESE, SUBTRACT POINTS INDICATED.



IF YOUR PORCH ROOF IS CONNECTED TO THE HOUSE LIKE THIS, ADD 3 POINTS.

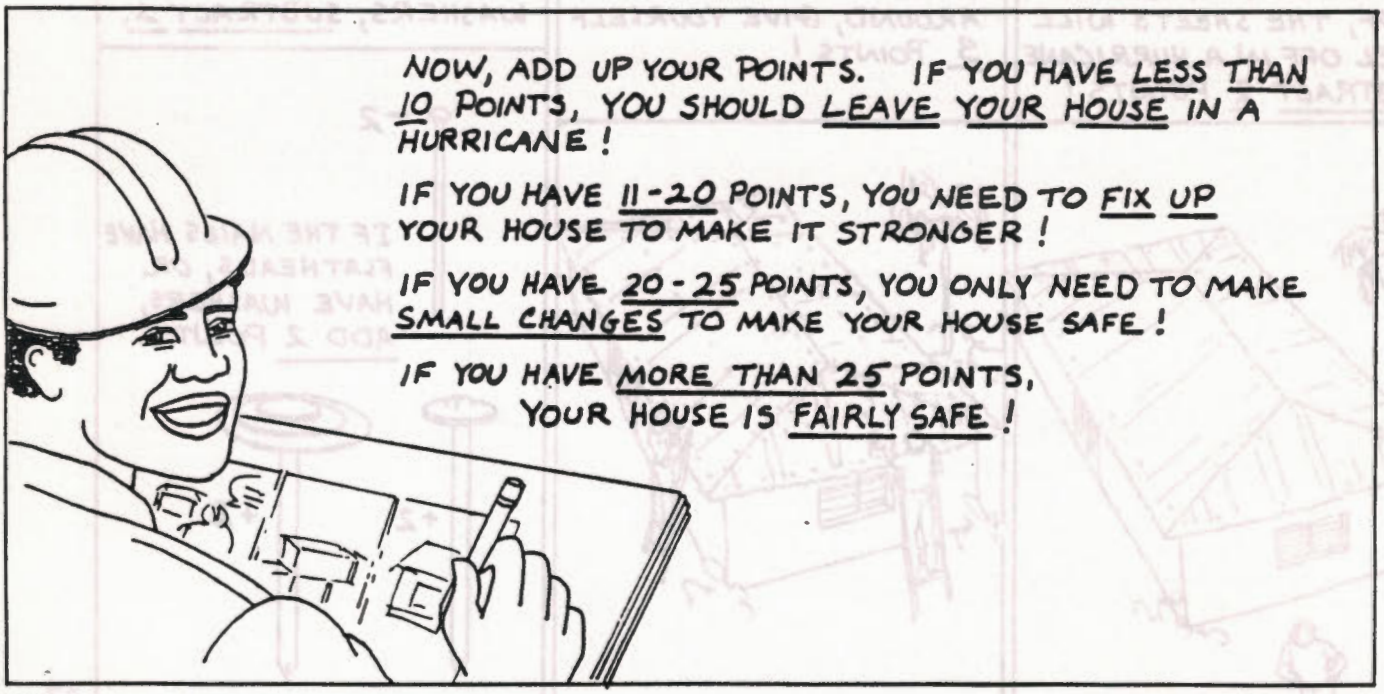


IF YOUR PORCH HAS ANGLE IRONS LIKE THESE, ADD 2 POINTS.



18

TOTAL _____


NOW, ADD UP YOUR POINTS. IF YOU HAVE LESS THAN 10 POINTS, YOU SHOULD LEAVE YOUR HOUSE IN A HURRICANE!
IF YOU HAVE 11-20 POINTS, YOU NEED TO FIX UP YOUR HOUSE TO MAKE IT STRONGER!
IF YOU HAVE 20-25 POINTS, YOU ONLY NEED TO MAKE SMALL CHANGES TO MAKE YOUR HOUSE SAFE!
IF YOU HAVE MORE THAN 25 POINTS, YOUR HOUSE IS FAIRLY SAFE!

19


WELL STONEY, HOW DID YOU DO?
I HAVE 15 POINTS SO I GUESS I NEED TO FIX UP!
IF YOU NEED HELP, GO TO YOUR NEAREST MINISTRY OF CONSTRUCTION OFFICE. THEY HAVE A LIST OF CONTRACTORS WHO CAN HELP YOU!
PARISH OFFICE OF THE MINISTRY OF CONSTRUCTION

20

Part 3 : A brief note on different manuals

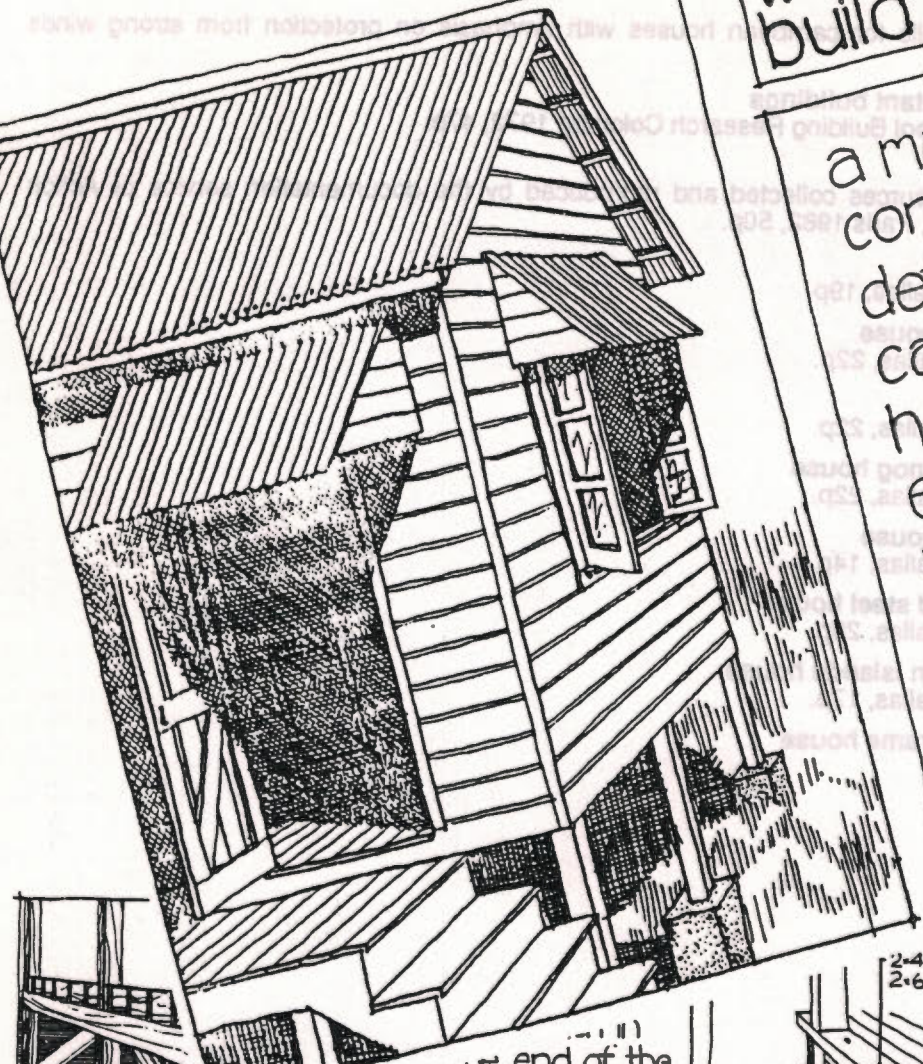
1. **When you build a house**
   A manual of construction details for carribean houses with emphasis on protection from strong winds
   Robinson, E.H., St. Vincent
2. **Construction of typhoon resistant buildings**
   Asian Regional Institute for School Building Research Colombo 1972, 47p.
3. **Attention Cyclone !**
   Documentation from various sources collected and reproduced by the documentation service of Action d'Urgence Internationale, A.U.I., Paris 1982, 50p.
4. **Improving a wooden house**
   Marek, Julianal INTERTECT, Dallas, 19p.
5. **How to make a safe wooden house**
   Marek, Juliana INTERTECT, Dallas, 22p.
6. **Improving a nog house**
   Marek, Juliana INTERTECT, Dallas, 22p.
7. **How to make a safe concrete nog house**
   Marek, Juliana INTERTECT, Dallas, 22p.
8. **Improving a block and steel house**
   Marek, Juliana INTERTECT, Dallas, 14p.
9. **How to make a safe block and steel house**
   Marek, Juliana INTERTECT, Dallas, 28p.
10. **How to strengthen a Solomon Islands house**
    Marek, Juliana INTERTECT, Dallas, 17p.
11. **How to built a strong wood frame house**
    INTERTECT, Dallas, 13p.

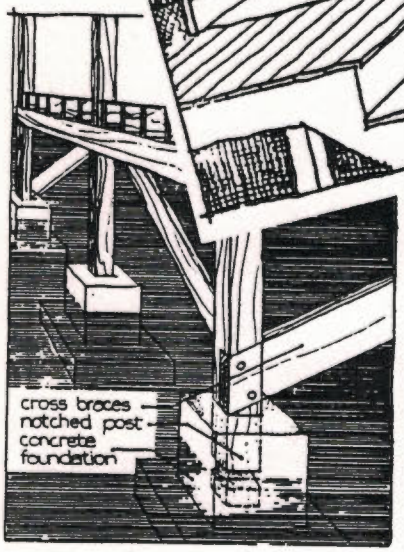
1.

when you build a house

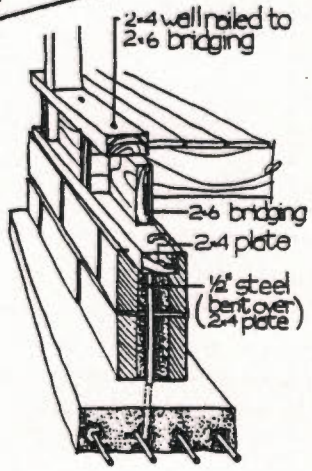
a manual of construction details for caribbean houses with emphasis on protection from strong winds

developed by e.h. robinson for owners-builders of houses in the Glebe community St. Vincent.



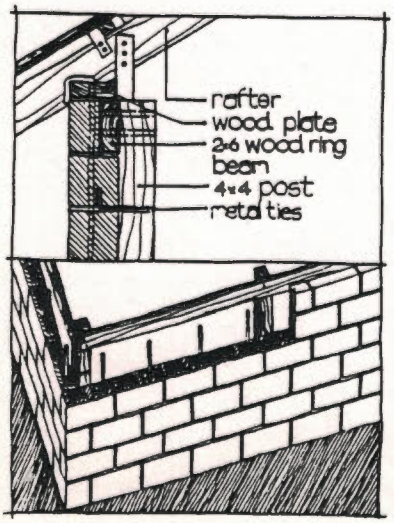


...e end of the post before pouring concrete piers. use cross bracing between all posts to protect against high winds.



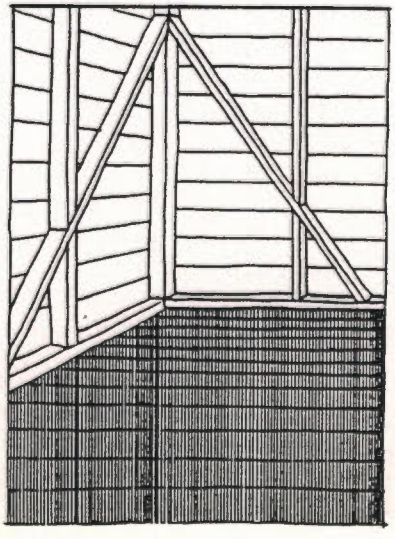
board walls/ foundations

if your house is going to stand up against high winds, the walls must be securely tied to the foundations.



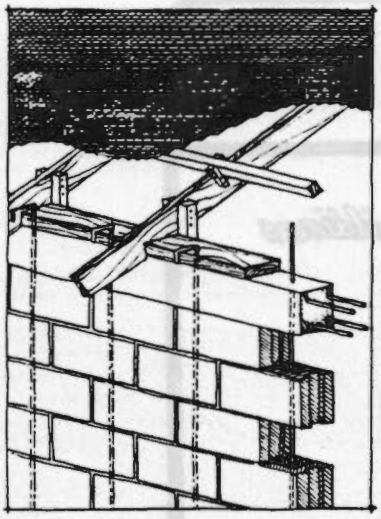
wall house / wood frame

a wall house can be built with wood posts and ring beam instead of reinforced concrete, reducing the building costs. the timber frame must be tied to the block wall with metal straps or bolts.



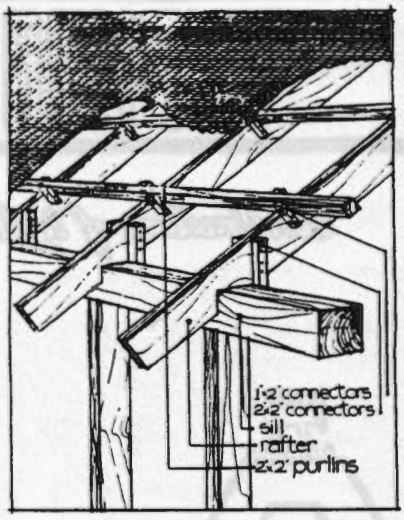
board walls

use 2×4 bracing in all corners to protect the walls from the force of high winds.



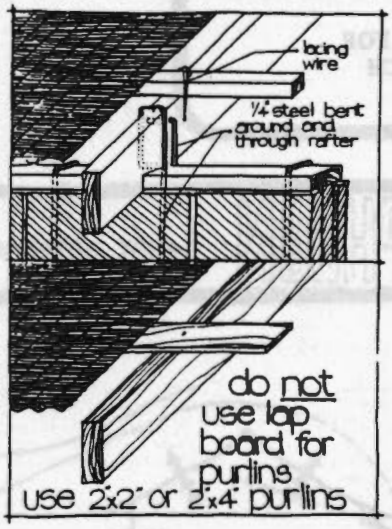
roofs and block walls

block walls should have ½" or ¼" steel running from the foundation through the wall and ring beam. the steel can then pass through the wood roof plate and bent over to tie roof/wall.



roof/wall connections

probably the most important construction details to resist high winds are the roofing connections. wall-to-rafter and rafter-to-purlin connectors should be used.

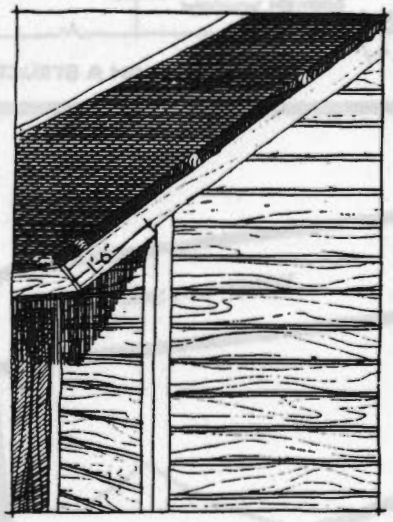


roof connections

purlins can be secured to rafters by bending lacing wire over purlin and through a hole drilled in rafter. the rafter can be secured by bending the wall reinforcement over and through.

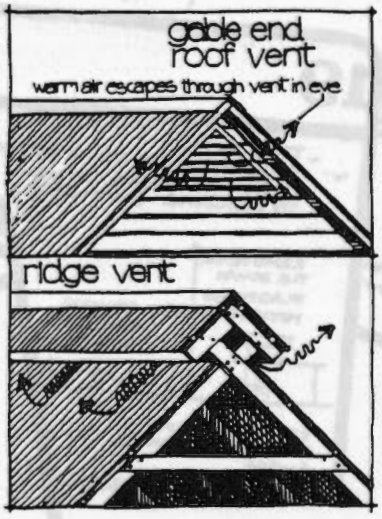
roof connections

nail roofing to purlins through the top of the corrugations using ¾" washers. roofing should be nailed at every corrugation on eave and ridge purlins as well as all end sheets.



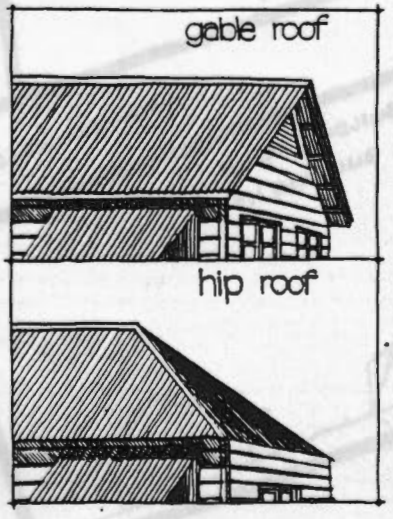
roof overhangs

to help prevent damage to your roof during high winds, limit overhangs as shown so that the wind can't lift off the roof.



roof ventilation

vents make your house cooler by allowing the hot air escape. vents such as these also help relieve the buildup of air pressure during high winds.



roofs for high winds

if you are building a gable roof, the roof pitch should be steep, between 6:12 and 12:12. slopes will be effective against high winds. hip roofs work best to resist high winds.

door/window awnings

overhangs above doors and windows keep the house cool and protect the windows and doors from direct exposure to rain and sun.

2.

TYPHOON

construction of typhoon resistant buildings

ARISBR

ASIAN REGIONAL - INSTITUTE FOR SCHOOL BUILDING RESEARCH

COLOMBO 1972

4 TYPHOON WHAT HAPPENS ?

FORCES ON A STRUCTURE

18 WHAT CAN YOU DO?

MAINTENANCE

-PREVENT ROTTING OF
-PREVENT CORROSION
STRIPS, AN
-DESTROY FUNGI, TE
-REPLACE DETERIORA

(IN SCHOOLS MAINTE
A PART OF THE YO

19 WHAT CAN YOU DO ?

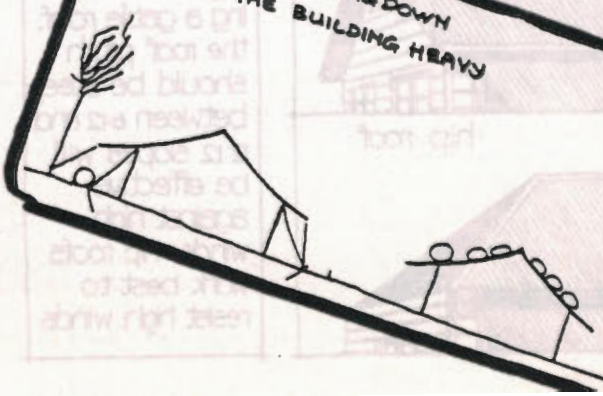
- THE SITE
- REMOVE OR TIE DOWN ALL ARTICLES ON THE SITE - THEY MAY CAUSE INJURIES TO BUILDING (WINDOW
- HERE DAMAGE

20 WHAT CAN YOU DO ?

- THE SITE

21 WHAT CAN YOU DO ?

- TIE THE BUILDING DOWN
- MAKE THE BUILDING HEAVY



38 IMPROVE DESIGN !

- THE SITE
- AVOID WINDCONCENTRATIONS

LES CYCLONES, ACCOMPAGNÉS DE VENTS VIOLENTS ET DE PUISSANTES MARÉES, SE PRODUISENT CHAQUE ANNÉE EN MAI, OCTOBRE, NOVEMBRE. ILS TUENT ET FONT D'ÉNORMES DÉGÂTS MATÉRIELS. ON NE PEUT EMPÊCHER LES CYCLONES. MAIS ON PEUT SAUVER DES VIES EN RESPECTANT CES CONSIGNES:

1. ÉCOUTER RÉGULIÈREMENT LA MÉTÉO.
2. AVERTIR TOUS CEUX QUE L'ON RENCONTRE LORSQUE L'ALERTE EST DONNÉE. MAIS PAS DE FAUSSES NOUVELLES!

ATTENTION: CYCLONE!

3. SE RÉFUGIER DANS DES BÂTIMENTS SOLIDES, SUR LES HAUTEURS OU LOIN DE LA CÔTE.
4. METTRE LE BÉTAIL À L'ABRI.
5. RÉCOLTER ET ENTREPOSER SUR LES HAUTEURS LES PRODUITS QUI SONT PRÊTS À ÊTRE CONSOMMÉS.
6. NE PAS LAISSER TRAÎNER D'OBJETS QUI POURRAIENT S'ENVOLER AVEC LE VENT ET TUER DES GENS.

APRÈS LE CYCLONE, LE BEAU TEMPS REVIENDRA: NOUS SAUVERONS CE QUI PEUT ÊTRE SAUVÉ ET IL N'Y AURA PAS DE VICTIMES.

DOCUMENTS REUNIS PAR L'ACTION D'URGENCE INTERNATIONALE (AUI) AOUT 1982

Des maisons carrées sont plus solides
Des toits inclinés sont mieux

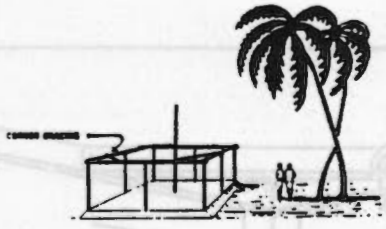
1

PRÉPARER LES POTEAUX

2

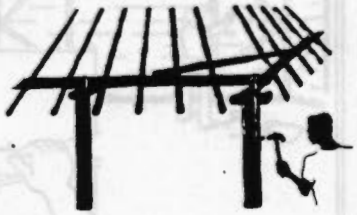
Enfoncer les poteaux dans le sol (maison ronde)

3



PLACER DES GNS DE RENFORCEMENT À TOUS LES COINS

4



ATTACHER LES POUTRES SUR POTEAUX aux moyen de lianes ou de câble.
ATTACHER LES RONDINS aux POUTRES avec du fil de fer.

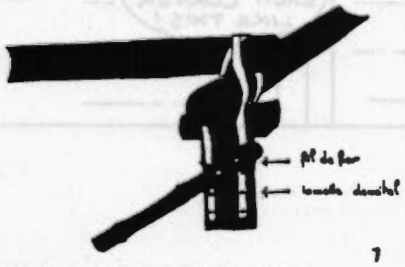
IMMOBILISER LE TOIT

5

Placer des bois en croix entre les poteaux pour les renforcer.

6

RENDRE LA MAISON RIGIDE



ATTACHER LES GNS DE RENFORCEMENT aux POTEAUX avec du câble et du fil de fer.

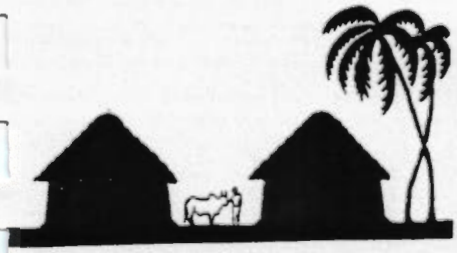
7

Placer la porte au milieu du mur
Renforcer par une croix de chaque côté de la porte.

8

Construisez un plancher surélevé
Faire des murs de terre épais

9



Placer une fenêtre sur le mur arrière de la maison

10

PLANTER DES ARBRES AUTOUR DE VOTRE MAISON ET AUTOUR DU VILLAGE.
LES ARBRES PROTÈGENT VOTRE VILLAGE

11

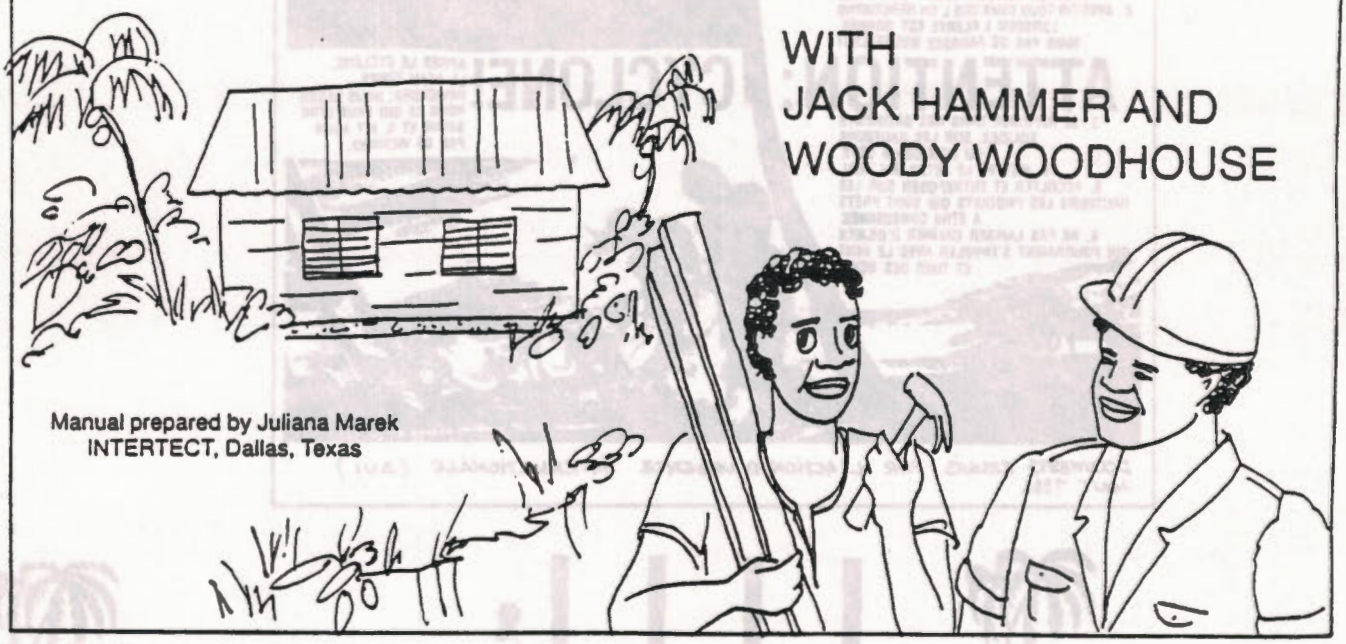
NE CONSTRUISEZ PAS LES MAISONS EN LIGNE DROITE

12

4.

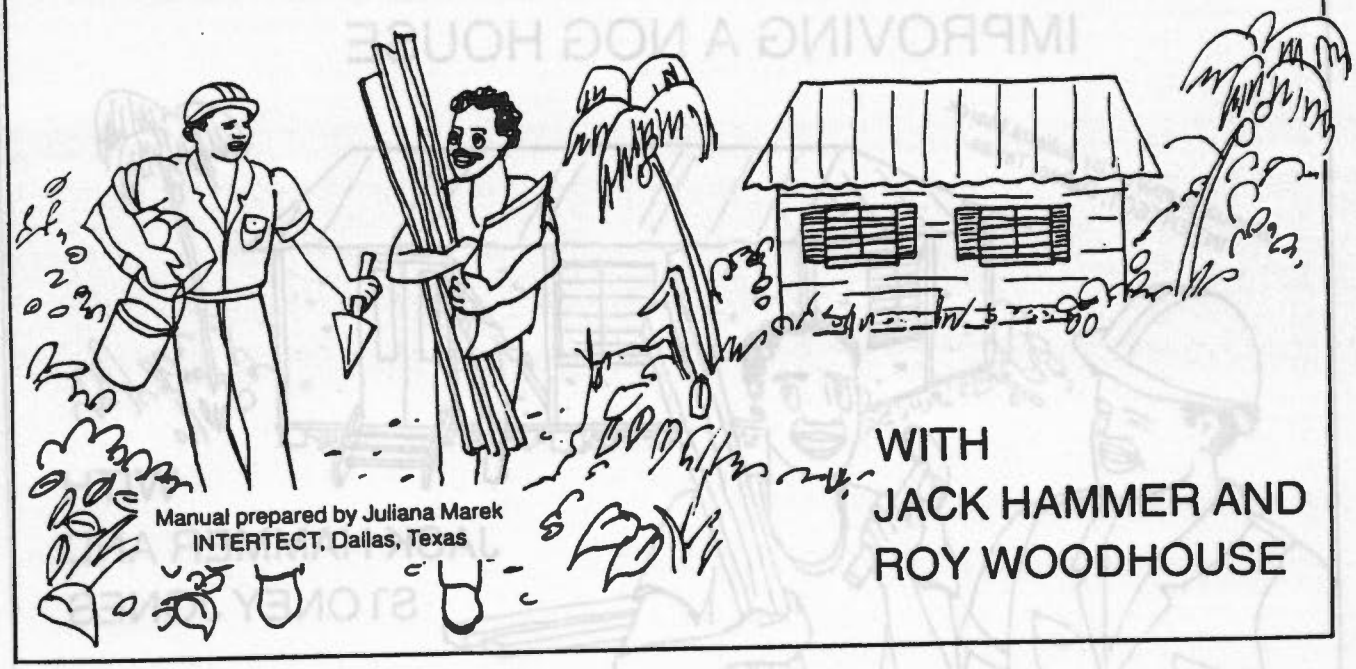
IMPROVING A WOODEN HOUSE

WITH JACK HAMMER AND WOODY WOODHOUSE



Manual prepared by Juliana Marek
INTERTECT, Dallas, Texas

HOW TO MAKE A SAFE WOODEN HOUSE



Manual prepared by Juliana Marek
INTERTECT, Dallas, Texas

WITH
JACK HAMMER AND
ROY WOODHOUSE

6.

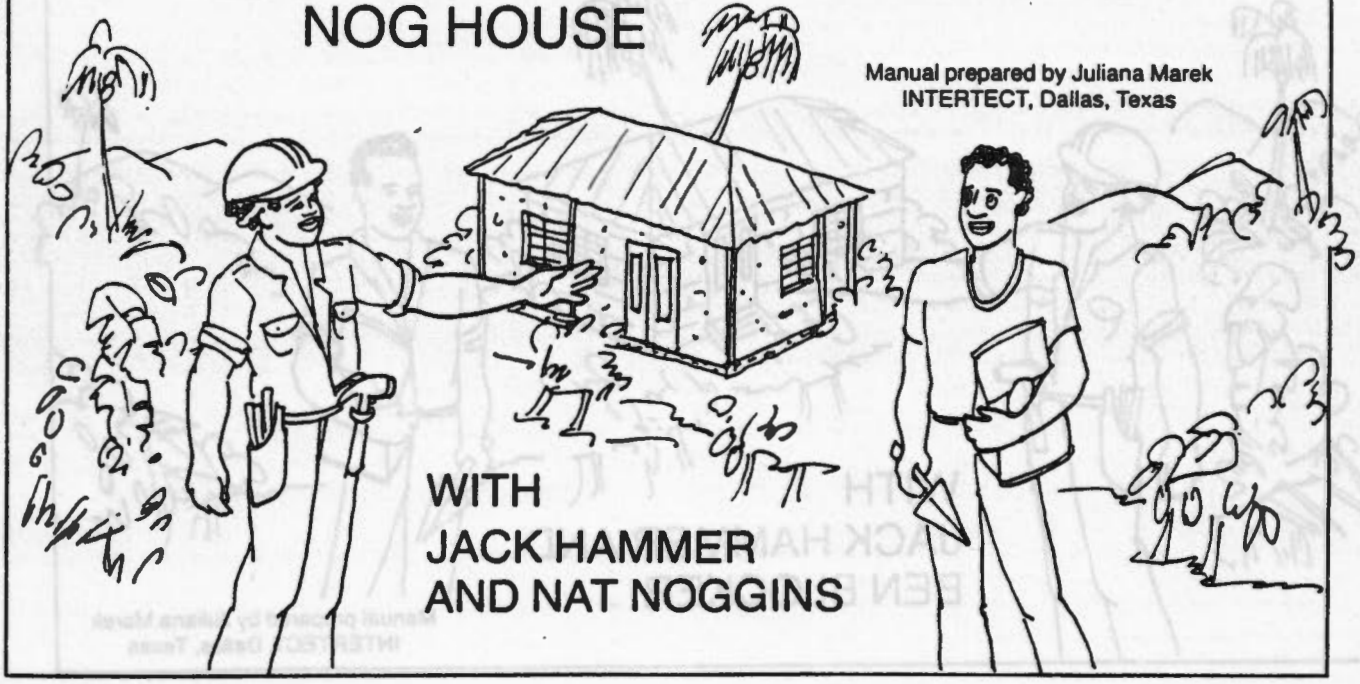
IMPROVING A NOG HOUSE

Manual prepared by Juliana Marek
INTERTECT, Dallas, Texas

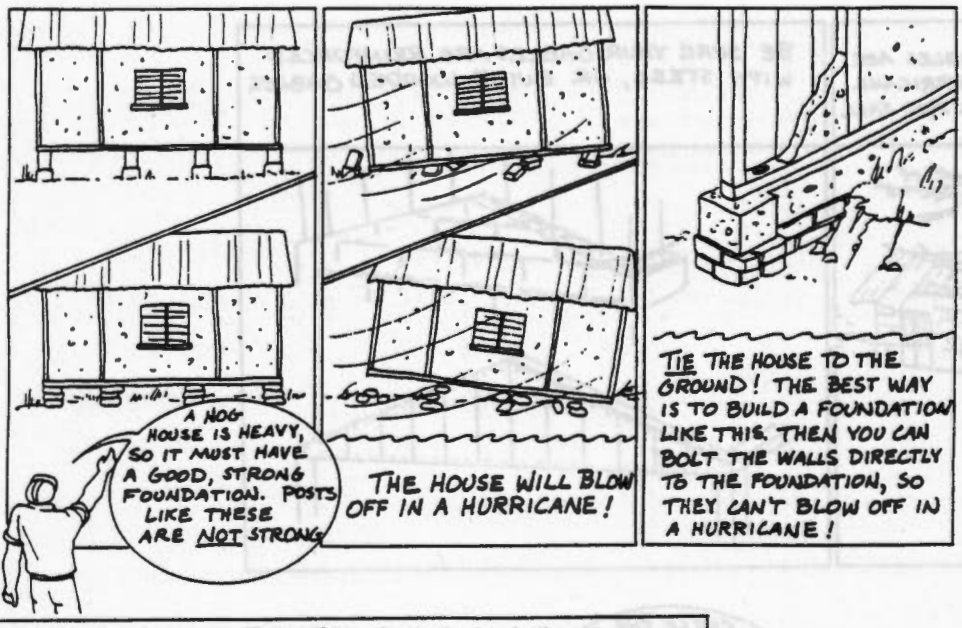
WITH
JACK HAMMER AND
STONEY JONES

HOW TO MAKE A SAFE CONCRETE NOG HOUSE

Manual prepared by Juliana Marek
INTERTECT, Dallas, Texas

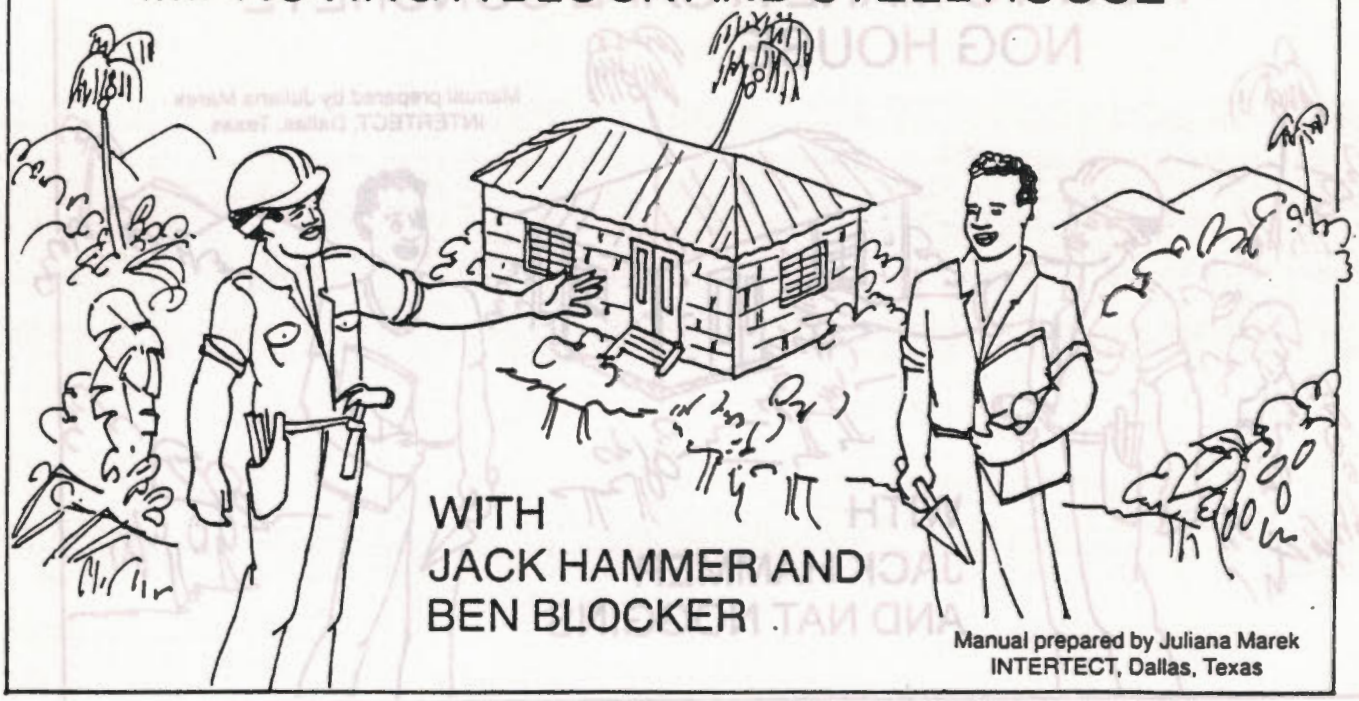


WITH
JACK HAMMER
AND NAT NOGGINS



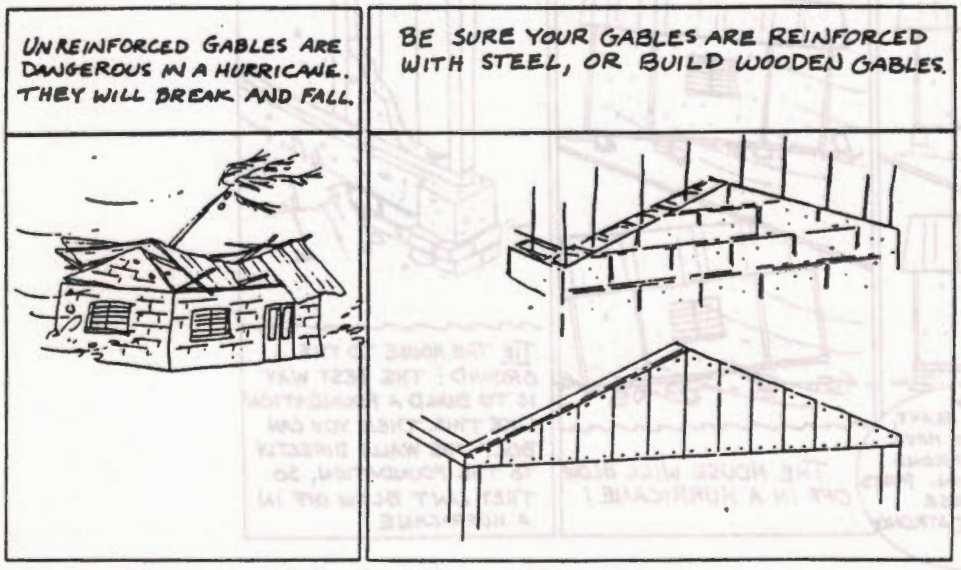
8.

IMPROVING A BLOCK AND STEEL HOUSE

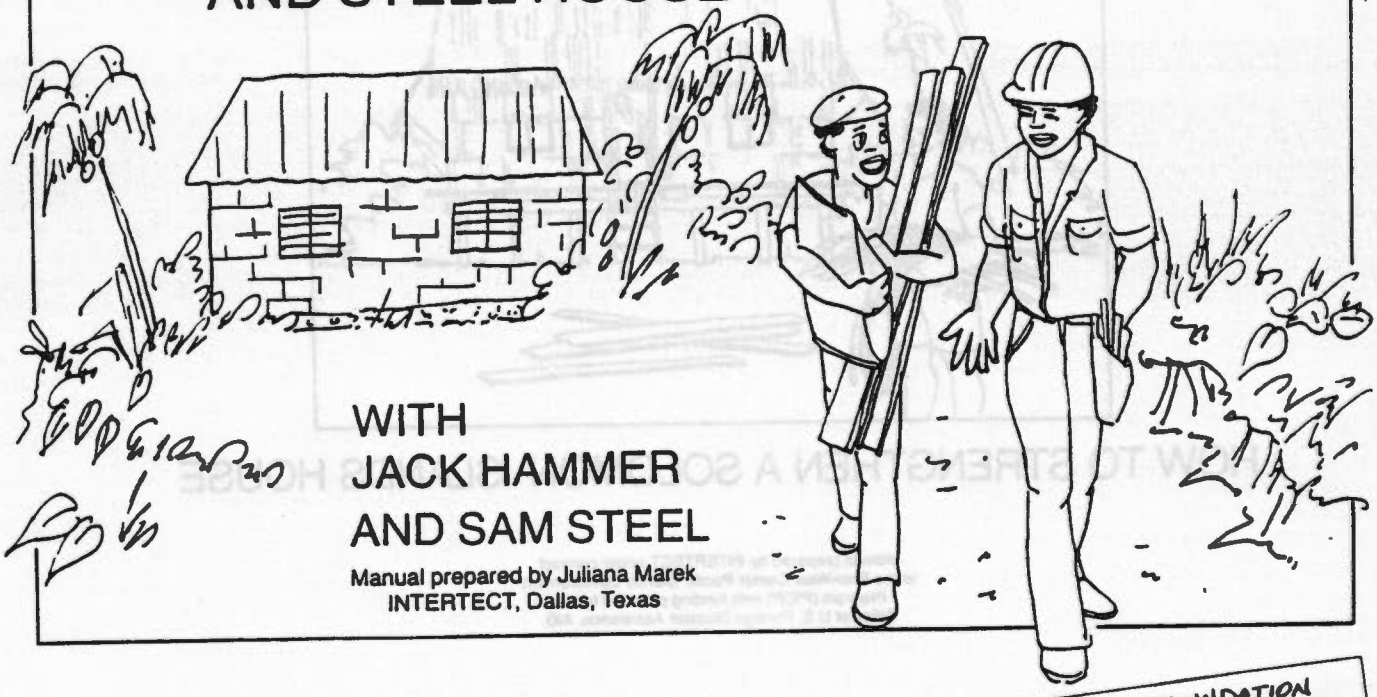


WITH
JACK HAMMER AND
BEN BLOCKER

Manual prepared by Juliana Marek
INTERTECT, Dallas, Texas

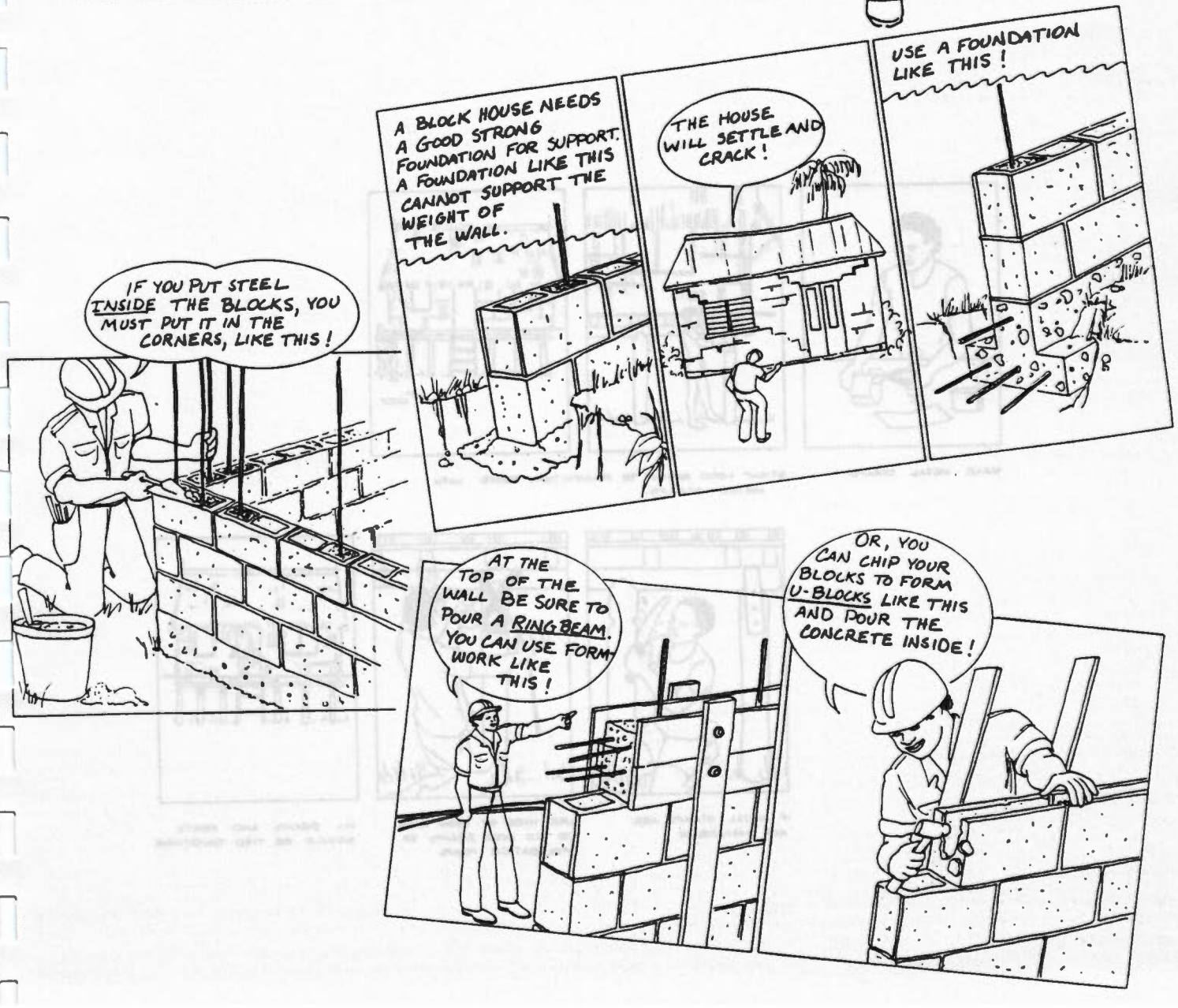


HOW TO MAKE A SAFE BLOCK AND STEEL HOUSE



WITH JACK HAMMER AND SAM STEEL

Manual prepared by Juliana Marek
INTERTECT, Dallas, Texas



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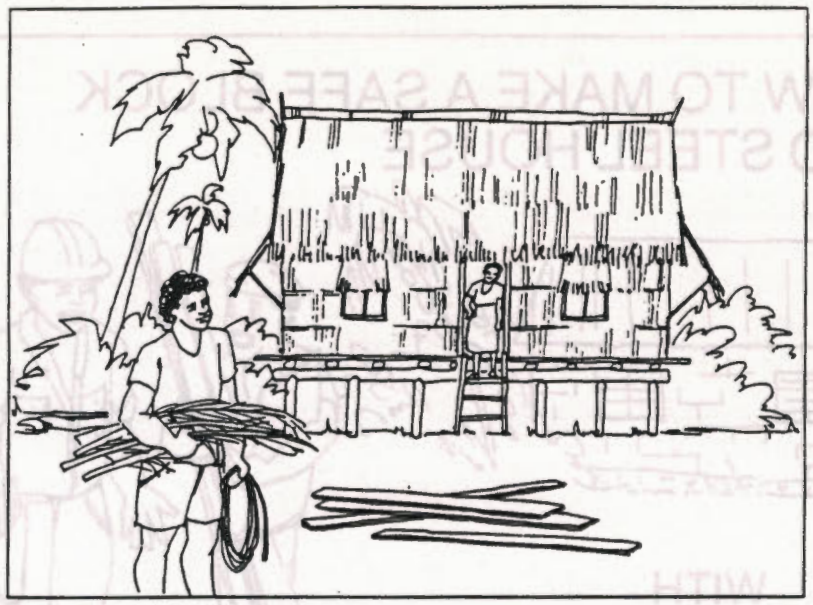


HOW TO STRENGTHEN A SOLOMON ISLANDS HOUSE

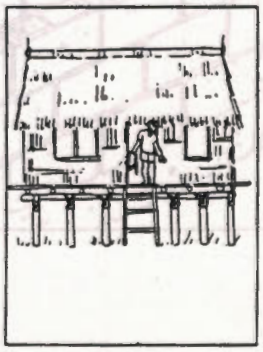
Manual prepared by INTERTECT under contract
to the East-West Center Pacific Islands Development
Program (PIDP) with funding provided by the
Office of U.S. Foreign Disaster Assistance, AID.

MAKE METAL STRAPS

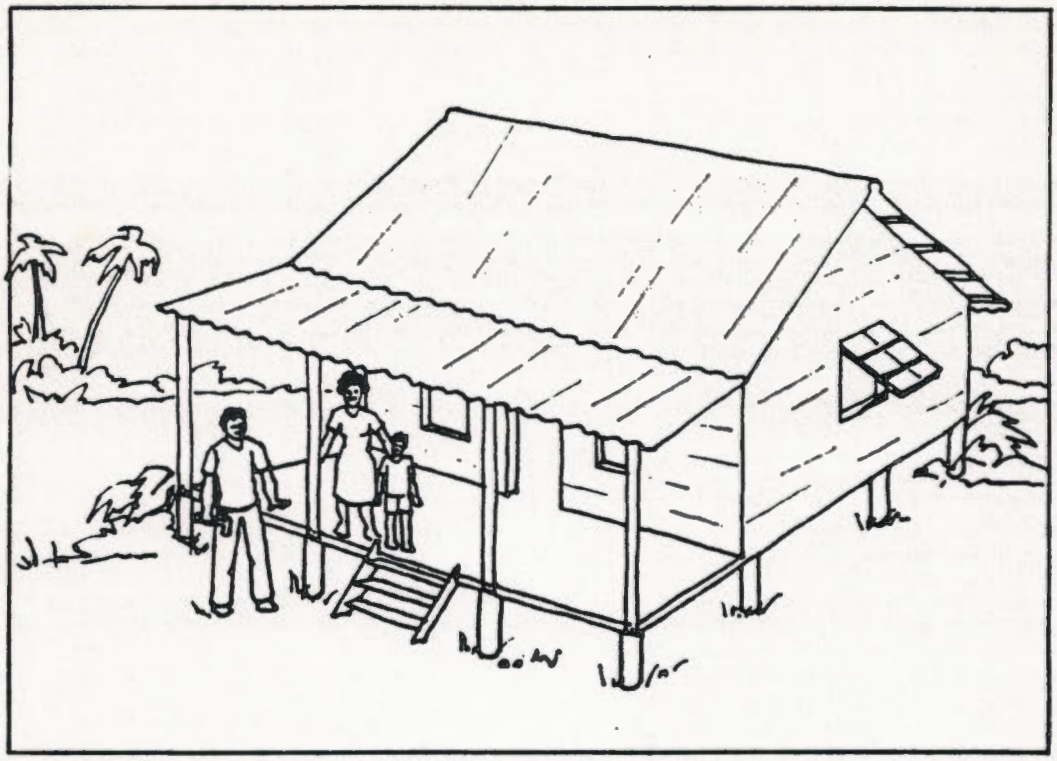
STRAP WOOD BEAMS TO FOUNDATION POSTS WITH METAL STRAPS.

IF METAL STRAPS ARE NOT AVAILABLE

USE WIRE OR BUSH ROPE TO TIE WOOD BEAMS TO FOUNDATION POSTS



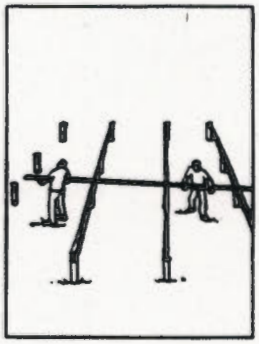
ALL BEAMS AND POSTS SHOULD BE TIED TOGETHER



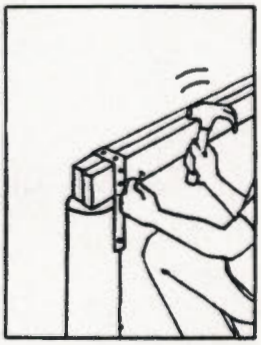
HOW TO BUILD A STRONG WOOD FRAME HOUSE

Manual prepared by INTERTECT under contract
to the East-West Center Pacific Islands Development
Program (PIDP) with funding provided by the
Office of U.S. Foreign Disaster Assistance, AID.

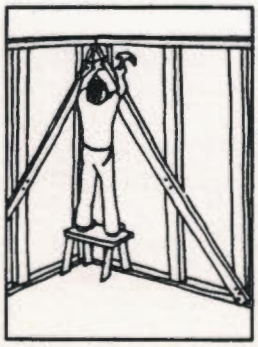
MAKE BEARERS USING TWO 6×2's



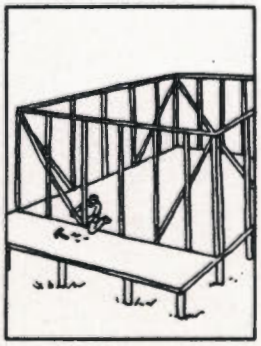
SET BEARERS ON POSTS



FASTEN BEARERS TO POSTS USING METAL STRAPS



NAIL CORNER BRACES



PUT BRACES IN ALL CORNERS

PUT DIAGONAL BRACES IN CORNERS. FASTEN WITH STRAPS