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Low-cost Prefabricated Wooden Houses

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

General Studies Series

LOW-COST PREFABRICATED WOODEN HOUSES

A MANUAL FOR DEVELOPING COUNTRIES

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION
Vienna, 1992

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Preface

The Manual for Low-Cost Prefabricated Wooden Houses was originally prepared by the Instituto de Pesquisas Tecnológicas (IPT), Sao Paulo, Brazil, for a self-help community building project at Coroados, Manaus, under a contract with the Housing Society for the Amazon State (SHAM). (Photographs 1 to 4 show the project at various stages, including a view of completed houses.)

An experimental group of 40 houses was built during the period November 1981-March 1982. The average cost was $US 49.70 to $US 59.50 per square metre (as of March 1982), depending on the area, which averaged 40 square metres, and the type of foundation used (stone or ceramic blocks and a cement or wooden floor). All houses were equipped with bathrooms built with concrete blocks. The cost included the materials delivered at the construction site and the labour for manufacture and assembly and for masonry, electrical and pipe work. It did not include materials and labour for painting; electrical, water and sewerage installations; rails and tools; and land acquisition and infrastructure.

The purpose of this Manual is to provide direct and simple assistance to people and communities that want to build their own houses either individually or on a co-operative basis. Complicated design calculations have been omitted and instructions are straightforward and easy to follow. Although the construction system was conceived and implemented in the Amazon region of Brazil, information on wood species found in Africa and Asia is also included, as are data on the required physical and mechanical characteristics of the wood used in the various parts of the house. Thus, the Manual can be of use in many regions of Africa, Asia and Latin America.

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Photo 1. Partial view of the IPT/SHAM houses under construction in Coroados, Manaus, Brazil

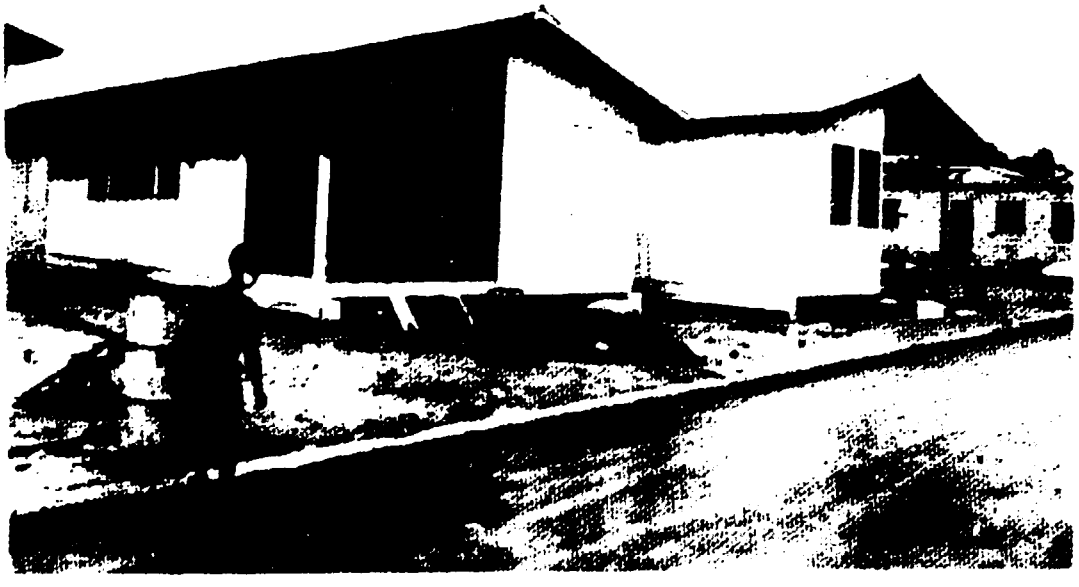


Photo 2. The houses being painted with PVA-based paint

Photo 3. View of houses nearing completion. In the foreground, house with ceramic block foundation and cement floor

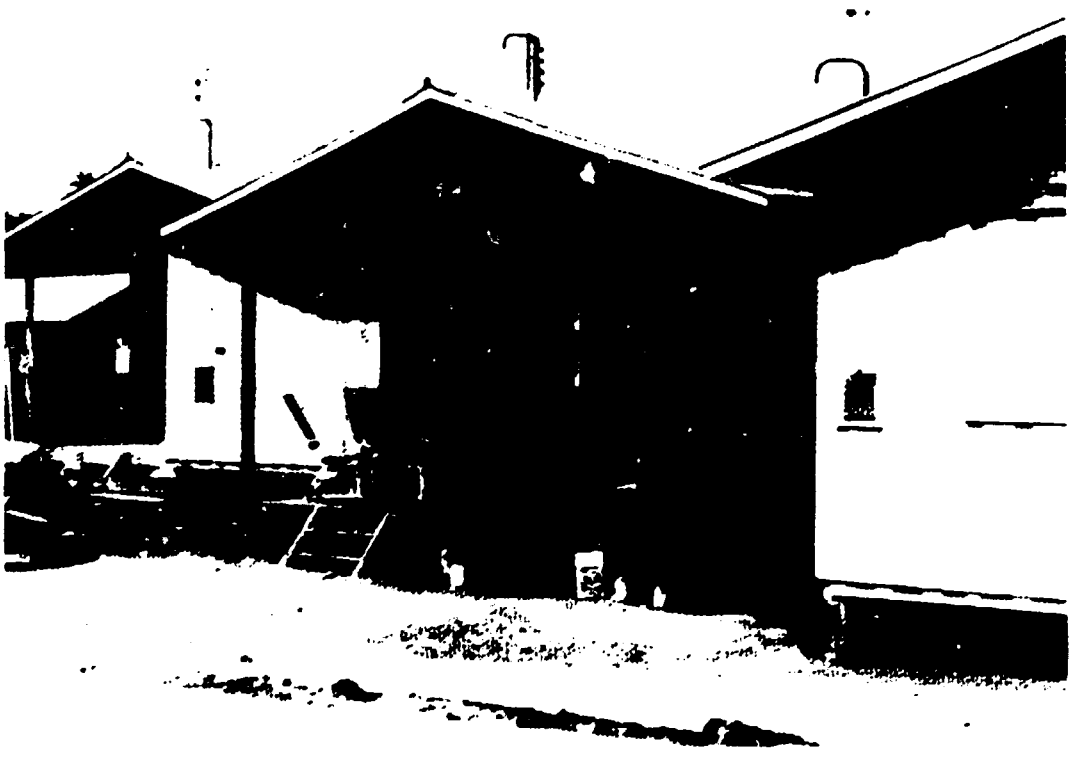
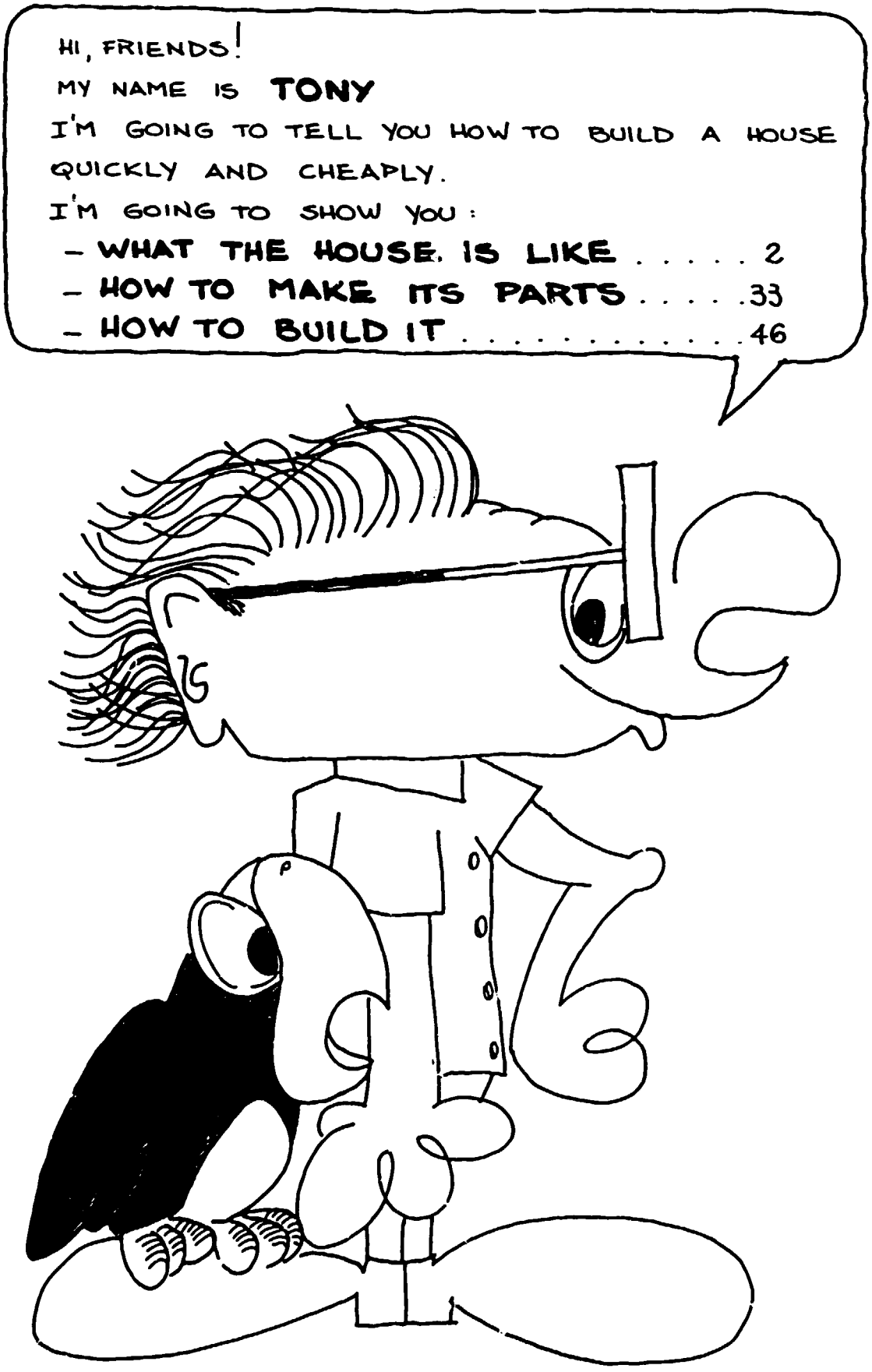
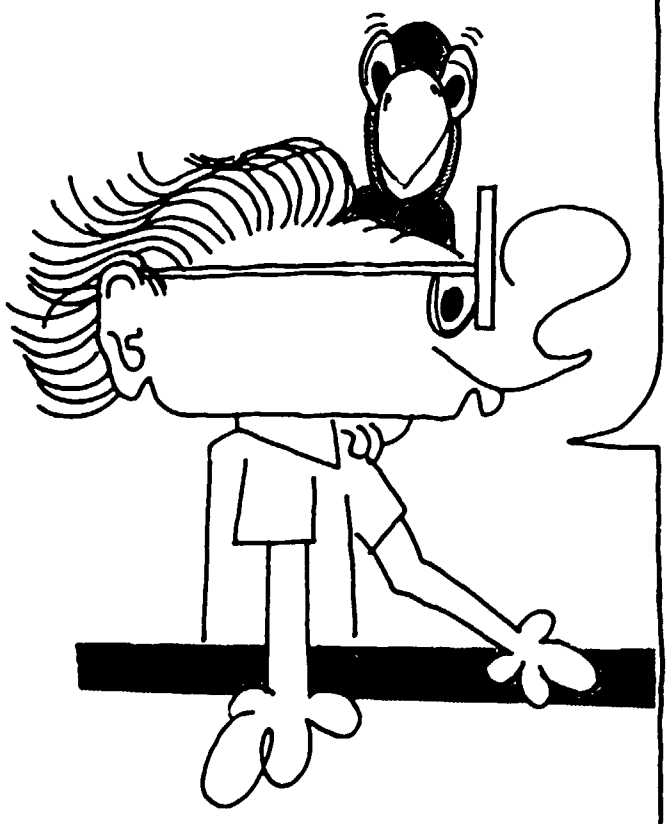


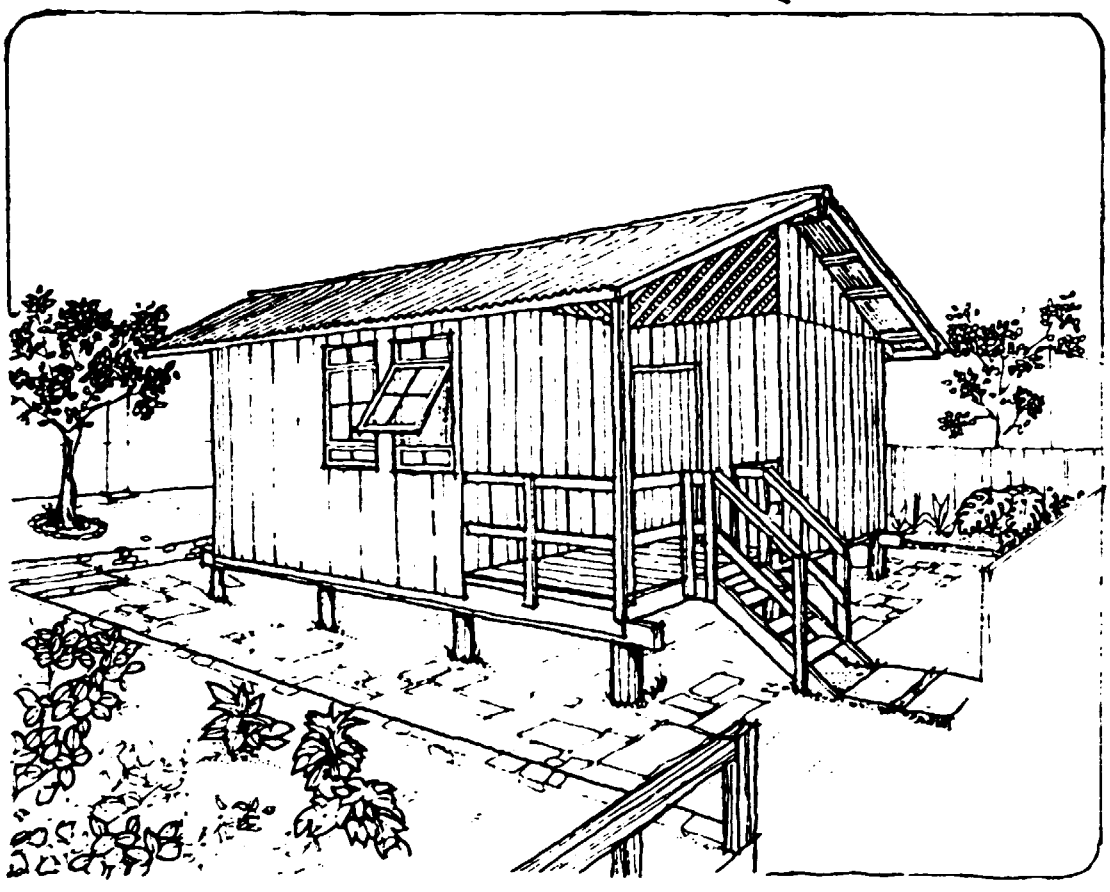
Photo 4. View of finished houses, already occupied


HI, FRIENDS!
MY NAME IS TONY
I'M GOING TO TELL YOU HOW TO BUILD A HOUSE QUICKLY AND CHEAPLY.
I'M GOING TO SHOW YOU:
- WHAT THE HOUSE IS LIKE 2
- HOW TO MAKE ITS PARTS 33
- HOW TO BUILD IT 46

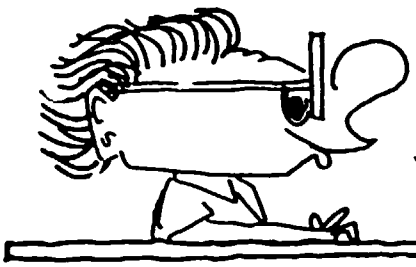


AH, I ALMOST FORGOT TO INTRODUCE YOU TO SOMEONE HERE ON MY SHOULDER.
HER NAME IS **POLLY**
AND NOW THE TWO OF US WILL SHOW YOU WHAT THE HOUSE IS LIKE.
YOU ARE GOING TO LEARN ABOUT:

THE HOUSE IS MADE OF WOOD OF SUITABLE SPECIES (AND DEPENDING ON THE USE EITHER NATURALLY DURABLE OR PRESERVATIVE TREATED - SEE TABLES AT END OF MANUAL). CONSTRUCTION IS SIMPLE AND YOU CAN EASILY DO IT YOURSELF.



YOU CAN MAKE YOUR HOUSE BIGGER OR SMALLER THAN OUR MODEL, AS WELL AS IDENTICAL TO IT.
IF YOU ARE NOT ABLE TO BUILD A BIG HOUSE AT THE MOMENT, START WITH A SMALLER ONE AND MAKE IT BIGGER LATER.

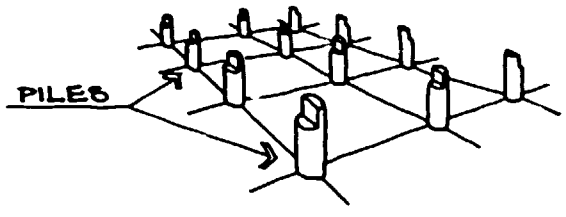


LET'S EXAMINE

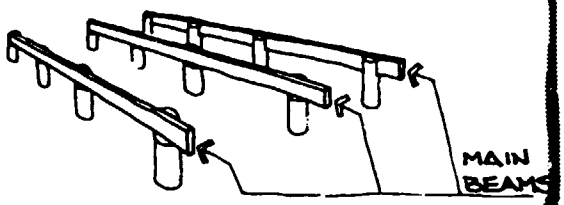
THE PARTS OF THE HOUSE...

THIS HOUSE IS SIMILAR TO ONES YOU OFTEN SEE.
THE DIFFERENCE IS THAT MANY PARTS OF THIS HOUSE CAN BE MADE BEFORE YOU START CONSTRUCTION.

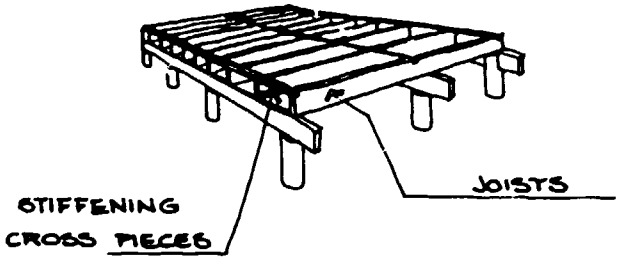
START THE CONSTRUCTION BY PUTTING PILES FIRMLY INTO THE GROUND



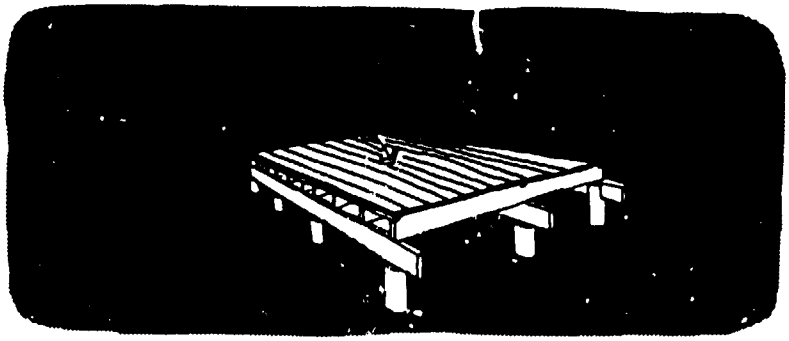
BEAMS ARE PLACED ACROSS THE PILES AND...

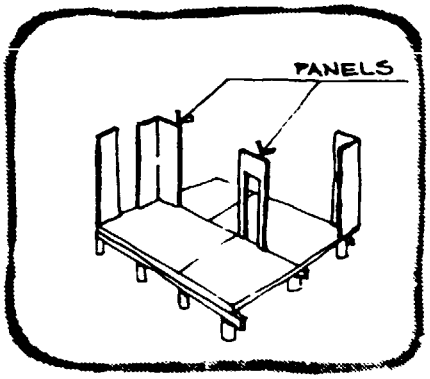


... JOISTS WITH STIFFENING CROSS PIECES ARE LAID ON THESE.



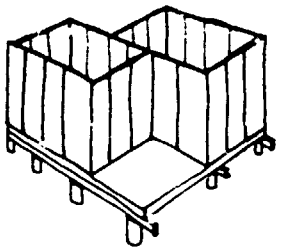
THEN THE FLOORBOARDS ARE NAILED TO THE JOISTS.



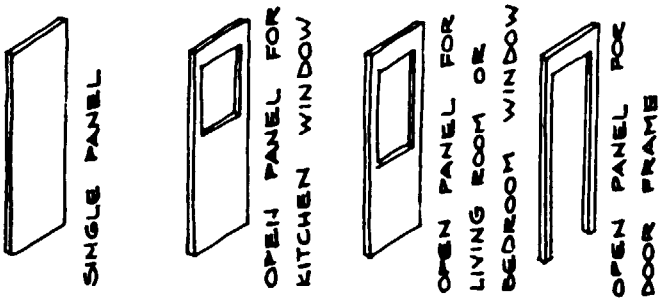


THE WALLS ARE MADE OUT OF PREASSEMBLED PANELS. THAT IS, THEY ARE MADE BEFORE CONSTRUCTION BEGINS.

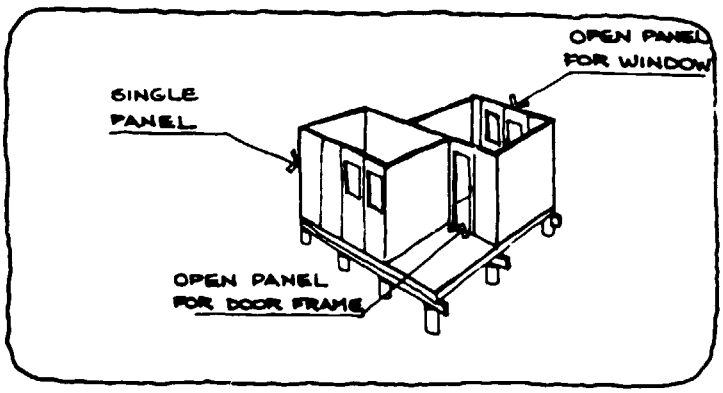
ALL THE PARTS SHOWN FROM NOW ON ARE TO BE ASSEMBLED BEFORE DELIVERY TO THE SITE.



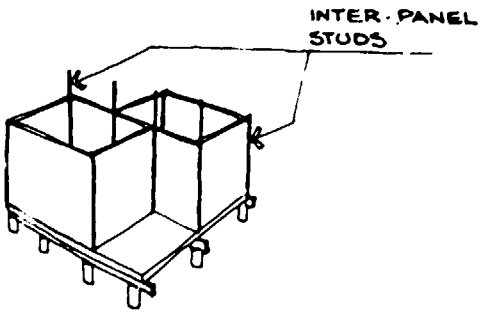
BY USING PANELS THE ERECTION OF WALLS IS EASY. YOU JUST LOCATE EACH PANEL IN ITS RIGHT PLACE AND NAIL IT TO THE FRAME.



THERE ARE FOUR TYPES OF PANELS:

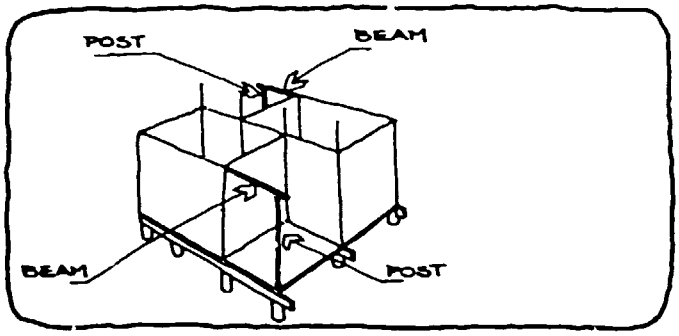


THE DIFFERENT PANELS ARE ARRANGED SO THAT THE WALLS, DOORS AND WINDOWS ARE WHERE YOU WANT THEM.

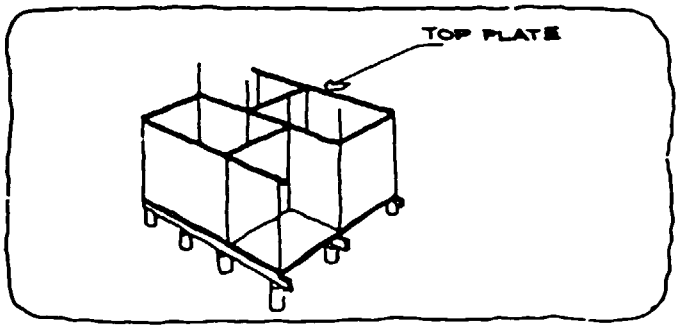


THE PANELS ARE FIXED FIRMLY TOGETHER USING VERTICAL CONNECTING PIECES (ALSO CALLED) INTER-PANEL STUDS.

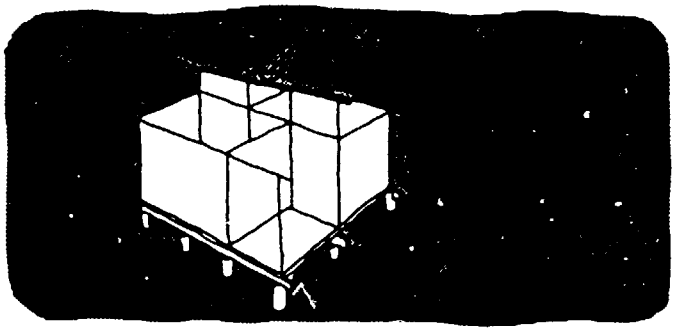
NEXT, THE EXTERNAL POSTS AND BEAMS MUST BE INSTALLED.



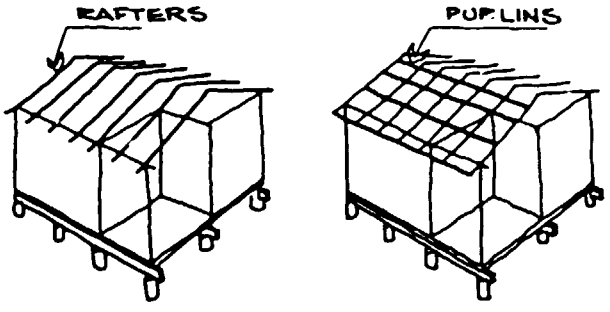
AND FINALLY "TOP PLATES" ARE PUT IN PLACE.



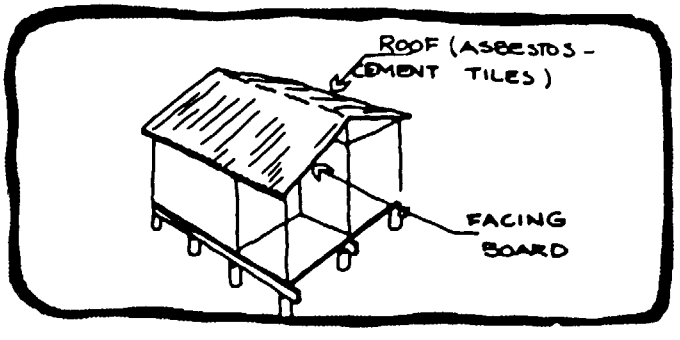
YOU BEGIN THE ROOF ASSEMBLY BY SETTING UP THE RIDGE BEAM...

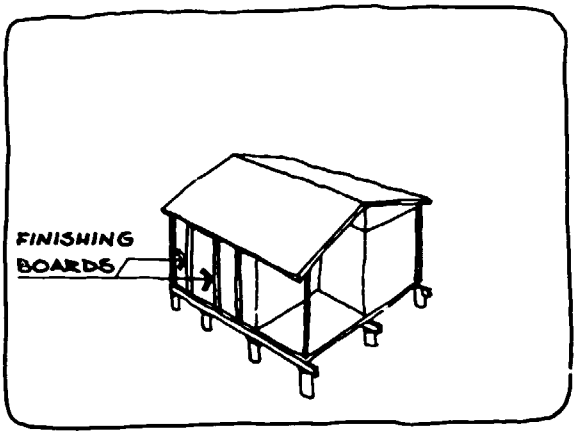


... THEN THE RAFTERS AND PURLINS

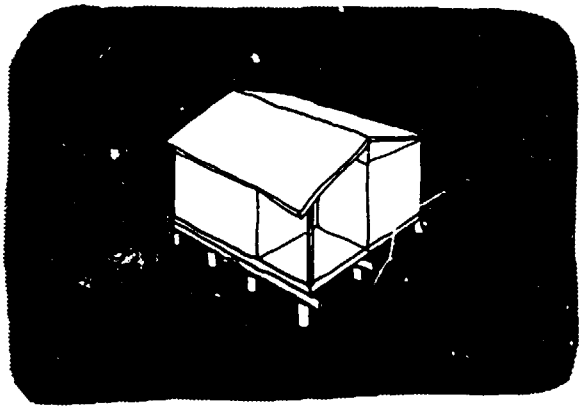


TO FINISH THE ROOF, A ROOFING MATERIAL IS LAID AND A FACING BOARD IS FIXED AT THE ENDS.

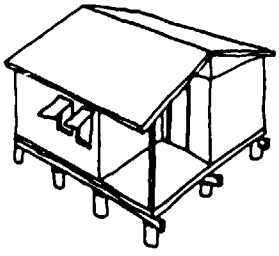




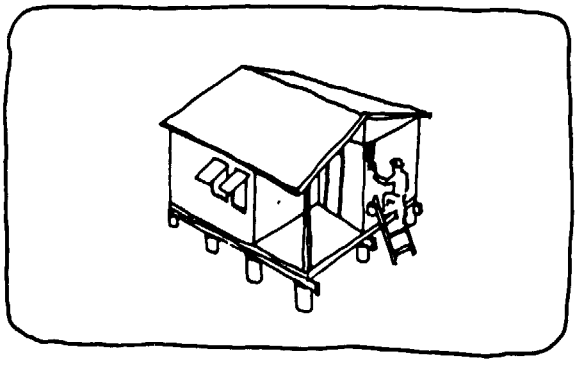
TO FINISH THE WALLS YOU SEAL THE GAPS BETWEEN THE PANELS AND AT THE CORNERS WITH BOARDS.



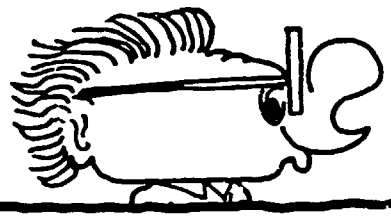
TO FINISH THE FLOORING YOU NAIL BOARDS TO THE ENDS OF THE JOISTS ON THE OUTSIDE OF THE HOUSE.



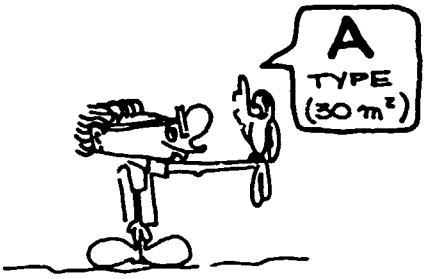
HANG THE DOORS, WINDOWS AND ...

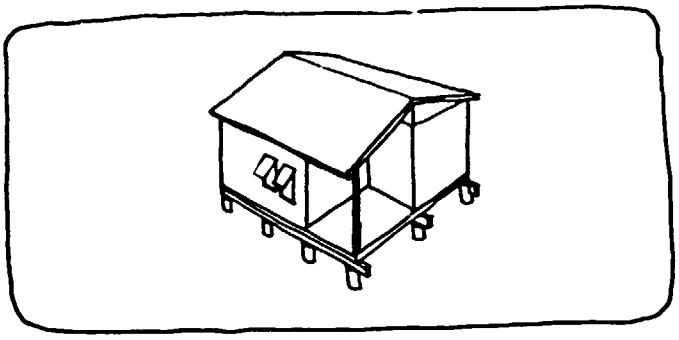


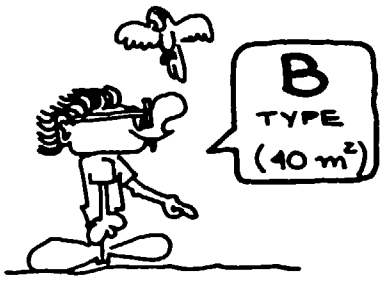
... NOW YOU CAN PAINT YOUR HOUSE FOR GREATER DURABILITY.

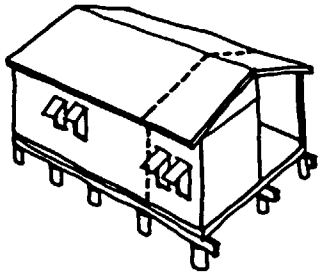


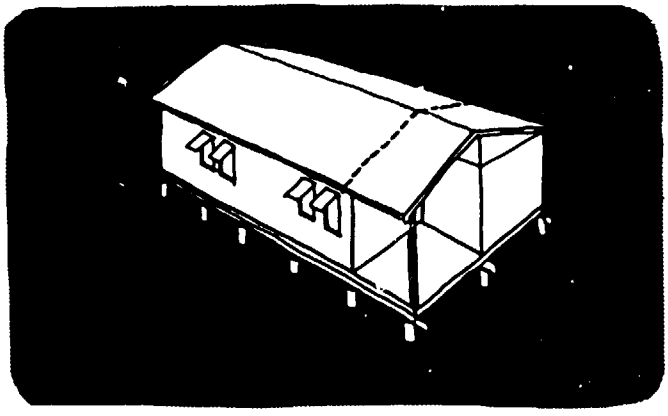
HERE ARE THE **HOUSE TYPES** YOU CAN BUILD.

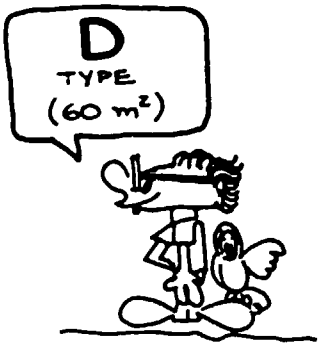


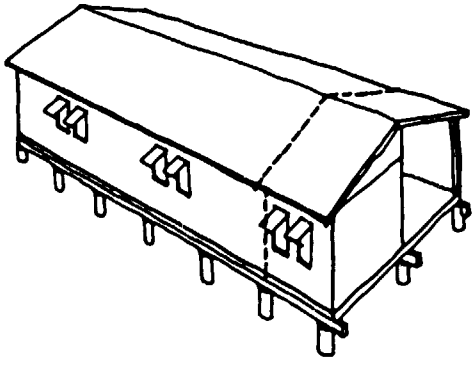




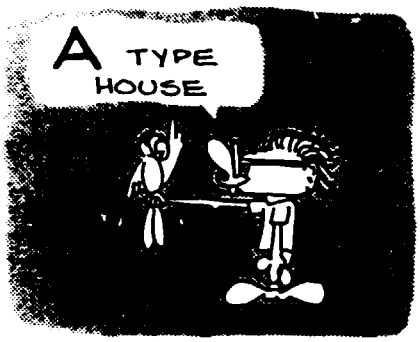






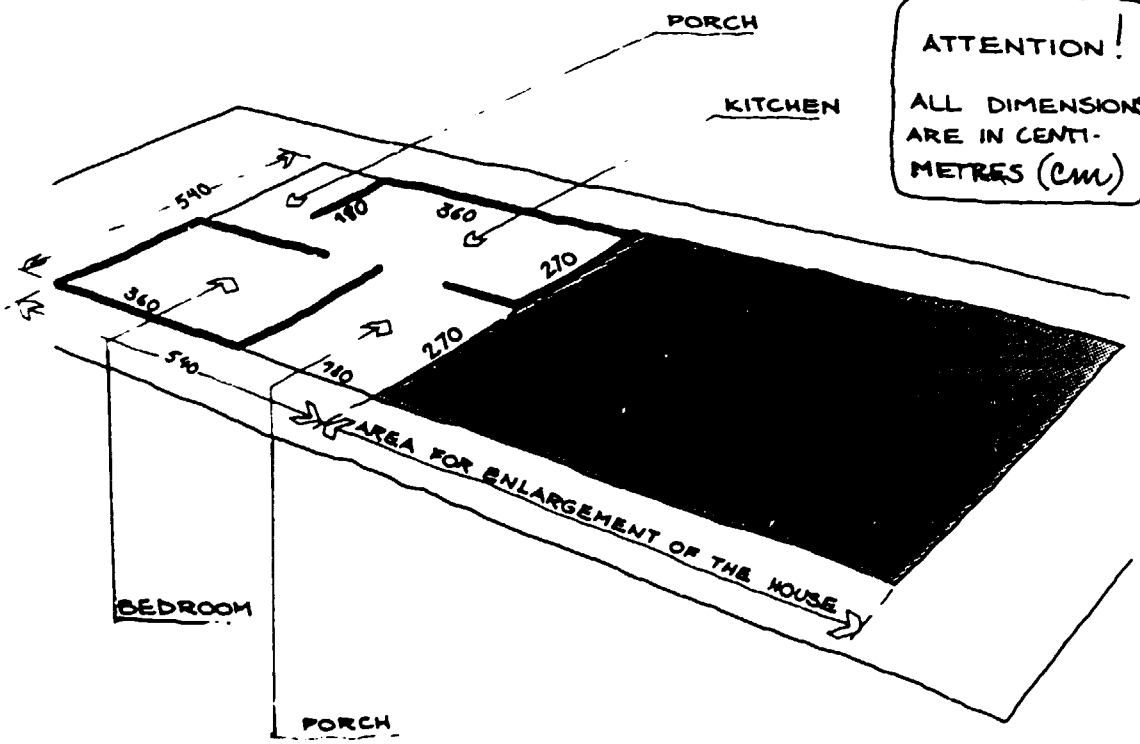


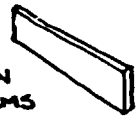
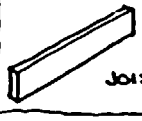
TO CHOOSE BETWEEN HOUSE TYPES, YOU MUST DECIDE ON THE NUMBER OF ROOMS YOU NEED. YOU MUST ALSO CALCULATE THE AMOUNT OF MATERIAL YOU CAN AFFORD TO BUY.
NOW YOU ARE GOING TO SEE IN MORE DETAIL THE FOUR TYPES OF HOUSES THAT YOU CAN MAKE.

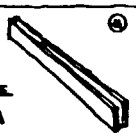
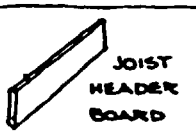
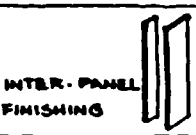
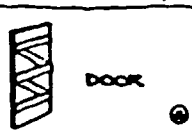
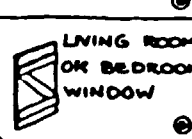


HERE ARE THE DIMENSIONS AND QUANTITIES OF THE DIFFERENT PIECES NECESSARY TO CONSTRUCT A TYPE A HOUSE.

ATTENTION!
ALL DIMENSIONS ARE IN CENTIMETRES (cm)



SEE PAGES	TYPE OF PART	DIMENSIONS (cm)	QUANTITY
04, 47 49 to 54	 PILES	ϕ 15 / 20	12
04, 55; 56	 MAIN BEAMS	5 x 20 x 400	5
04; 57 to 59	 JOISTS	5 x 15 x 300	20
59	 STIFFENING CROSS PIECES	5 x 7,5 x 400	5
04; 60	 FLOOR BOARD	2,5 x 20 x 300	50
05; 36; 63 to 70	 SINGLE PANEL	85 x 240	19
05; 36; 63 to 70	 OPEN PANEL FOR KITCHEN WINDOW ⊛	85 x 240	2
05; 36; 63 to 70	 OPEN PANEL FOR LIVING OR BEDROOM WINDOW ⊛	85 x 240	2
05; 36; 63 to 70	 OPEN PANEL FOR DOOR ⊛	85 x 240	3
05; 41; 65; 67; 69; 70	 INTER-PANEL STUDS ⊛	5 x 5 x 232,5	2
		5 x 5 x 240	4
		5 x 5 x 325	4
06; 42; 71	 PORCH SUPPORT POST ⊛	5 x 7,5 x 265	2
		5 x 5 x 232,5	2
06; 42; 71	 PORCH BEAM ⊛	5 x 7,5 x 232,5	2

TYPE OF PART	DIMENSIONS (cm)	QUANTITY	SEE PAGES
 TOP PLATE	5 x 7,5 x 175	3	06; 72
	5 x 7,5 x 265	4	
	5 x 7,5 x 640 1/	2	
 RIDGE BEAM ⊛	l = 180 cm	–	06; 43; 44; 73; 74
	l = 197,5 cm	2	
	l = 245 cm	1	
 RAFTER ⊛	l = 330 cm	18	06; 45; 74 to 78
 PURLIN	5 x 5 x 640 1/	8	06; 80; 81
 FACING BOARD	2,5 x 7,5 x 330	4	06; 81
	2,5 x 7,5 x 640 1/	2	
 TILE (ASBESTOS-CEMENT)	LENGTH = 122 cm WIDTH = 50,6 cm THICKNESS = 0,4 cm	90	82
 RIDGE TILE	LENGTH = 102 cm WIDTH = 41,5 cm THICKNESS = 0,5 cm	15	82
 JOIST HEADER BOARD	2,5 x 20 x 545 1/	2	07; 70
 INTER-PANEL FINISHING	1,25 x 20 x 250	31	07; 79
	1,25 x 5 x 250	6	
 DOOR ⊛	75 x 215	3	07; 83
 KITCHEN WINDOW ⊛	75 x 90	2	07; 83
 LIVING ROOM OR BEDROOM WINDOW ⊛	75 x 125	2	07; 83

⊛ SEE SECTION HOW TO MAKE THE PARTS OF THE HOUSE.

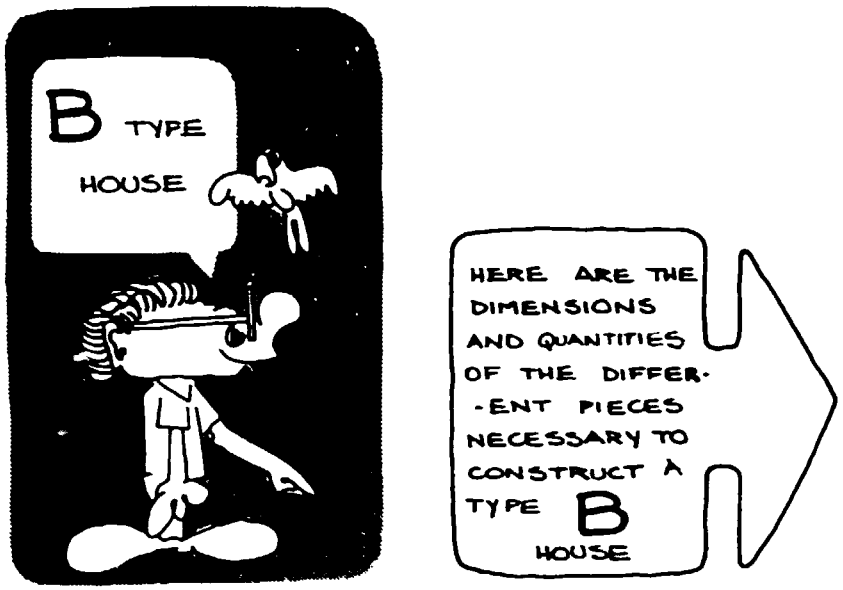
1/ LENGTH OBTAINED BY TWO OR MORE PIECES.

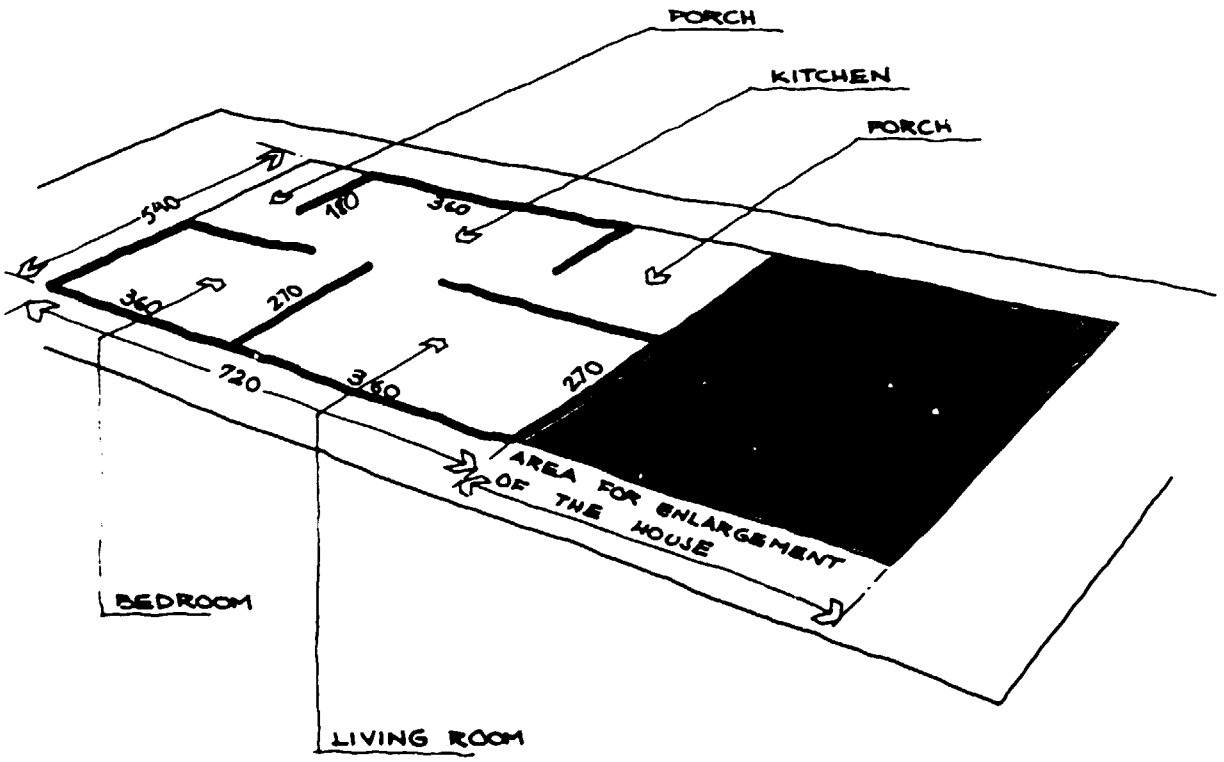
THE SUMMARY BELOW IS INTENDED TO HELP YOU ORDER OR CUT THE MATERIALS NECESSARY TO CONSTRUCT A TYPE A HOUSE

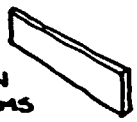
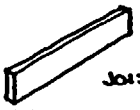
DIMENSIONS (cm)	QUANTITY	COST
∅ 15 TO 20 (PILES)	12	
5 x 20 x 400	5	
5 x 15 x 300	20	
2,5 x 20 x 300	56 (50 + 6 FOR JOIST HEADER BOARDS, PAGE 70)	
1,25 x 20 x 250	31	
1,25 x 20 x 247,5	95	
1,25 x 20 x 152,5	10	
1,25 x 20 x 97,5	10	
1,25 x 20 x 25	35	
5 x 5 x 320	16	
5 x 5 x 325	4	
5 x 5 x 240	52	
5 x 5 x 232,5	4	
5 x 5 x 75	119	
5 x 5 x 60	18	
5 x 5 x 35	48	
5 x 5 x 30	18	
5 x 7,5 x 400	8	
5 x 7,5 x 265	6	
5 x 7,5 x 232,5	2	
5 x 7,5 x 175	3	
5 x 7,5 x 60	2	
5 x 7,5 x 20	4	

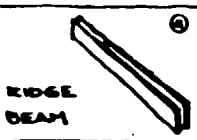
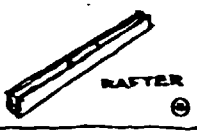
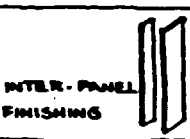
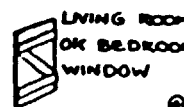
DIMENSIONS (cm)	QUANTITY	COST
2,5 x 10 x 245	2	
2,5 x 10 x 197,5	4	
2,5 x 7,5 x 330	44 1/	
1,25 x 5 x 250	6	
1,25 x 5 x 222,5	6	
1,25 x 5 x 125	4	
1,25 x 5 x 90	4	
1,25 x 5 x 12,5	120	
l = 10 cm NAILS	538	
l = 6,25 cm NAILS	476	
l = 5 cm NAILS	1381	

1/ QUANTITY NEEDED FOR RAFTERS AND FACING BOARDS.


B TYPE HOUSE
HERE ARE THE DIMENSIONS AND QUANTITIES OF THE DIFFER-ENT PIECES NECESSARY TO CONSTRUCT A TYPE B HOUSE


PORCH
KITCHEN
PORCH
540
180
360
360
270
720
360
270
AREA FOR ENLARGEMENT OF THE HOUSE
BEDROOM
LIVING ROOM

SEE PAGES	TYPE OF PART	DIMENSIONS (cm)	QUANTITY
04; 47; 49 to 54	 PILES	ϕ 15 / 20	15
04; 55; 56	 MAIN BEAMS	5 x 20 x 400	6
04 57 to 59	 JOISTS	5 x 15 x 300	26
59	 STIFFENING CROSS PIECES	5 x 7,5 x 400	6
04; 60	 FLOOR BOARD	2,5 x 20 x 300	66
05; 36; 63 to 70	 SINGLE PANEL	85 x 240	25
05; 36; 63 to 70	 OPEN PANEL FOR KITCHEN WINDOW Ⓐ	85 x 240	2
05; 36; 63 to 70	 OPEN PANEL FOR LIVING OR BEDROOM WINDOW Ⓐ	85 x 240	4
05; 36; 63 to 70	 OPEN PANEL FOR DOOR Ⓐ	85 x 240	4
05; 41; 65; 67; 69; 70	 INTER-PANEL STUDS Ⓐ	5 x 5 x 232,5	2
		5 x 5 x 240	6
		5 x 5 x 325	5
06; 42; 71	 PORCH SUPPORT POST Ⓐ	5 x 7,5 x 265	2
		5 x 5 x 232,5	2
06; 42; 71	 PORCH BEAM Ⓐ	5 x 7,5 x 232,5	2

TYPE OF PART	DIMENSIONS (cm)	QUANTITY	SEE PAGES
 TOP PLATE	5 x 7,5 x 175	4	06; 72
	5 x 7,5 x 265	5	
	5 x 7,5 x 820 1/	2	
 RIDGE BEAM Ⓐ	l = 180 cm	1	06; 43; 44; 73; 74
	l = 197,5 cm	2	
	l = 245 cm	1	
 RAFTER Ⓐ	l = 330 cm	22	06; 45; 74 to 78
 PURLIN	5 x 5 x 820 1/	8	06; 80; 81
 FACING BOARD	2,5 x 7,5 x 330	4	06; 81
	2,5 x 7,5 x 820 1/	2	
 TILE (ASBESTOS-CEMENT)	LENGTH = 122 cm WIDTH = 50,6 cm THICKNESS = 0,4 cm	114	82
 RIDGE TILE	LENGTH = 102 cm WIDTH = 41,5 cm THICKNESS = 0,5 cm	19	82
 JOIST HEADER BOARD	2,5 x 20 x 725 1/	2	07; 70
 INTER-PANEL FINISHING	1,25 x 20 x 250	31	07; 79
	1,25 x 5 x 250	6	
 DOOR Ⓐ	75 x 215	3	07; 83
 KITCHEN WINDOW Ⓐ	75 x 90	2	07; 83
 LIVING ROOM OR BEDROOM WINDOW Ⓐ	75 x 125	2	07; 83

Ⓐ SEE SECTION HOW TO MAKE THE PARTS OF THE HOUSE.

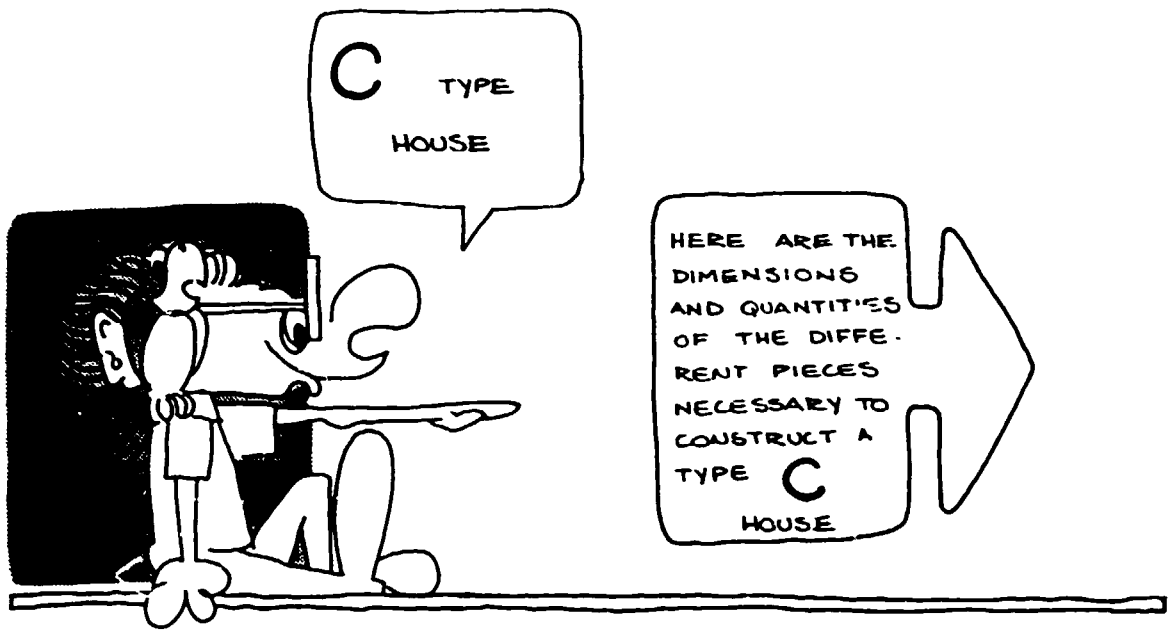
1/ LENGTH OBTAINED BY TWO OR MORE PIECES.

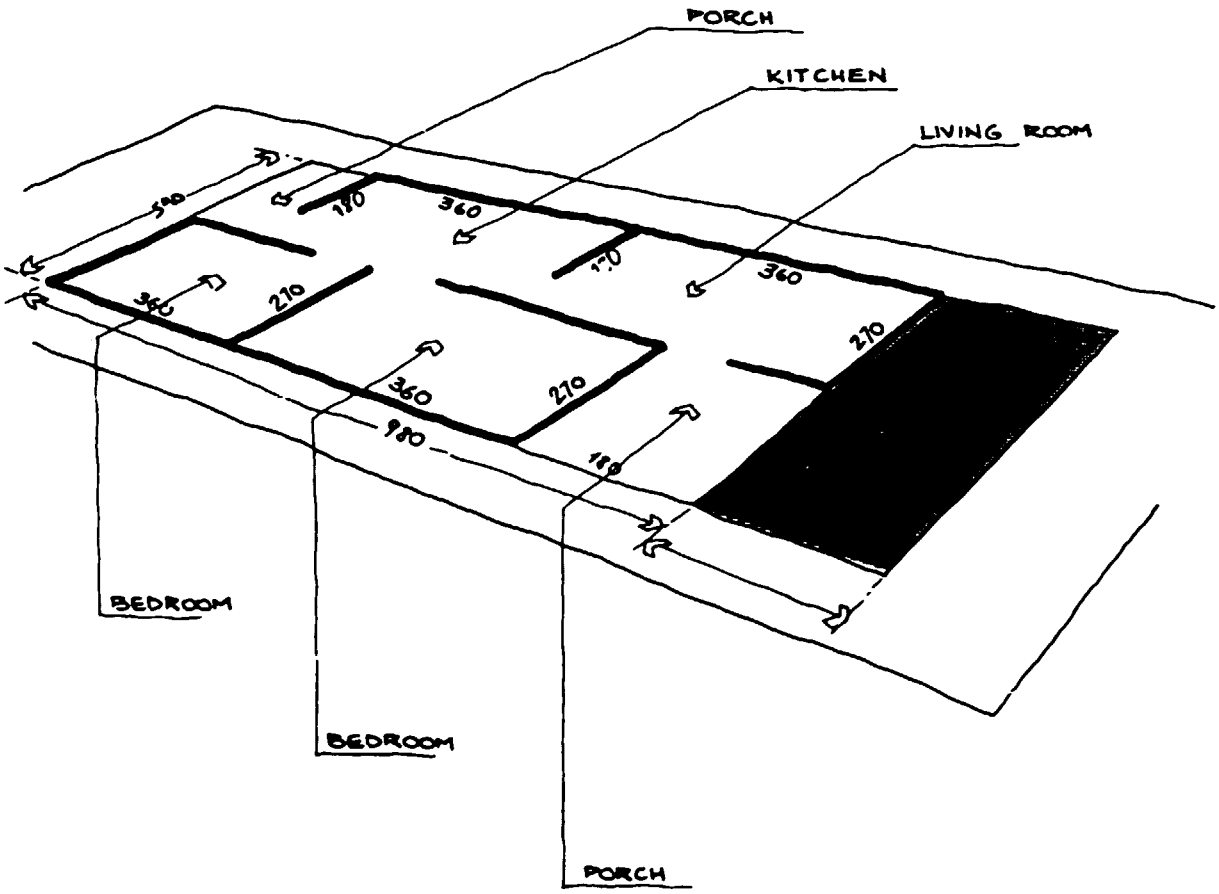
THE SUMMARY BELOW IS INTENDED TO HELP YOU ORDER OR CUT THE MATERIALS NECESSARY TO CONSTRUCT TYPE B HOUSE

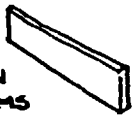
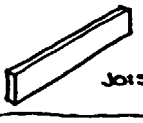
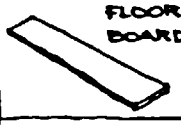
DIMENSIONS (cm)	QUANTITY	COST
ø 15/20 (PILES)	15	
6 x 20 x 400	6	
5 x 15 x 300	26	
2,5 x 20 x 300	72	(66 + 6 FOR JOIST HEADER BOARDS, PAGE 70)
1,25 x 20 x 250	39	
1,25 x 20 x 247,5	125	
1,25 x 20 x 132,5	10	
1,25 x 20 x 97,5	20	
1,25 x 20 x 25	50	
5 x 5 x 325	5	
5 x 5 x 320	16	
5 x 5 x 240	76	
5 x 5 x 232,5	4	
5 x 5 x 180	8	
5 x 5 x 75	159	
5 x 5 x 60	22	
5 x 5 x 35	57	
5 x 5 x 30	22	
5 x 7,5 x 400	11	
5 x 7,5 x 232,5	2	
5 x 7,5 x 175	4	
5 x 7,5 x 60	3	
5 x 7,5 x 20	5	

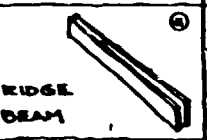
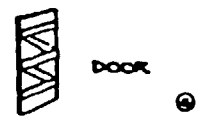
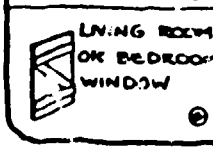
DIMENSIONS (cm)	QUANTITY	COST
2,5 x 10 x 245	2	
2,6 x 10 x 197,5	4	
2,5 x 10 x 180	2	
2,5 x 7,5 x 330	54 3/	
1,25 x 5 x 250	6	
1,25 x 5 x 222,5	8	
1,25 x 5 x 125	8	
1,25 x 5 x 90	4	
1,25 x 5 x 12,5	64	
l = 10 cm NAIL	638	
l = 6,25 cm NAIL	636	
l = 5 cm NAIL	1857	

3/ QUANTITY NEEDED FOR RAFTERS AND FACING BOARDS.


C TYPE HOUSE
HERE ARE THE DIMENSIONS AND QUANTITIES OF THE DIFFERENT PIECES NECESSARY TO CONSTRUCT A TYPE C HOUSE


PORCH
KITCHEN
LIVING ROOM
500
180
360
170
360
360
270
270
360
270
980
180
BEDROOM
BEDROOM
PORCH

SEE PAGES	TYPE OF PART	DIMENSIONS (cm)	QUANTITY
04; 47; 49 to 59	 PILES	ϕ 15 / 20	18
04; 55; 56	 MAIN BEAMS	5 x 20 x 400	8
04 57 to 59	 JOISTS	5 x 15 x 300	32
59	 STIFFENING CROSS PIECES	5 x 7,5 x 400	8
04; 60	 FLOOR BOARD	2,5 x 20 x 300	83
05; 36; 63 to 70	 SINGLE PANEL	85 x 240	29
05; 36; 63 to 70	 OPEN PANEL FOR KITCHEN WINDOW ⊛	85 x 240	2
05; 36; 63 to 70	 OPEN PANEL FOR LIVING OR BEDROOM WINDOW ⊛	85 x 240	8
05; 36; 63 to 70	 OPEN PANEL FOR DOOR ⊛	85 x 240	5
05; 41; 65; 67; 69; 70.	 INTER-PANEL STUDS ⊛	5 x 5 x 232,5	2
		5 x 5 x 240	8
		5 x 5 x 325	6
06; 42; 71	 PORCH SUPPORT POST ⊛	5 x 7,5 x 265	2
		5 x 5 x 232,5	2
06; 42; 71	 PORCH BEAM ⊛	5 x 7,5 x 232,5	2

TYPE OF PART	DIMENSIONS (cm)	QUANTITY	SEE PAGES
 TOP PLATE	5 x 7,5 x 175	5	06; 72
	5 x 7,5 x 265	6	
	5 x 7,5 x 1000 1/	2	
 RIDGE BEAM ⊛	l = 180 cm	2	06; 43; 44; 73; 74
	l = 197,5 cm	2	
	l = 245 cm	1	
 RAFTER ⊛	l = 330 cm	26	06; 45; 74 to 78
 PURLIN	5 x 5 x 1000 1/	8	06; 80; 81
 FACING BOARD	2,5 x 7,5 x 330	4	06; 81
	2,5 x 7,5 x 1000 1/	2	
 TILE (ASBESTOS-CEMENT)	LENGTH = 122 cm WIDTH = 50,6 cm THICKNESS = 0,4 cm	138	82
 RIDGE TILE	LENGTH = 102 cm WIDTH = 41,5 cm THICKNESS = 0,5 cm	23	82
 JOIST HEADER BOARD	2,5 x 20 x 905 1/	2	07; 70
 INTER-PANEL FINISHING	1,25 x 20 x 250	47	07; 79
	1,25 x 5 x 250	6	
 DOOR ⊛	75 x 215	5	07; 83
 KITCHEN WINDOW ⊛	75 x 90	2	07; 83
 LIVING ROOM OR BEDROOM WINDOW ⊛	75 x 125	8	07; 83.

⊛ SEE SECTION HOW TO MAKE THE PARTS OF THE HOUSE.

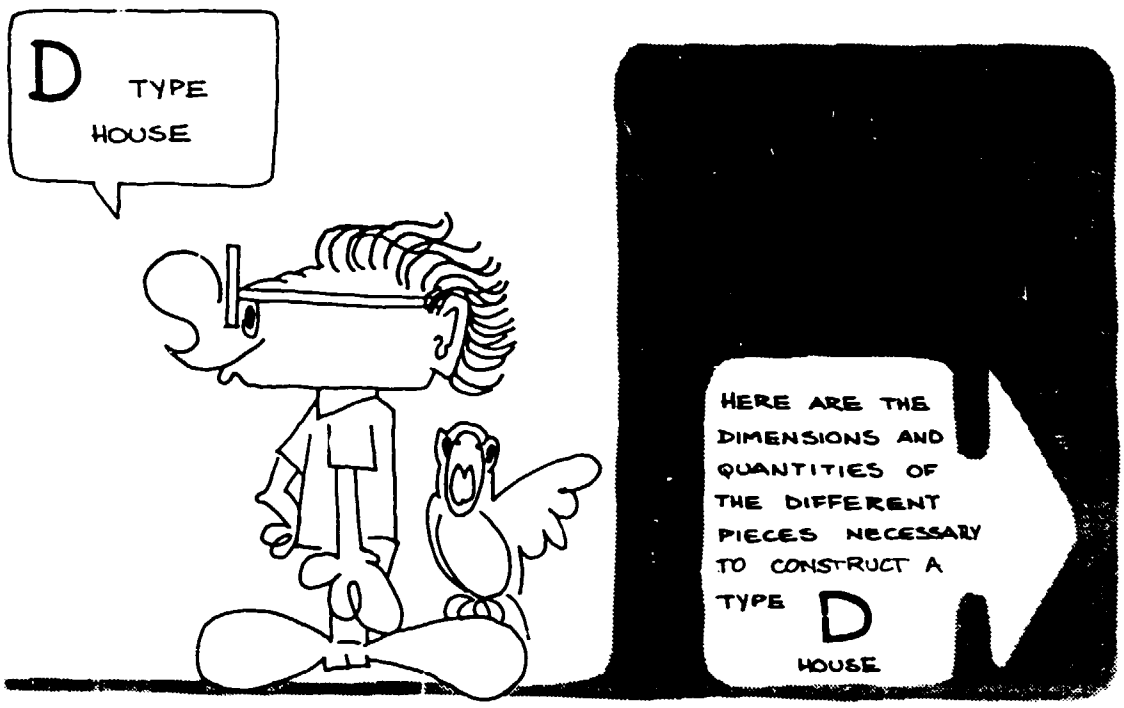
1/ LENGTH OBTAINED BY TWO OR MORE PIECES.

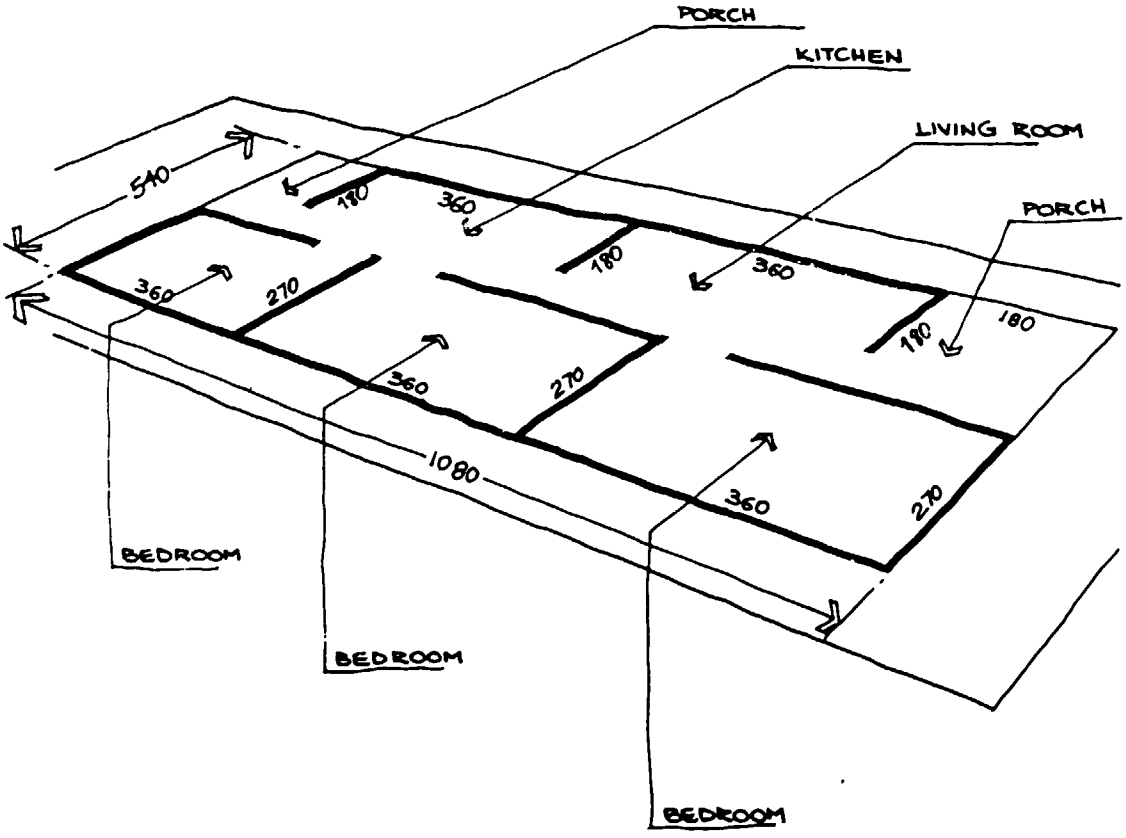
THE SUMMARY BELOW IS INTENDED TO HELP YOU ORDER OR CUT MATERIALS NECESSARY TO CONSTRUCT TYPE C HOUSE

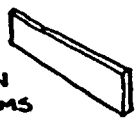
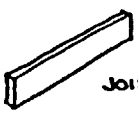
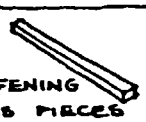
DIMENSIONS (cm)	QUANTITY	COST
ϕ 15/20 (PILES)	18	
5 x 20 x 400	8	
5 x 15 x 300	32	
2,5 x 20 x 300	90 (83 + 7 FOR JOIST HEADER BOARDS, PAGE 70)	
1,25 x 20 x 250	47	
1,25 x 20 x 247,5	145	
1,25 x 20 x 132,5	10	
1,25 x 20 x 97,5	40	
1,25 x 20 x 25	75	
5 x 5 x 325	6	
5 x 5 x 320	16	
5 x 5 x 240	88	
5 x 5 x 232,5	4	
5 x 5 x 180	16	
5 x 5 x 75	197	
5 x 5 x 60	26	
5 x 5 x 35	74	
5 x 5 x 30	26	
5 x 7,5 x 400	13	
5 x 7,5 x 265	8	
5 x 7,5 x 232,5	2	
5 x 7,5 x 175	5	
5 x 7,5 x 60	4	
5 x 7,5 x 20	6	

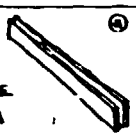
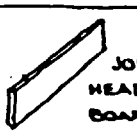
DIMENSIONS (cm)	QUANTITY	COST
2,5 x 10 x 245	2	
2,5 x 10 x 197,5	4	
2,5 x 10 x 180	4	
2,5 x 7,5 x 300	62 3/	
1,25 x 5 x 250	6	
1,25 x 5 x 222,5	10	
1,25 x 5 x 125	16	
1,25 x 5 x 90	4	
1,25 x 5 x 12,5	216	
ℓ = 10 cm NAIL	778	
ℓ = 6,25 cm NAIL	788	
ℓ = 5 cm NAIL	2347	

3/ QUANTITY NEEDED FOR RAFTERS AND FACING BOARDS.


D TYPE HOUSE
HERE ARE THE DIMENSIONS AND QUANTITIES OF THE DIFFERENT PIECES NECESSARY TO CONSTRUCT A TYPE D HOUSE


PORCH
KITCHEN
LIVING ROOM
PORCH
540
180
360
180
360
360
270
180
180
360
270
1080
360
270
BEDROOM
BEDROOM
BEDROOM

SEE PAGES	TYPE OF PART	DIMENSIONS (cm)	QUANTITY
04; 47; 49 to 54	 PILES	ϕ 15 / 20	21
04; 55; 56	 MAIN BEAMS	5 x 20 x 400	9
04 57 to 59	 JOISTS	5 x 15 x 300	38
59	 STIFFENING CROSS PIECES	5 x 7,5 x 400	9
04; 60	 FLOOR BOARD	2,5 x 20 x 300	99
05; 36; 63 to 70	 SINGLE PANEL	85 x 240	35
05; 36; 63 to 70	 OPEN PANEL FOR KITCHEN WINDOW ⊛	85 x 240	2
05; 36; 63 to 70	 OPEN PANEL FOR LIVING OR BEDROOM WINDOW ⊛	85 x 240	10
05; 36; 63 to 70	 OPEN PANEL FOR DOOR ⊛	85 x 240	6
05; 41; 65; 67; 69; 70	 INTER. PANEL STUDS ⊛	5 x 5 x 232,5	2
		5 x 5 x 240	10
		5 x 5 x 325	7
06; 42; 71	 PORCH SUPPORT POST ⊛	5 x 7,5 x 265	2
		5 x 5 x 232,5	2
06; 42; 71	 PORCH BEAM ⊛	5 x 7,5 x 232,5	2

TYPE OF PART	DIMENSIONS (cm)	QUANTITY	SEE PAGES
 TOP PLATE	5 x 7,5 x 175	6	06; 72
	5 x 7,5 x 265	7	
	5 x 7,5 x 1180 1/	2	
 RIDGE BEAM ⊛	l = 180 cm	3	06; 43; 44; 73; 74
	l = 197,5 cm	2	
	l = 245 cm	1	
 RAFTER ⊛	l = 330 cm	30	06; 45; 74 to 78
 PURLIN	5 x 5 x 1180 1/	8	06; 80; 81
 FACING BOARD	2,5 x 7,5 x 330	4	06; 81
	2,5 x 7,5 x 1180 1/	2	
 TILE (ASBESTOS-CEMENT)	LENGTH = 122 cm WIDTH = 50,6 cm THICKNESS: 0,4 cm	162	82
 RIDGE TILE	LENGTH = 102 cm WIDTH = 41,5 cm THICKNESS: 0,5 cm	27	82
 JOIST HEADER BOARD	2,5 x 20 x 1085 1/	2	07; 70
 INTER-PANEL FINISHING	1,25 x 20 x 250	55	07; 79
	1,25 x 5 x 250	6	
 DOOR ⊛	75 x 215	6	07; 83
 KITCHEN WINDOW ⊛	75 x 90	2	07; 83
 LIVING ROOM OR BEDROOM WINDOW ⊛	75 x 125	10	07; 83

⊛ SEE SECTION HOW TO MAKE THE PARTS OF THE HOUSE.

1/ LENGTH OBTAINED BY TWO OR MORE PIECES.

THE SUMMARY BELOW IS INTENDED TO HELP YOU ORDER OR CUT MATERIALS NECESSARY TO CONSTRUCT TYPE **D** HOUSE

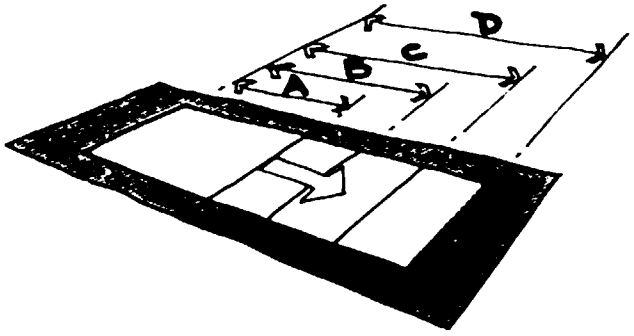
DIMENSIONS (cm)	QUANTITY	COST
∅ 15/20 (PILES)	21	
5 x 20 x 400	9	
5. 20 x 300	38	
2,5 x 20 x 300	107 (99 + 8 FOR JOIST HEADER BOARDS, PAGE 70)	
1,25 x 20 x 250	55	
1,25 x 20 x 247,5	175	
1,25x 20 x 132,5	10	
1,25 x 20 x 97,5	50	
1,25 x 20 x 25	90	
5 x 5 x 325	7	
5 x 5 x 320	16	
5 x 5 x 240	116	
5 x 5 x 232,5	4	
5 x 5 x 180	24	
5 x 5 x 75	237	
5 x 5 x 60	30	
5 x 5 x 35	87	
5 x 5 x 30	30	
5 x 7,5 x 400	15	
5 x 7,5 x 265	9	
5 x 7,5 x 232,5	2	
5 x 7,5 x 175	6	
5 x 7,5 x 60	5	
5 x 7,5 x. 20	7	

DIMENSIONS (cm)	QUANTITY	COST
2,5 x 10 x 245	2	
2,5 x 10 x 197,5	4	
2,5 x 10 x 180	6	
2,5 x 7,5 x 330	72 3/	
1,25 x 5 x 250	6	
1,25 x 5 x 222,5	12	
1,25 x 5 x 125	20	
1,25 x 5 x 90	4	
1,25 x 5 x 12,5	260	
ℓ = 10 cm NAIL	922	
ℓ = 6,25 cm NAIL	948	
ℓ = 5 cm NAIL	2823	

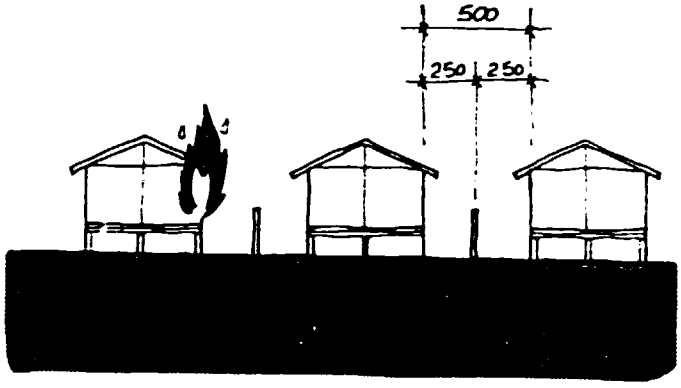
3/ QUANTITY NEEDED FOR RAFTERS AND FACING BOARDS.

HOW TO LOCATE THE HOUSE ON YOUR PLOT.

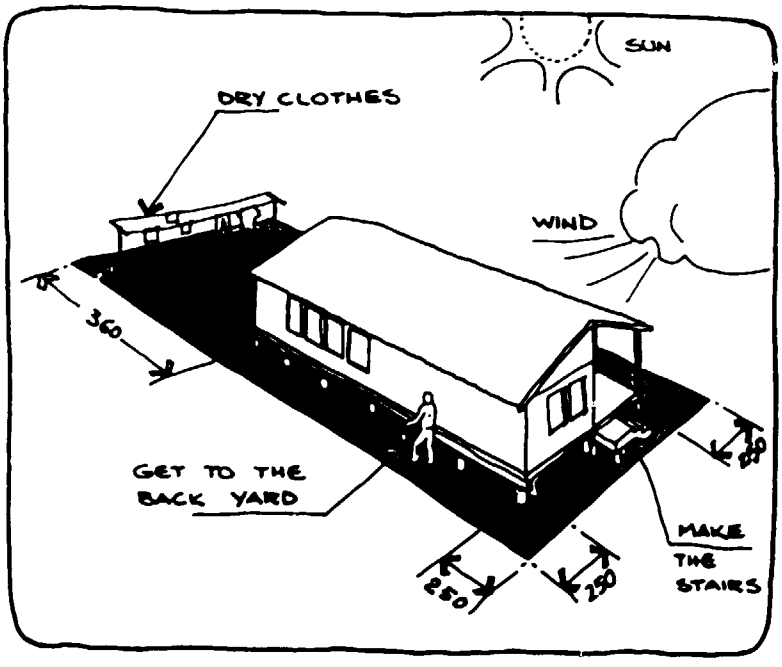
YOUR PLOT AREA MUST BE LARGE ENOUGH TO GIVE THE MINIMUM UNBUILT SPACE AS DESCRIBED HERE THERE SHOULD ALSO BE SPACE LEFT FOR FUTURE POSSIBLE EXTENSION.



IN ORDER TO REDUCE THE DANGER OF A FIRE SPREADING FROM YOUR NEIGHBOUR'S HOUSE TO YOUR HOME, THE HOUSE SHOULD NOT BE BUILT NEXT TO THE BOUNDARIES OF THE PLOT.

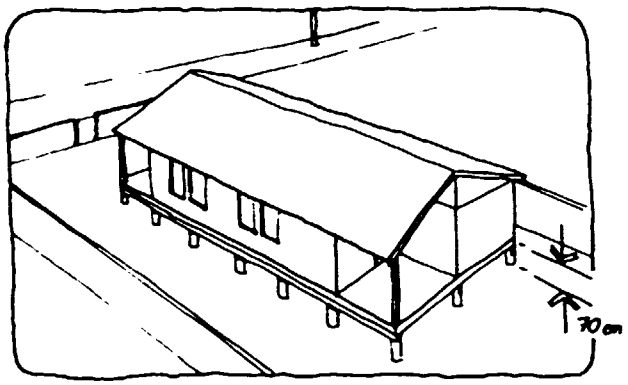


BESIDES YOU SHOULD NOT ERECT YOUR HOUSE TOO CLOSE TO THE FENCES BECAUSE YOU WILL NEED SPACE TO...

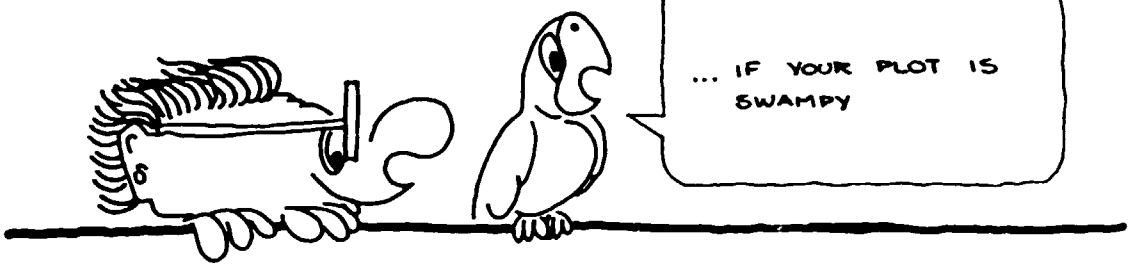


WHAT TO DO

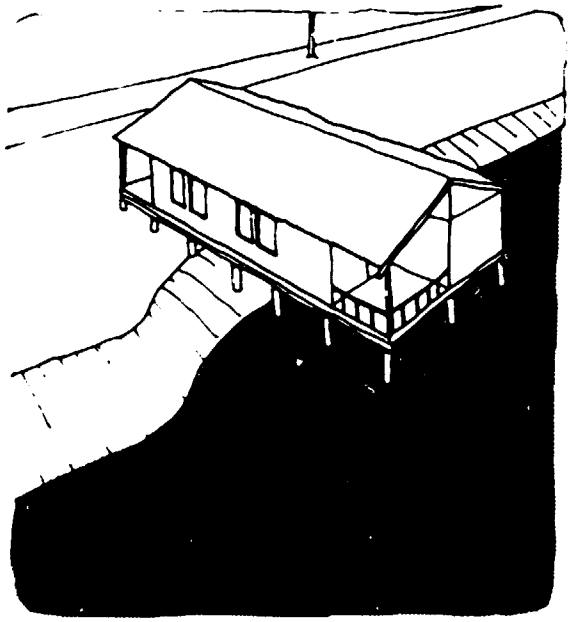
... IF YOUR PLOT IS FLAT OR ONLY SLIGHTLY SLOPING.



YOU MUST BUILD THE FLOOR OF THE HOUSE AT LEAST 70 cm ABOVE GROUND.

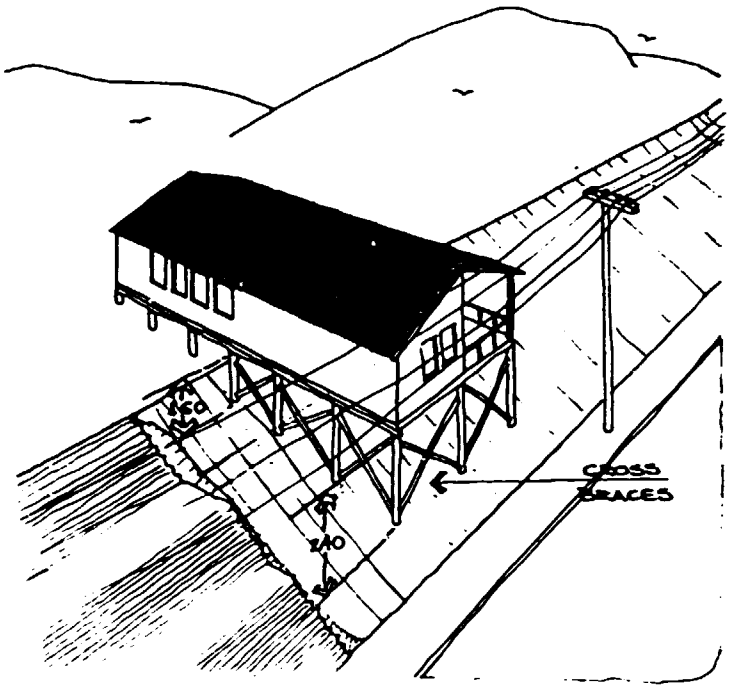


... IF YOUR PLOT IS SWAMPY

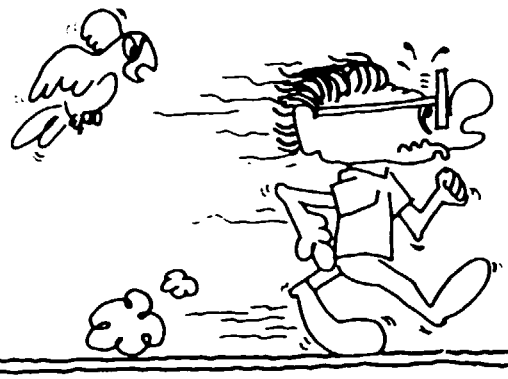


YOU MUST PUT THE PILES AT LEAST 120 cm HIGHER THAN THE MAXIMUM FLOOD-WATER HEIGHT. DON'T FORGET TO CROSS BRACE THE PILES TO AVOID POSSIBLE INSTABILITY DUE TO WATER FLOW UNDERNEATH THE HOUSE..

IF YOUR PLOT IS SLOPING SPECIAL CARE IS NEEDED.

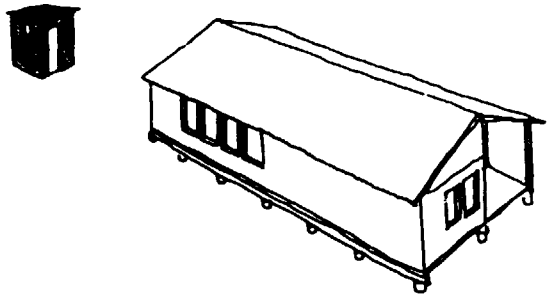


PILES HIGHER THAN 160 cm BUT LESS THAN 240 cm MUST BE CROSS BRACED. ABOVE 240 cm YOU MUST CONSULT A TECHNICIAN TO ENSURE ADEQUATE SAFETY.



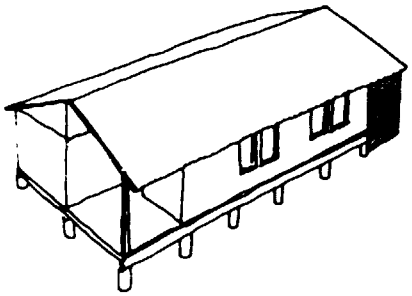
LOCATION OF TOILET AND BATH FACILITIES

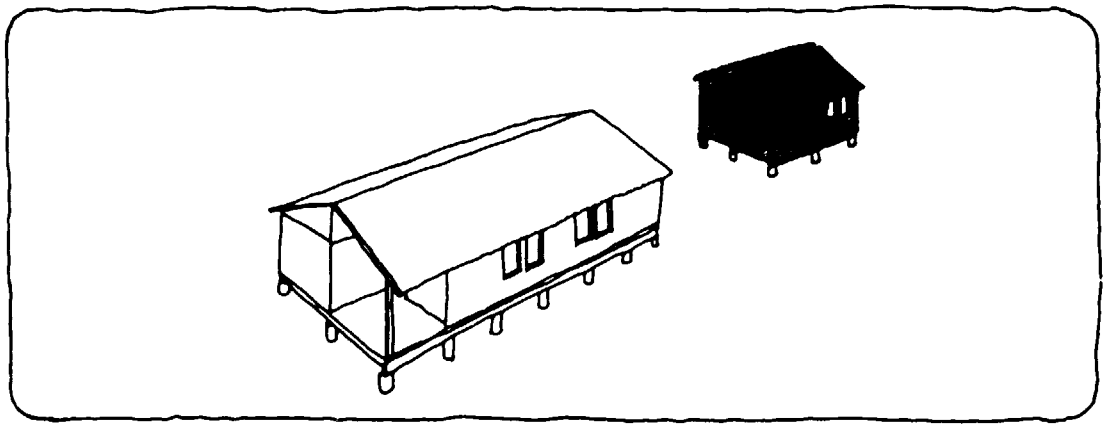
THE COMPLETE BATHROOM AND TOILET CAN BE CONSTRUCTED IN THE BACK YARD OR...

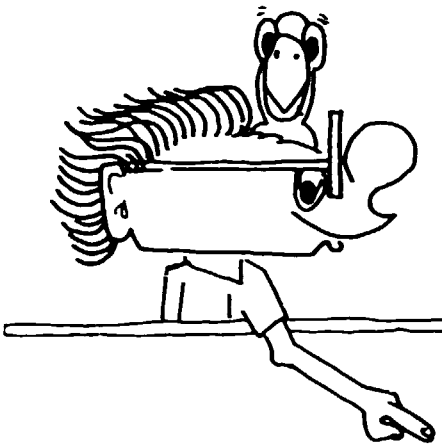


... CLOSE TO THE HOUSE IN THE SPACE RESERVED FOR THE BACK PORCH. IN THIS CASE IT WOULD BE BETTER TO USE BRICKS.

YOU MAY ALSO INSTALL A SEPARATE SHED FOR STORAGE AND OUTSIDE WORK



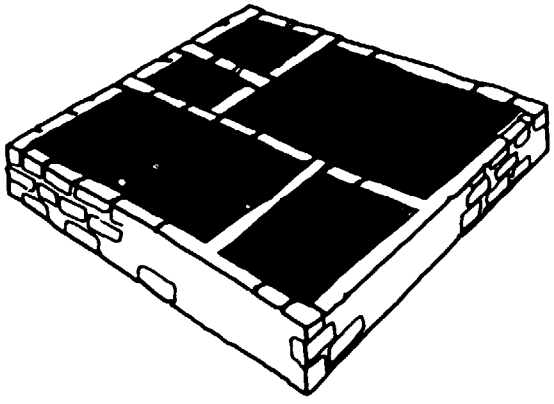




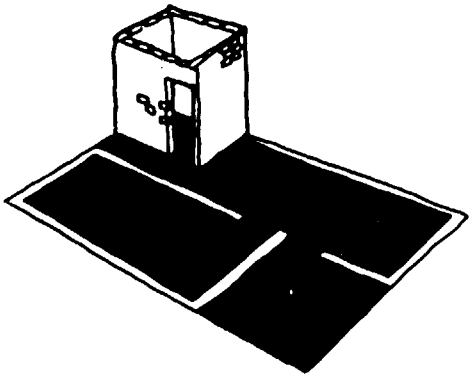
HERE ARE SOME MODIFICATIONS YOU CAN MAKE TO YOUR HOUSE

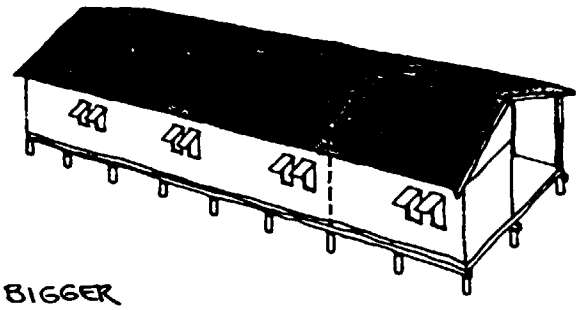
ATTENTION. THESE ARE THE MODIFICATIONS YOU CAN DO YOURSELF, BUT IT'S BETTER TO CONSULT A TECHNICIAN FIRST TO MAKE SURE YOU'RE DOING IT PROPERLY

IN PLACE OF THE PILES YOU CAN BUILD THE FOUNDATIONS WITH MASONRY AND THE FLOOR CAN BE A CONCRETE SLAB. REMEMSER THAT THE HOUSE SHOULD BE PROPERLY ANCHORED INTO THE FOUNDATIONS.



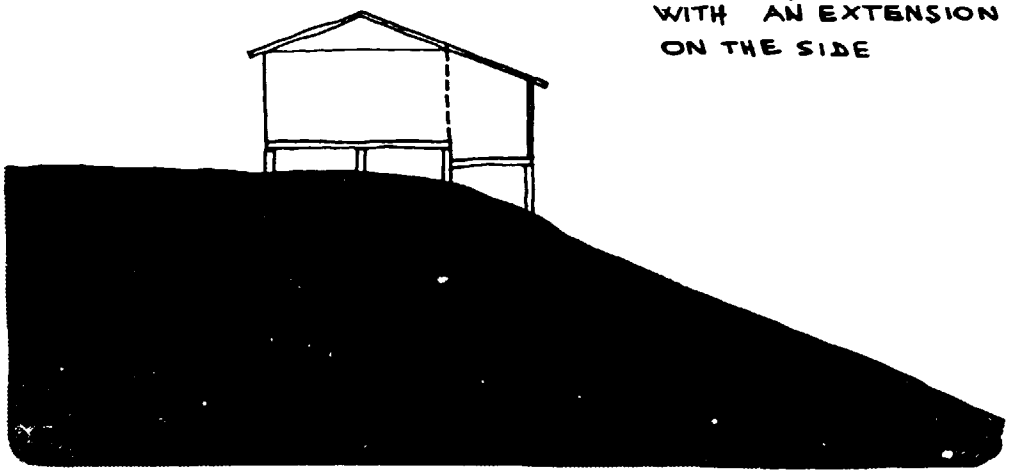
BATHROOM CONSTRUCTED WITH BRICKS CLOSE TO THE HOUSE.

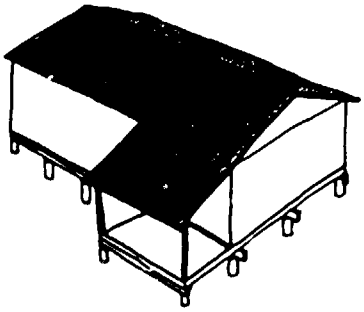




HOUSE BIGGER THAN TYPE D

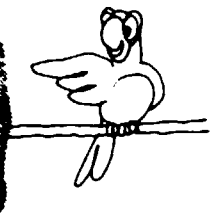
OR IF THE PLOT ALLOWS, A HOUSE WITH AN EXTENSION ON THE SIDE



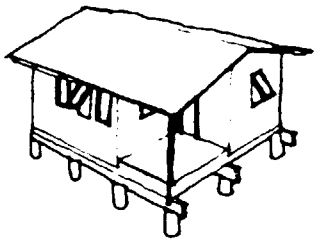


OR EVEN A HOUSE WITH A SIDE PORCH FOR SHADE.

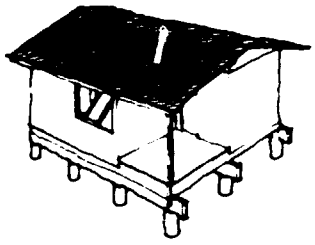
THESE MODIFICATIONS CAN BE MADE WITHOUT SPECIFIC TECHNICAL ASSISTANCE.



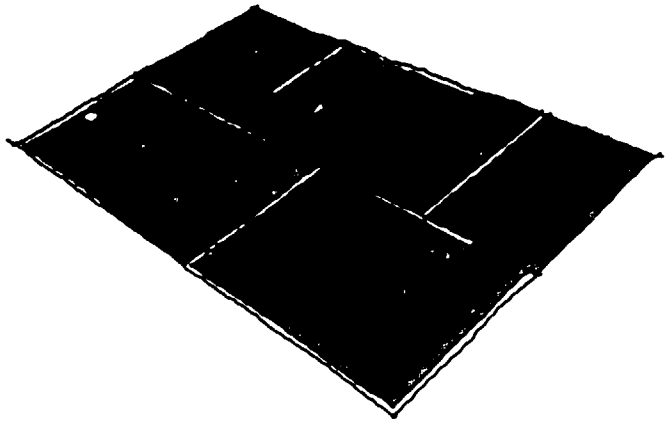
CHANGE THE POSITION AND THE NUMBER OF THE WINDOWS, THE TYPE AND QUALITY OF THE FRAMES TO IMPROVE THE ASPECT OF THE HOUSE, THE VENTILATION OR WIND AND RAIN PROTECTION.



CHANGE THE POSITION OF THE DOORS OR INCLUDE MORE DOORS.



THE ROOF CAN BE MADE OF CORRUGATED ALUMINIUM OR GALVANIZED CORRUGATED IRON SHEETS OR VEGETABLE FIBER PANELS OR ANY OTHER KIND OF ROOFING MATERIAL LOCALLY AVAILABLE

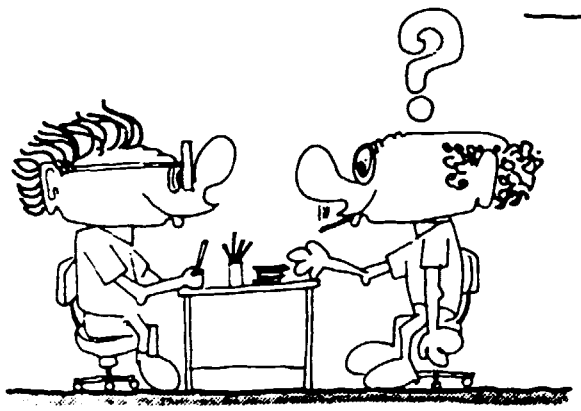


AND FURTHER ...

- PUT A CEILING UNDER THE ROOF
- PUT PANELLING ON INSIDE WALLS
- COVER THE FLOOR TO KEEP OUT DUST AND INSECTS, AND ALSO FOR MORE COMFORT.

THE BEST WAY TO BUILD THE HOUSE

READ THIS LITTLE BOOK CAREFULLY AND DO EVERYTHING EXACTLY AS DESCRIBED HERE.

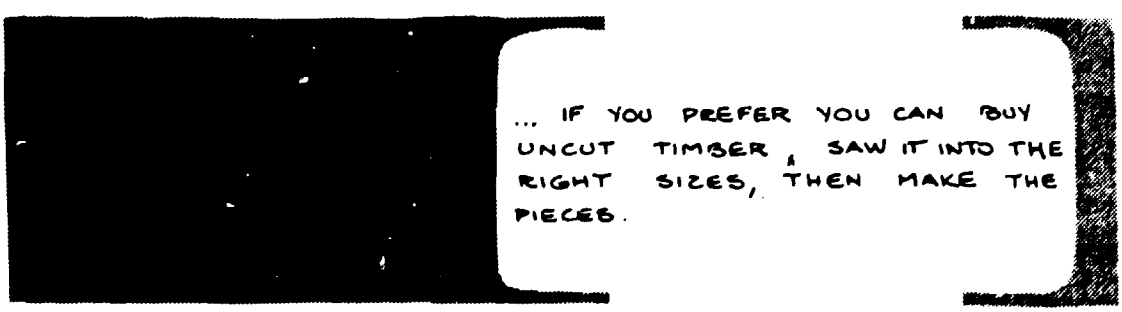


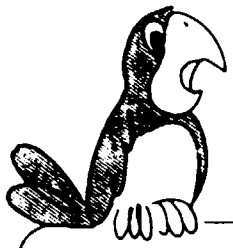
ASK FOR ADVICE FROM PEOPLE EXPERIENCED IN CONSTRUCTION JOBS IN ORDER TO CLEAR UP DOUBTS ABOUT THE HOUSE AND ALSO TO DISCUSS MODIFICATIONS YOU MAY WANT TO MAKE.

WHEN SOME NEIGHBOURS OR FRIENDS DECIDE TO BUILD THEIR HOUSES AT THE SAME TIME, THE CONSTRUCTION OF ALL HOUSES BECOMES EASIER IF THE FAMILIES GET TOGETHER AND CO-OPERATE.
YOU CAN ORGANIZE THE WORK SO THAT EVERYBODY HELPS TO MAKE THE PIECES (PANELS, BEAMS ETC.). THEN EVERYBODY HELPS TO ASSEMBLE THE HOUSES. THIS WAY, YOU CAN SHARE TASKS AND FINISH THE WORK FASTER. TO ORGANIZE THE WORK IN THIS MANNER ASK FOR HELP FROM PEOPLE WITH EXPERIENCE IN CONSTRUCTION.

HOW TO MAKE THE PARTS OF THE HOUSE

NOW WE ARE GOING TO SHOW HOW TO MAKE AND ASSEMBLE ALL THOSE PIECES.
WE ARE ALSO GOING TO SHOW THE TOOLS AND THE WORKBENCH WHICH YOU WILL NEED TO MAKE THE PIECES.
YOU CAN MAKE THESE PIECES YOURSELF OR THEY CAN BE ORDERED FROM A CARPENTER.
IF SEVERAL FAMILIES GET TOGETHER TO ORDER THE PIECES FOR ALL THE HOUSES, THE CARPENTER MAY GIVE YOU A BETTER PRICE...





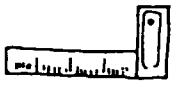
THE TOOLS SHOWN BELOW ARE INTENDED FOR BOTH SHAPING THE PIECES AND FOR ASSEMBLING THE HOUSE.

TAPE MEASURE

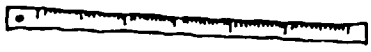
LINE OR WIRE

CARPENTER'S PENCIL

FOLDING RULER



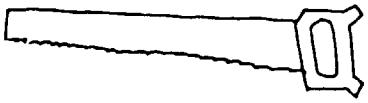
SQUARE



RULER

PLUMB BOB

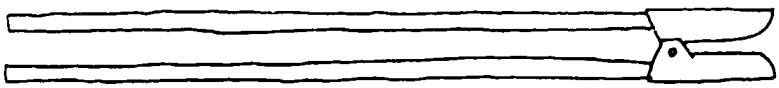
CLAW HAMMER



HAND SAW

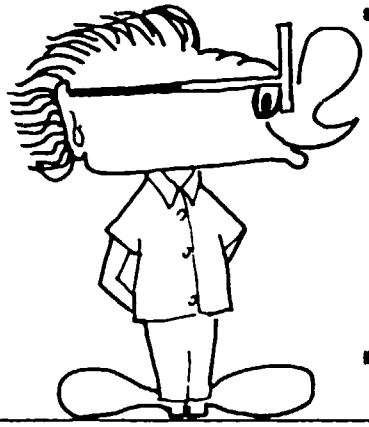
RASP

PLANE



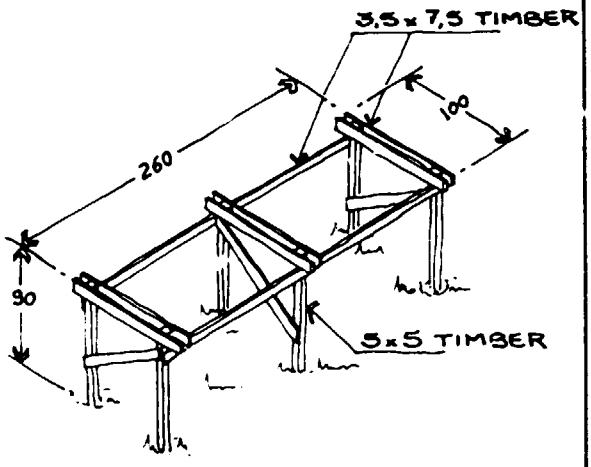
POST HOLE DIGGER

IF YOU ALREADY HAVE TOOLS, FOR EXAMPLE AN ELECTRIC SAW, YOUR TASK WILL BE EASIER.
YOUR WORK WILL ALSO BE EASIER IF YOU FORM GROUPS WITH OTHER PEOPLE WHO ARE GOING TO MAKE THEIR OWN HOUSES, TOO.
THESE GROUPS CAN HIRE TOOLS OR LEASE A WORKSHOP.

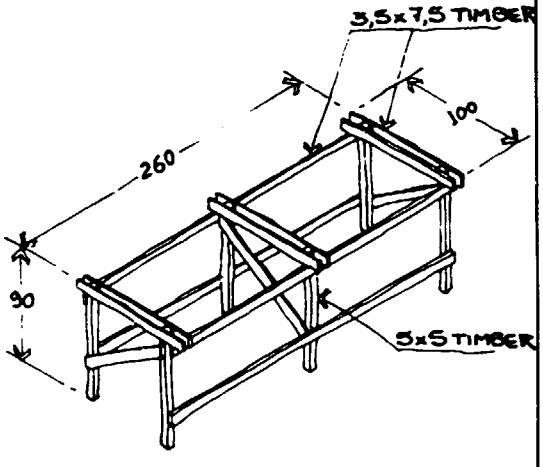


FOR SHAPING AND ASSEMBLING THE PARTS YOU ARE ADVISED TO BUILD A BENCH WHERE JIGS CAN BE PLACED SO AS TO SIMPLIFY MAKING MEASUREMENTS.

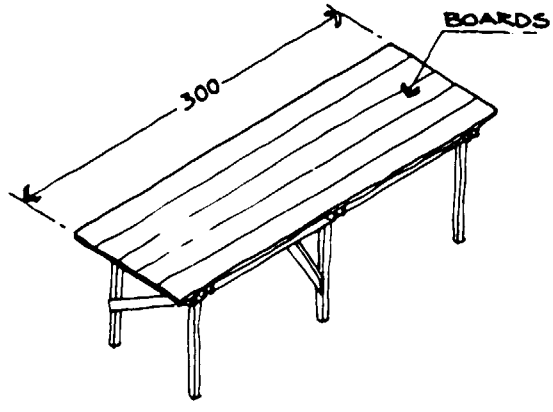
FIRST YOU MAKE THE WORKBENCH, STAYS OR WOODEN HORSES. THE VERTICAL SUPPORTS CAN BE FIXED INTO THE GROUND ...



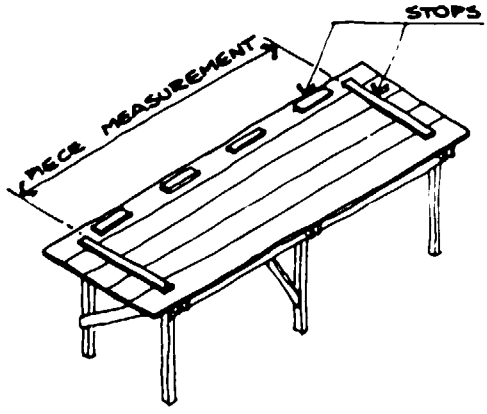
... OR CAN STAY FREE, SO YOU CAN SHIFT THE BENCH FROM PLACE TO PLACE.

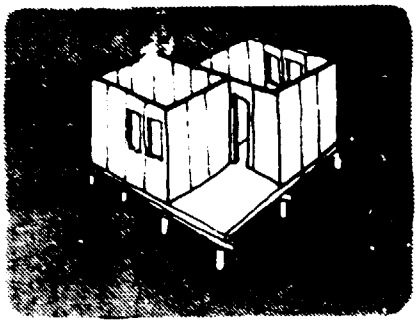


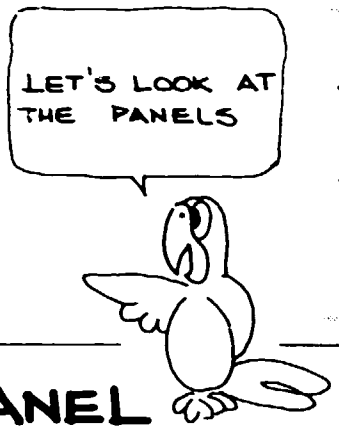
YOU NAIL BOARDS ON TOP OF THIS STRUCTURE.



NEXT YOU MARK THE DIMENSION OR LENGTH OF THE PIECE ON THE BENCH TOP AND NAIL THE STOPS, SO YOU MAKE ALL THE PIECES ALIKE.



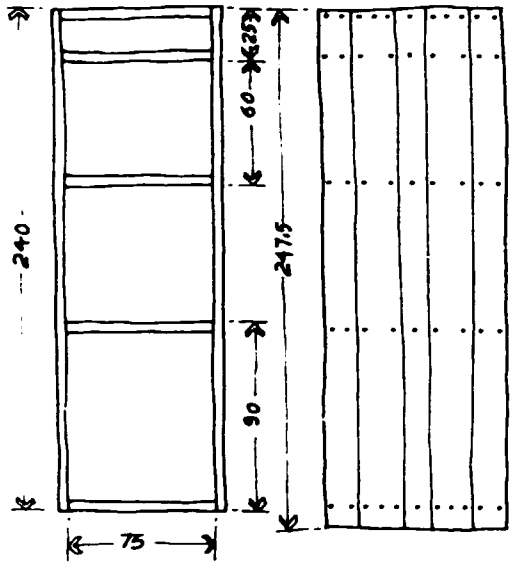




HOW TO MAKE THE PANELS

YOU ALREADY KNOW WHICH TYPES OF PANELS ARE NEEDED. HERE WE ARE GOING TO SHOW HOW THEY ARE MADE.

SINGLE PANEL



FRAMEWORK PANEL FRONT VIEW

LIST OF MATERIALS:

FRAME

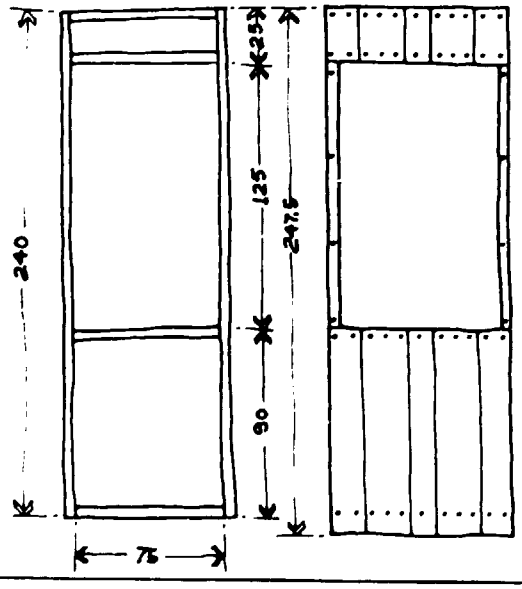
02	5x5 x 240 cm	TIMBER
05	5x5 x 75 cm	TIMBER
20	l = 6,25 cm	NAILS
10	l = 10 cm	NAILS

COVERING

04	1,25x5x12,5 cm	TIMBER
05	1,25x20x247,5 cm	TIMBER
53	l = 5 cm	NAILS

OPEN PANEL FOR LIVING OR BEDROOM WINDOW

FRAMEWORK PANEL FRONT VIEW



LIST OF MATERIALS:

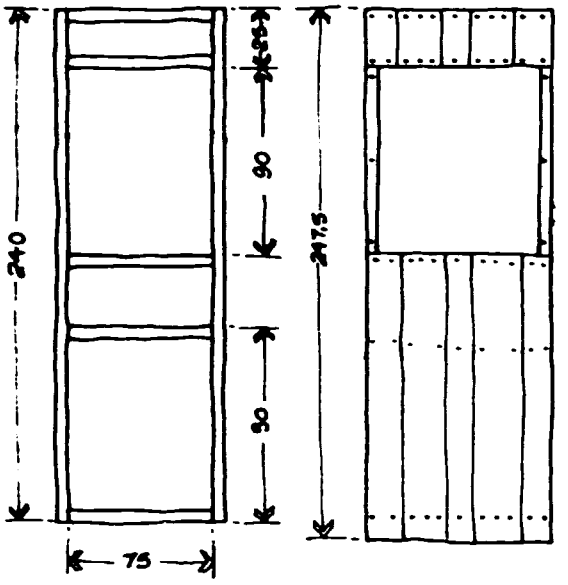
FRAME

02	5x5x240 cm	TIMBER
04	5x5x 75 cm	TIMBER
16	l = 6,25 cm	NAILS
08	l = 10 cm	NAILS

COVERING

08	1,25x5x12,5 cm	TIMBER
02	1,25x5x125 cm	TIMBER
05	1,25x20x25 cm	TIMBER
05	1,25x20x97,5	TIMBER
60	l = 5 cm	NAILS

OPEN PANEL FOR KITCHEN WINDOW



FRAMEWORK PANEL FRONT VIEW

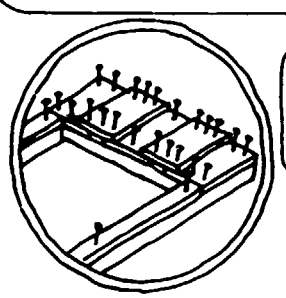
LIST OF MATERIALS:

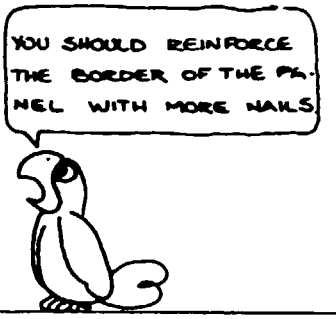
FRAME

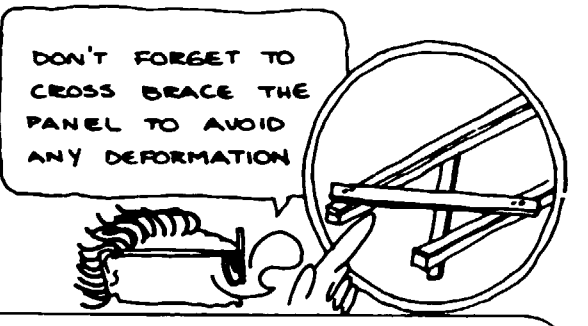
02	5x5x240 cm	TIMBER
02	5x5x 75 cm	TIMBER
20	l=6,25 cm	NAILS
10	l=10 cm	NAILS

COVERING

08	1,25x5x12,5 cm	TIMBER
02	1,25x5x90 cm	TIMBER
05	1,25x20x132,5 cm	TIMBER
05	1,25x5x25 cm	TIMBER
67	l=5 cm	NAILS

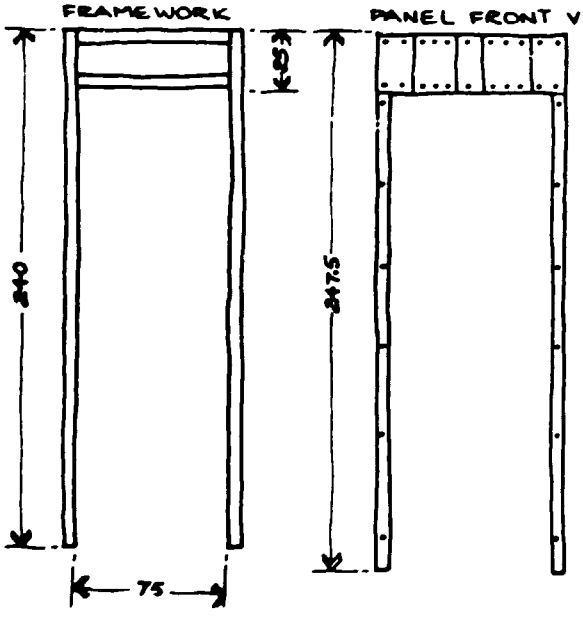






OPEN PANEL FOR DOOR

FRAMEWORK PANEL FRONT VIEW



LIST OF MATERIALS:

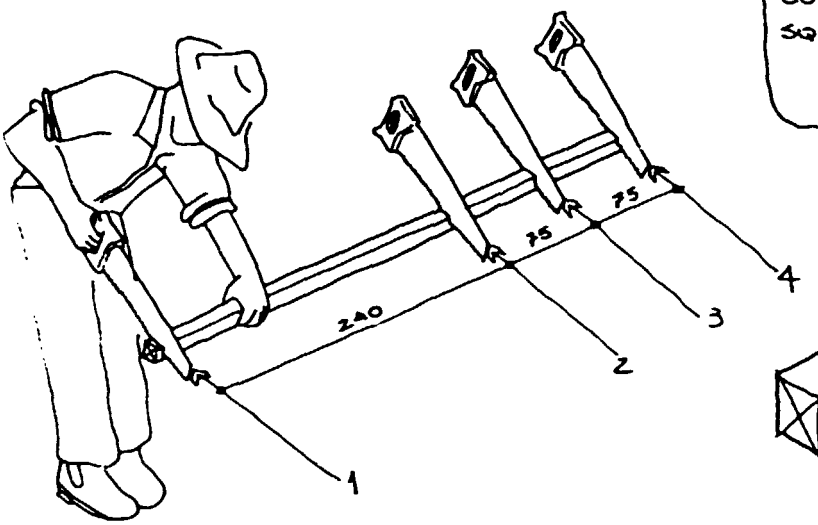
FRAME

02	5x5x240 cm	TIMBER
02	5x5x 75 cm	TIMBER
08	l=6,25 cm	NAILS
04	l=10 cm	NAILS

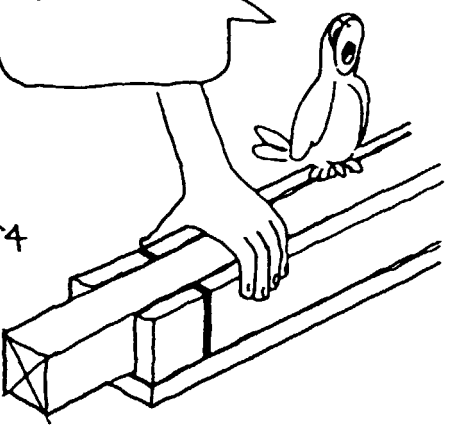
COVERING

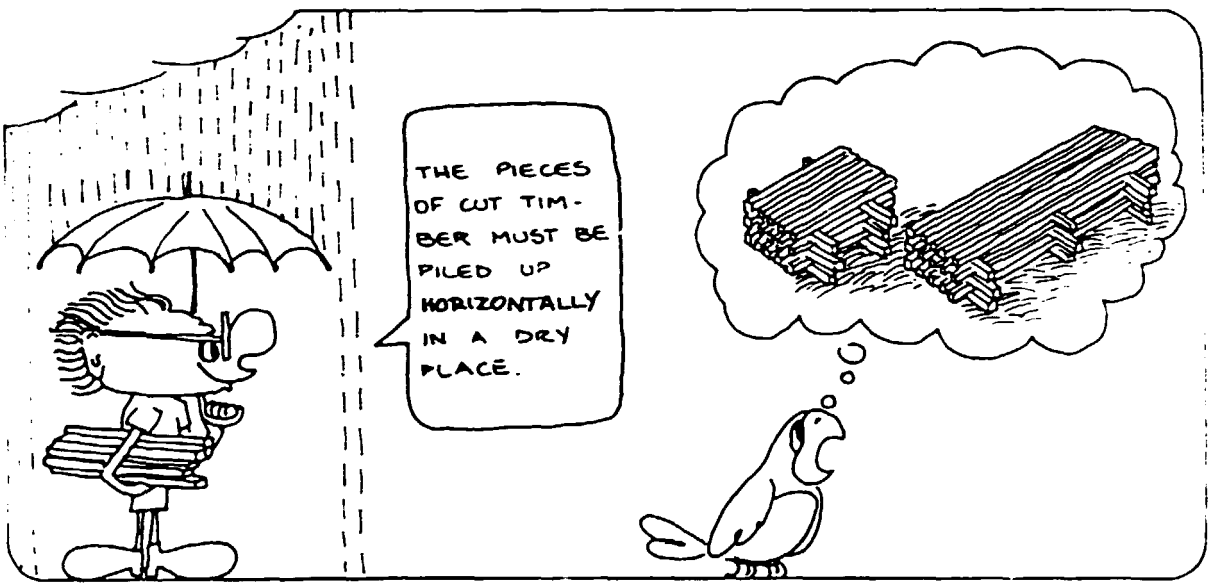
04	1,25x5x12,5 cm	TIMBER
02	1,25x5x222,5 cm	TIMBER
05	1,25x20x25 cm	TIMBER
34	l=5 cm	NAILS

TO ASSEMBLE THE PANEL YOU MUST ASSEMBLE THE FRAME FIRST. TO MINIMIZE WASTAGE YOU SHOULD CUT THE TIMBER USED FOR THE FRAME AS SHOWN.

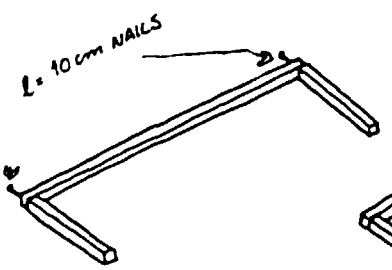


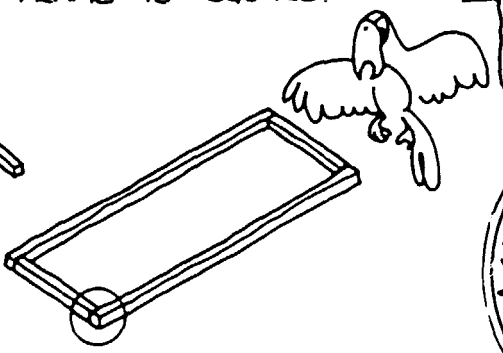
A DEVICE LIKE THIS ONE CAN BE USED TO CUT TIMBER SQUARE



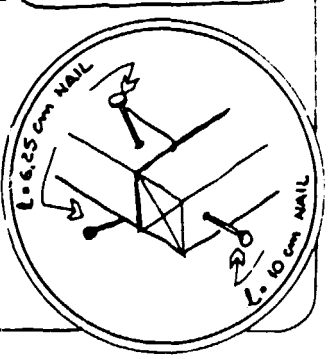


NOW YOU CAN BEGIN TO NAIL THE CROSSMEMBERS AT THE ENDS! TAKE CARE THAT THE FRAME IS SQUARE.



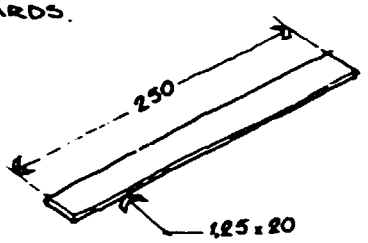


BEFORE NAILING YOU MUST DRILL THE TIMBER.

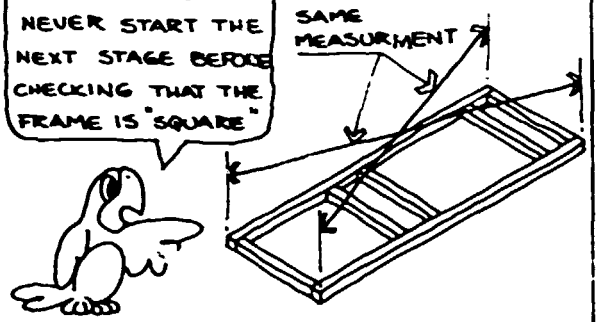


THE PANEL FRAME IS COVERED WITH BOARDS.

USE 250 cm LENGTH BOARDS.



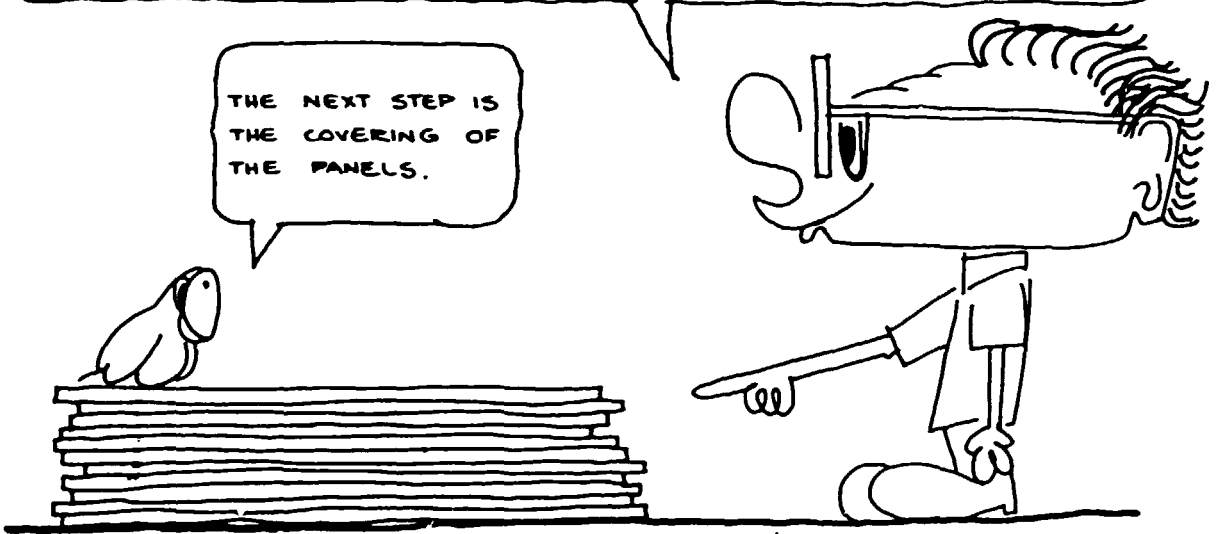
IMPORTANT!
NEVER START THE NEXT STAGE BEFORE CHECKING THAT THE FRAME IS "SQUARE"



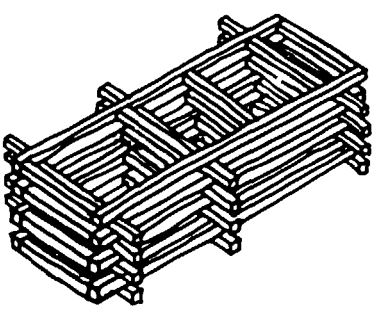
WHEN YOU BUY THE BOARDS, CHOOSE:
- DRY BOARDS;
- BOARDS OF THE SAME WIDTH AND THICKNESS.

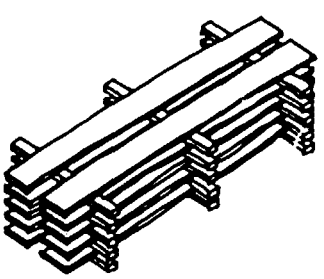
YOU MUST AVOID:
- BOARDS WITH LOOSENED KNOTS;
- BOARDS WITH SPLITS;
- BOARDS WITH ROTTING SPOTS;
- WARPED BOARDS.

THE NEXT STEP IS THE COVERING OF THE PANELS.



IMPORTANT!
KEEP ALL THE PIECES IN A DRY PLACE.

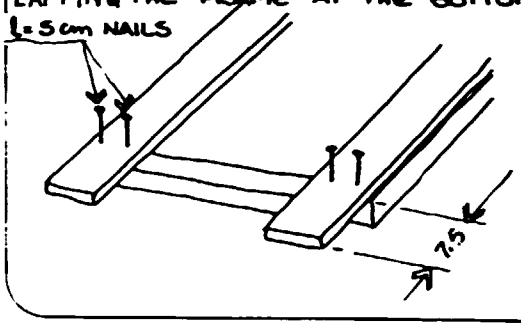




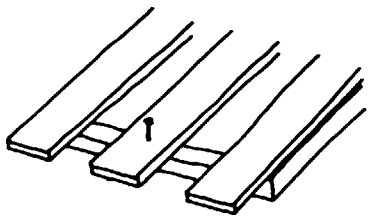
NOW, ATTENTION! THE PANELS MUST BE MADE CAREFULLY BECAUSE THE QUALITY OF THE HOUSE WILL DEPEND ON THEM.

LET US GIVE YOU SOME ADVICE ON NAILING THE BOARDS.

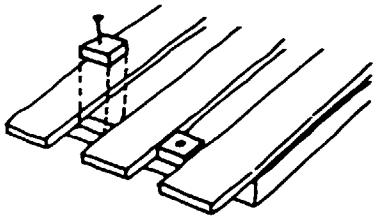
FIRST YOU NAIL TWO BOARDS AT THE EDGES OF THE FRAME. THE FACED SURFACES OF THE BOARDS ARE ON THE TOP. LEAVE SOME BOARD OVER LAPPING THE FRAME AT THE BOTTOM.



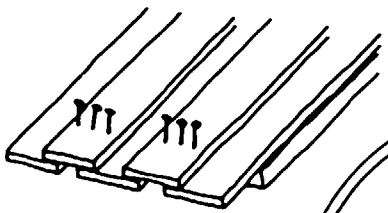
THEN NAIL THE MIDDLE BOARD.

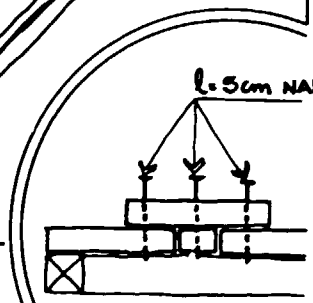


BEFORE NAILING THE UPPER BOARDS, NAIL SPACERS CUT FROM 1.25 x 5 cm TIMBER STRIPS.

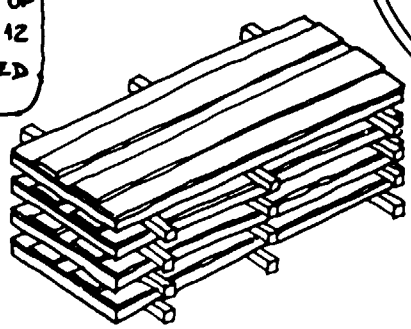


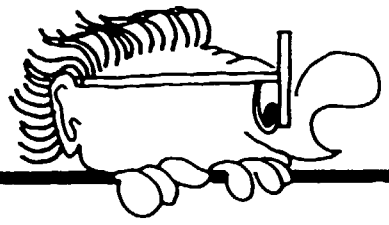
NEXT, YOU ONLY HAVE TO NAIL THE UPPER BOARDS, BEING CAREFUL NOT TO HAMMER A NAIL INTO THE SPACE BETWEEN THE BOARDS.





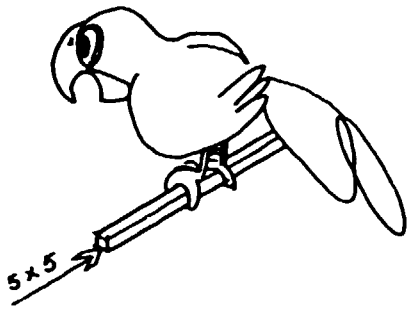
AFTER THE PANELS ARE READY, STACK THEM UP TO A MAXIMUM OF 12 HIGH IN A PROTECTED PLACE





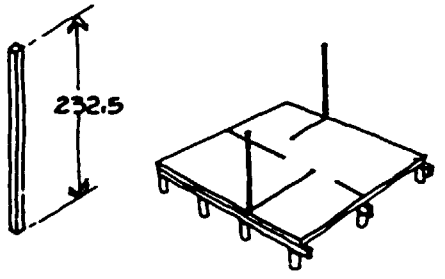
HOW TO MAKE THE INTER-PANEL STUDS

THE INTER-PANEL STUDS ARE CUT BEFORE BEING TAKEN TO THE WORK SITE, BUT THE NAILING IS DONE ON LOCATION.

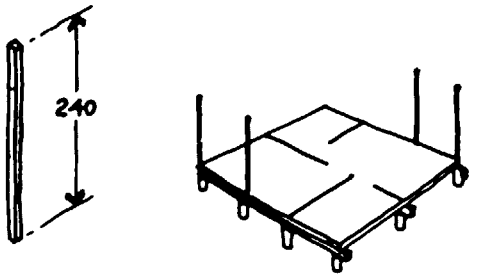


THE INTER-PANEL STUDS ARE CUT IN DIFFERENT LENGTHS, ACCORDING TO THE PLACE THEY ARE INTENDED FOR.

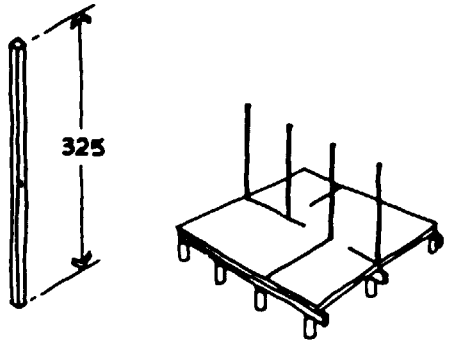
THESE INTER-PANEL STUDS ARE CUT SHORTER IN ORDER TO SUPPORT THE PORCH BEAMS.

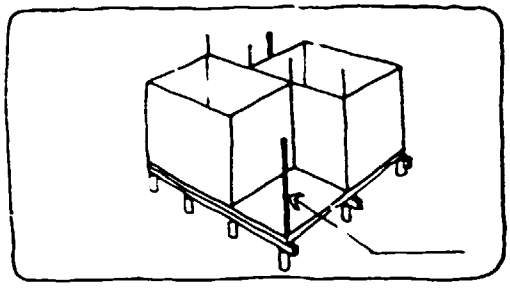


AND HERE ARE THE INTER-PANEL STUDS



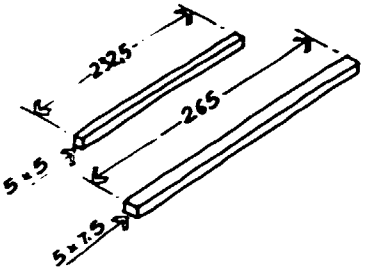
THESE INTER-PANEL STUDS ARE CUT LONGER IN ORDER TO PERMIT THE ASSEMSLY OF THE RIDGE BEAM.



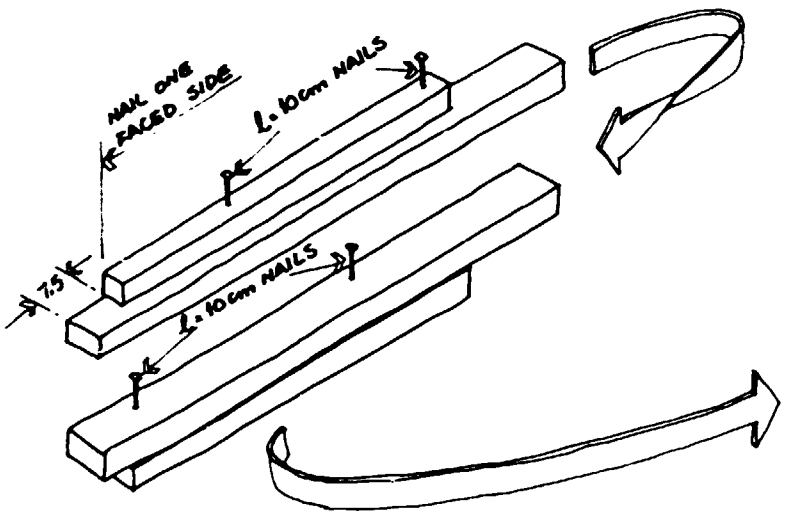


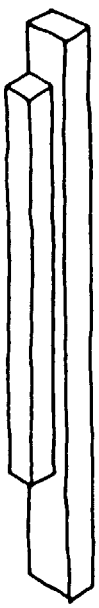
HOW TO MAKE THE PORCH SUPPORT POST

THIS POST IS MADE FROM TWO PIECES OF TIMBER OF DIFFERENT SIZES AND FOUR l. 10 cm NAILS

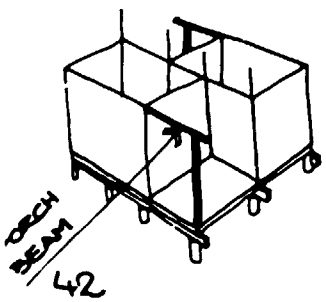


THE PIECES ARE NAILED ON BOTH SIDES

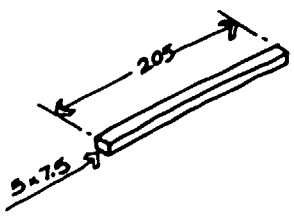


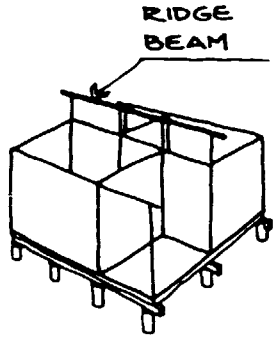


HOW TO MAKE THE PORCH BEAM

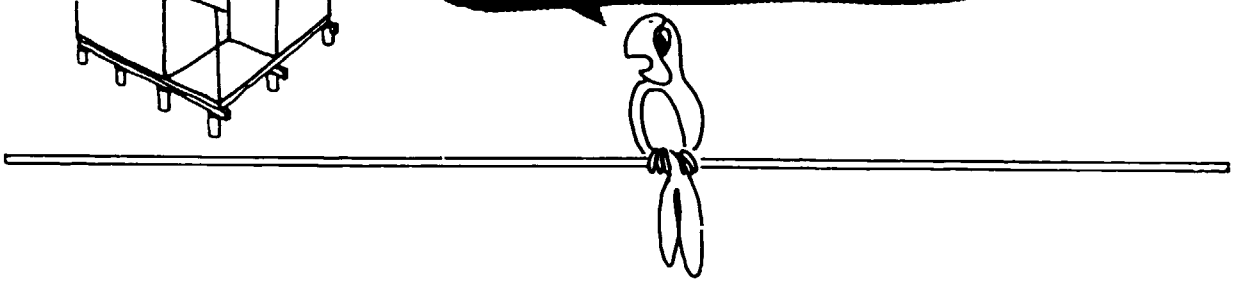


THE PORCH BEAM IS CUT BEFORE HAND, BUT NAILED AT THE WORK SITE.





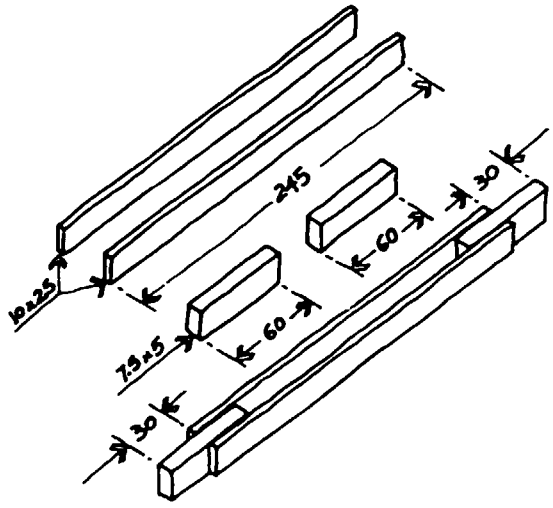
HOW TO MAKE THE RIDGE BEAM



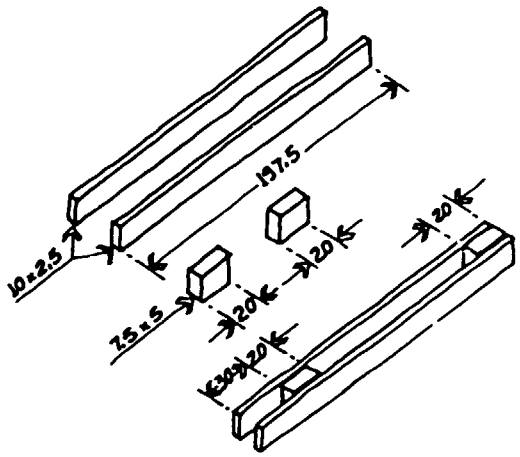
THE RIDGE BEAM IS ALSO CUT BEFORE BEING SENT TO THE WORK SITE. BUT THE NAILING IS DONE ON SITE.

THE RIDGE BEAM IS COMPOSED OF TWO DIFFERENT PARTS: A MIDDLE RIDGE BEAM AND AN END RIDGE BEAM.

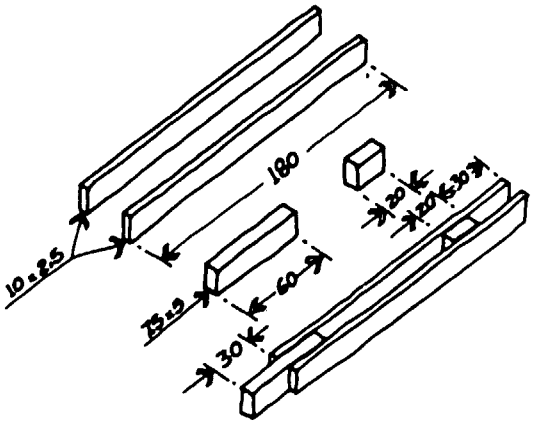
THE MIDDLE RIDGE BEAM IS MADE THIS WAY ...



... AND THE END RIDGE BEAM IS MADE THIS WAY ...

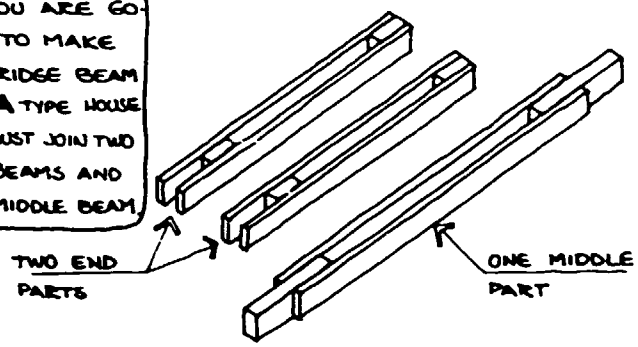


IF YOUR HOUSE IS LARGER THAN THE **A** TYPE HOUSE, YOU WILL NEED AN EXTENSION RIDGE BEAM. IT IS MADE THIS WAY ...

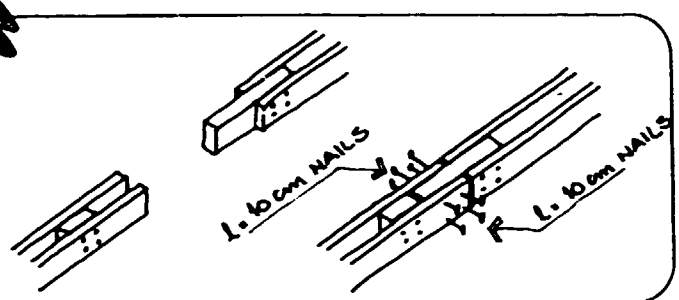


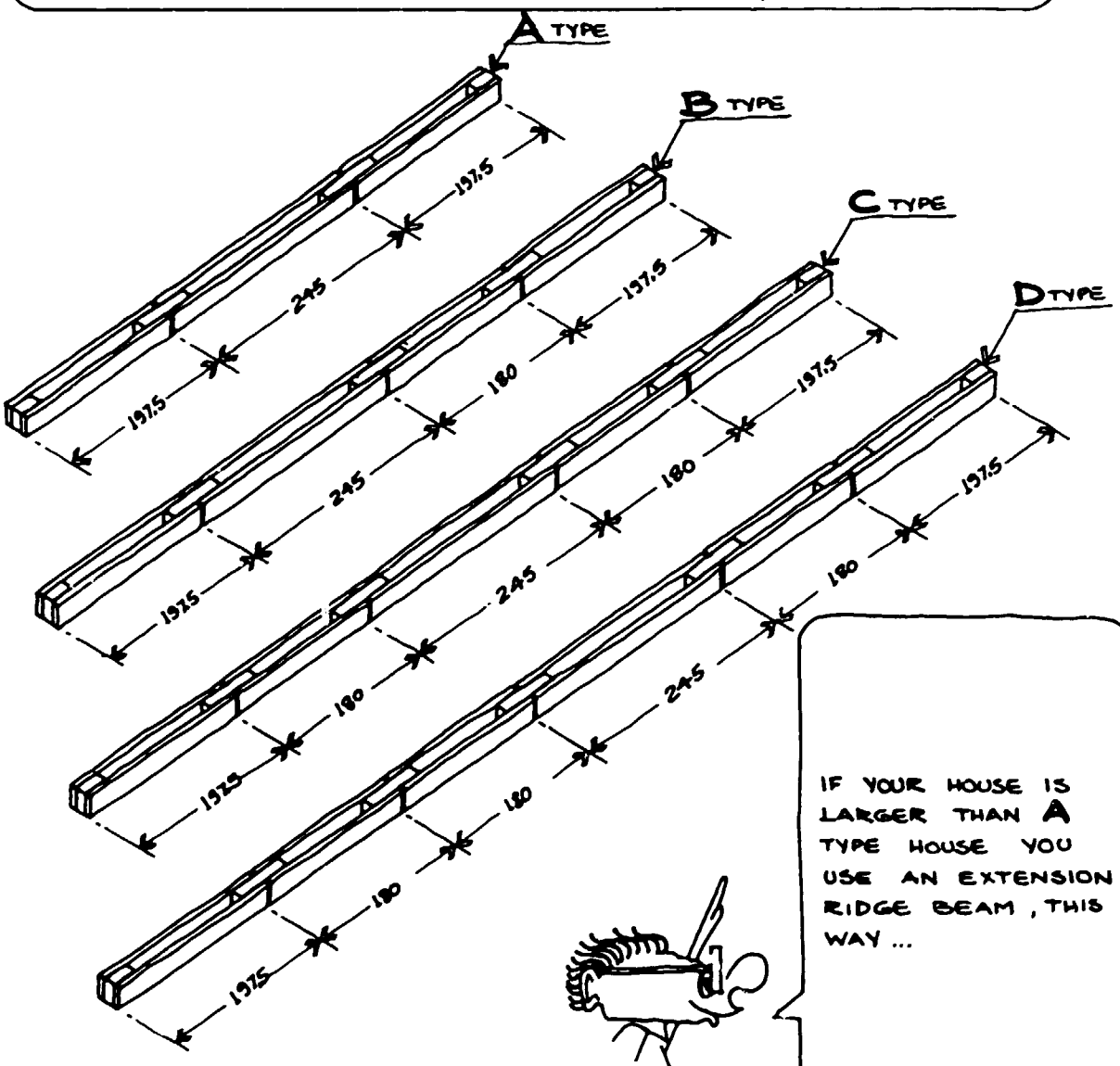
YOU MAKE THE RIDGE BEAM BY JOINING THE MIDDLE AND END RIDGE BEAMS.

IF YOU ARE GOING TO MAKE THE RIDGE BEAM FOR A TYPE HOUSE YOU MUST JOIN TWO END BEAMS AND ONE MIDDLE BEAM.

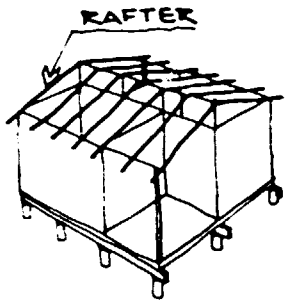


TO JOIN THE PARTS YOU FIT THE TONGUE OF THE MIDDLE PART INTO THE GROOVE OF THE END PART AND NAIL THE TWO TOGETHER.



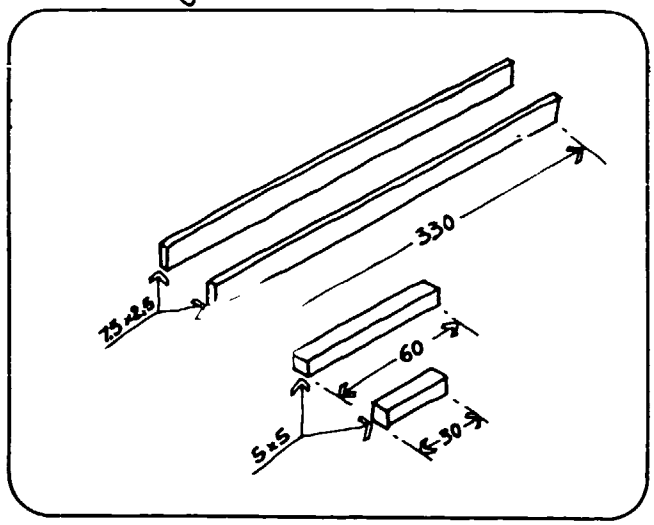


IF YOUR HOUSE IS LARGER THAN A TYPE HOUSE YOU USE AN EXTENSION RIDGE BEAM, THIS WAY ...

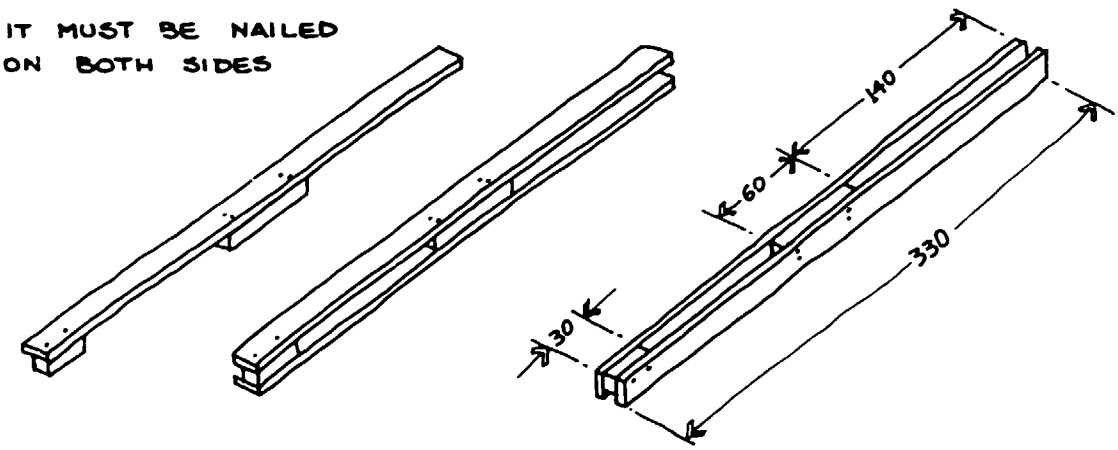


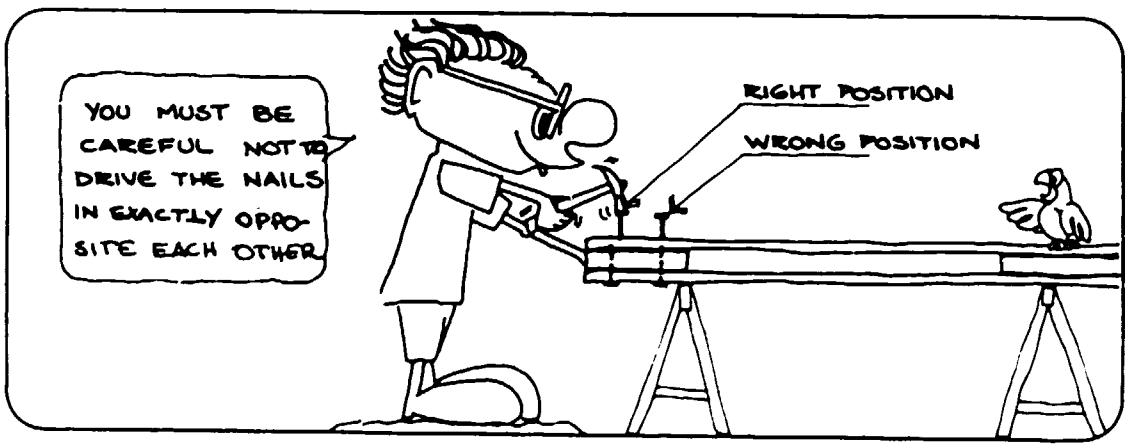
HOW TO MAKE THE RAFTERS

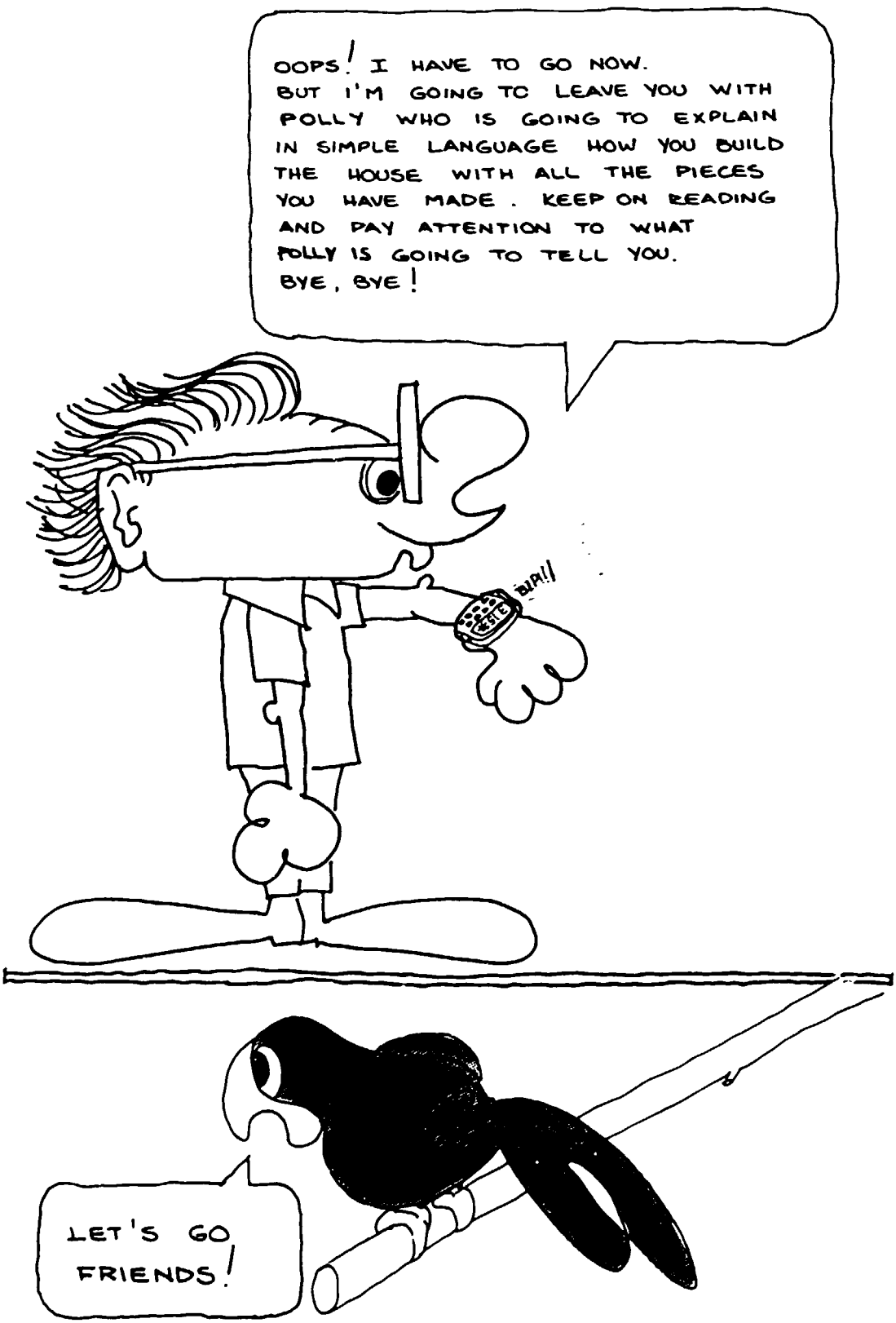
EACH RAFTER IS MADE THIS WAY ...

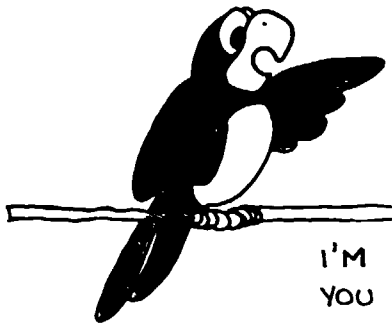


IT MUST BE NAILED ON BOTH SIDES



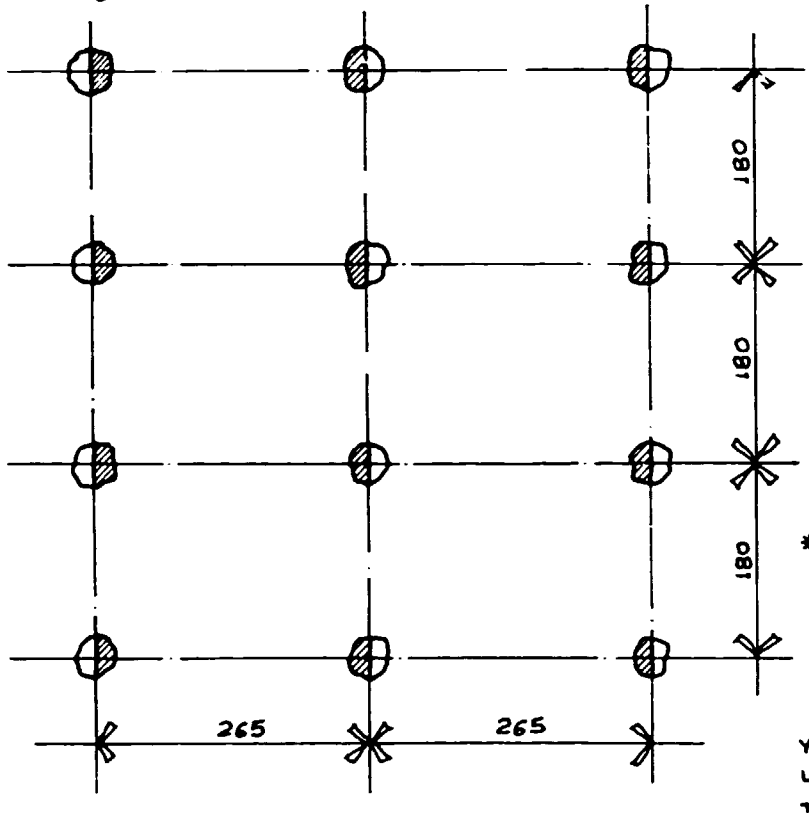



OOPS! I HAVE TO GO NOW.
BUT I'M GOING TO LEAVE YOU WITH POLLY WHO IS GOING TO EXPLAIN IN SIMPLE LANGUAGE HOW YOU BUILD THE HOUSE WITH ALL THE PIECES YOU HAVE MADE. KEEP ON READING AND PAY ATTENTION TO WHAT POLLY IS GOING TO TELL YOU.
BYE, BYE!
BIP!!
LET'S GO FRIENDS!



HOW TO BUILD YOUR HOUSE

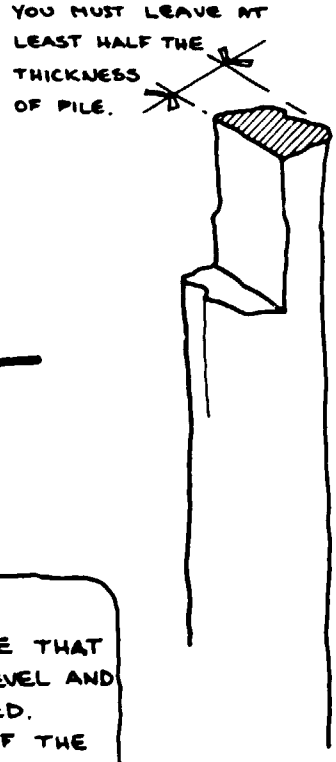
I'M NOW GOING TO EXPLAIN EVERYTHING YOU MUST DO TO ASSEMBLE THE HOUSE.

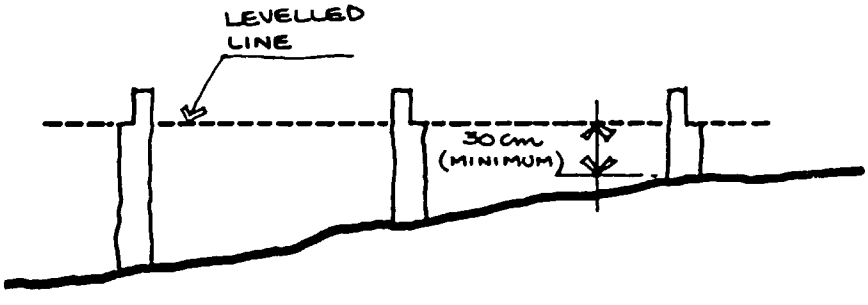


GROUND PLAN

TO BEGIN WITH, EXAMINE THE SKETCH ON THE LEFT.
IT SHOWS THE POSITIONS OF THE PILES AND HOW THEY WILL LOOK AFTER THEY ARE INSTALLED AND HAVE SLOTS CUT IN THEM.

* BE SURE TO USE ONLY PILES WITH HEARTWOOD OF DURABLE TIMBER!



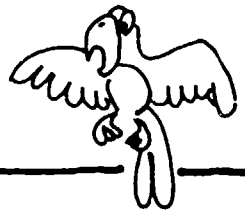


CROSS SECTION

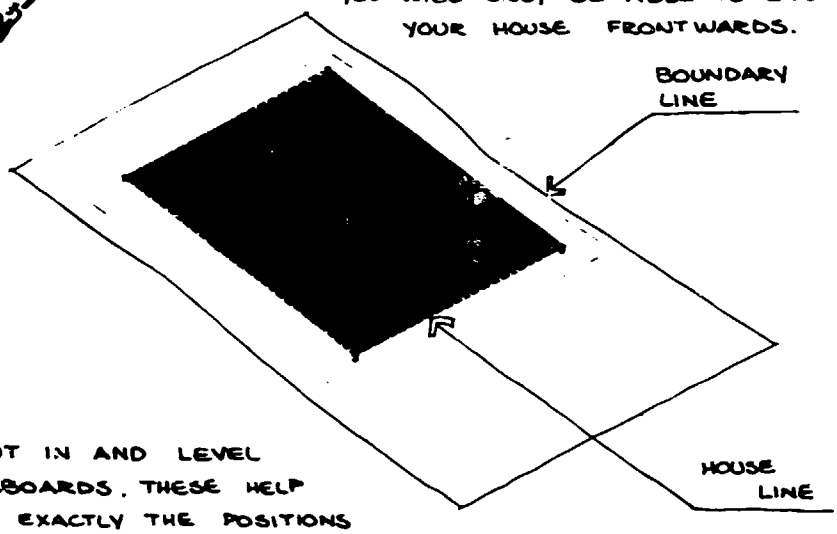
IMPORTANT
YOU MUST CUT A SLOT IN EACH PILE, MAKING SURE THAT ALL THE HORIZONTAL CUTS ARE AT THE SAME LEVEL AND THAT THE VERTICAL CUTS ARE PROPERLY ALIGNED.
WHEN MAKING THE SLOT LEAVE AT LEAST HALF THE THICKNESS OF THE POLE.

LET'S BEGIN WITH THE

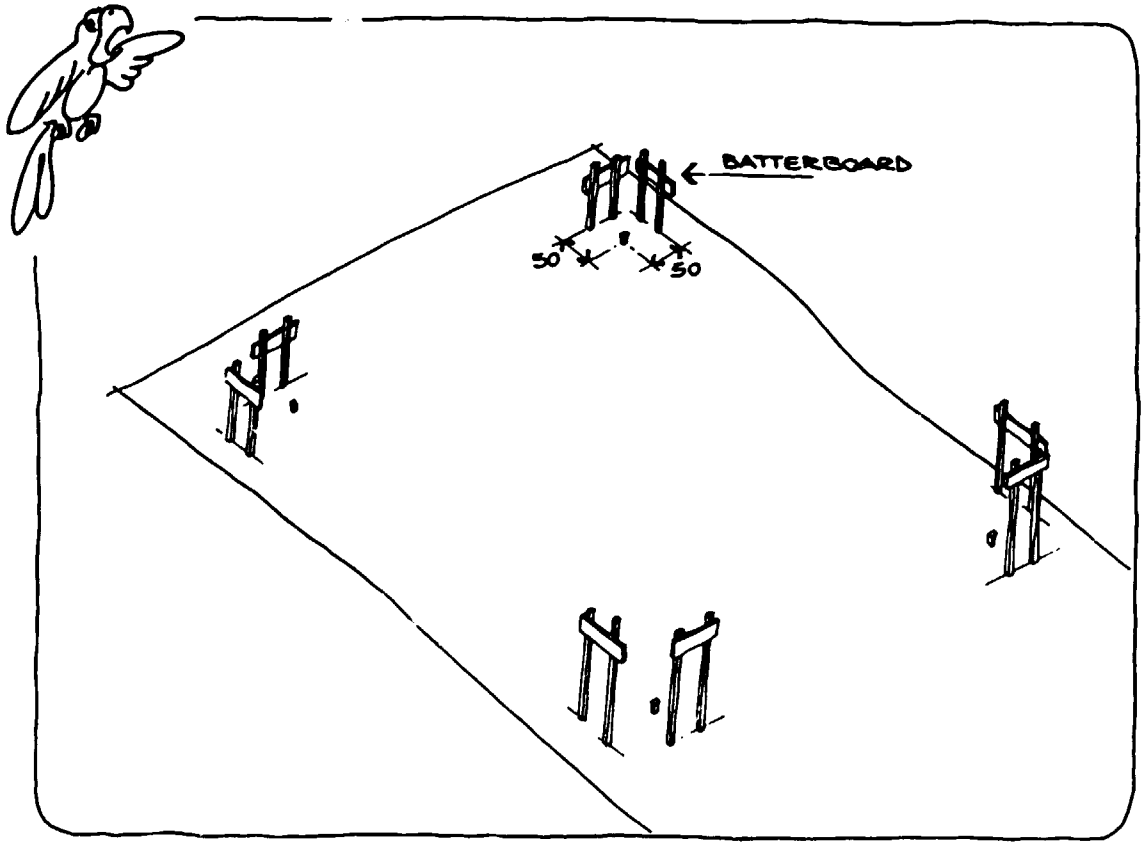
PREPARATION OF THE BUILDING SITE



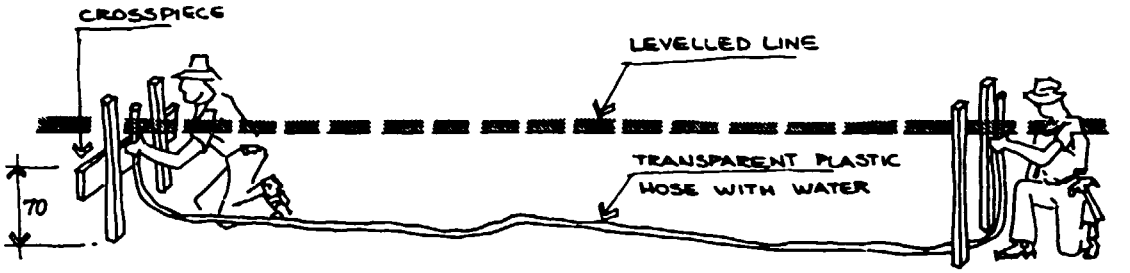
FIRST, YOU MUST MARK ON THE PLOT THE PLACE WHERE THE HOUSE IS GOING TO BE BUILT. YOU MUST REMEMBER THAT, AFTERWARDS, YOU WILL ONLY BE ABLE TO ENLARGE YOUR HOUSE FRONTWARDS.

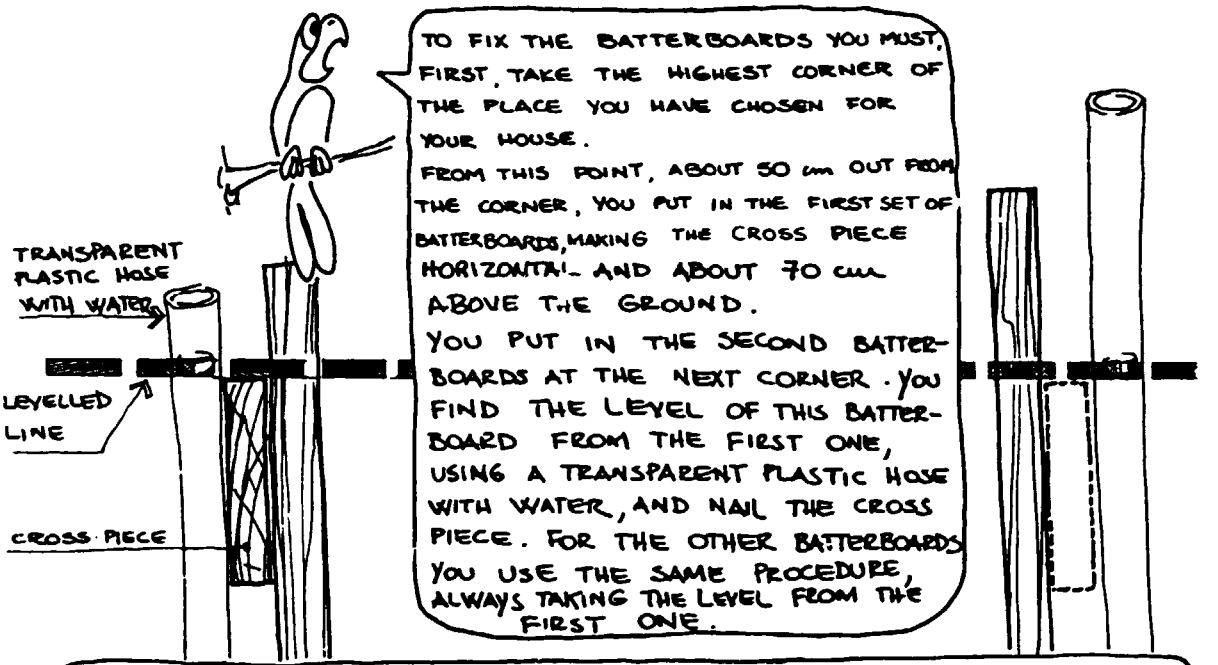


YOU MUST PUT IN AND LEVEL THE BATTERBOARDS. THESE HELP YOU LOCATE EXACTLY THE POSITIONS OF THE PILES.

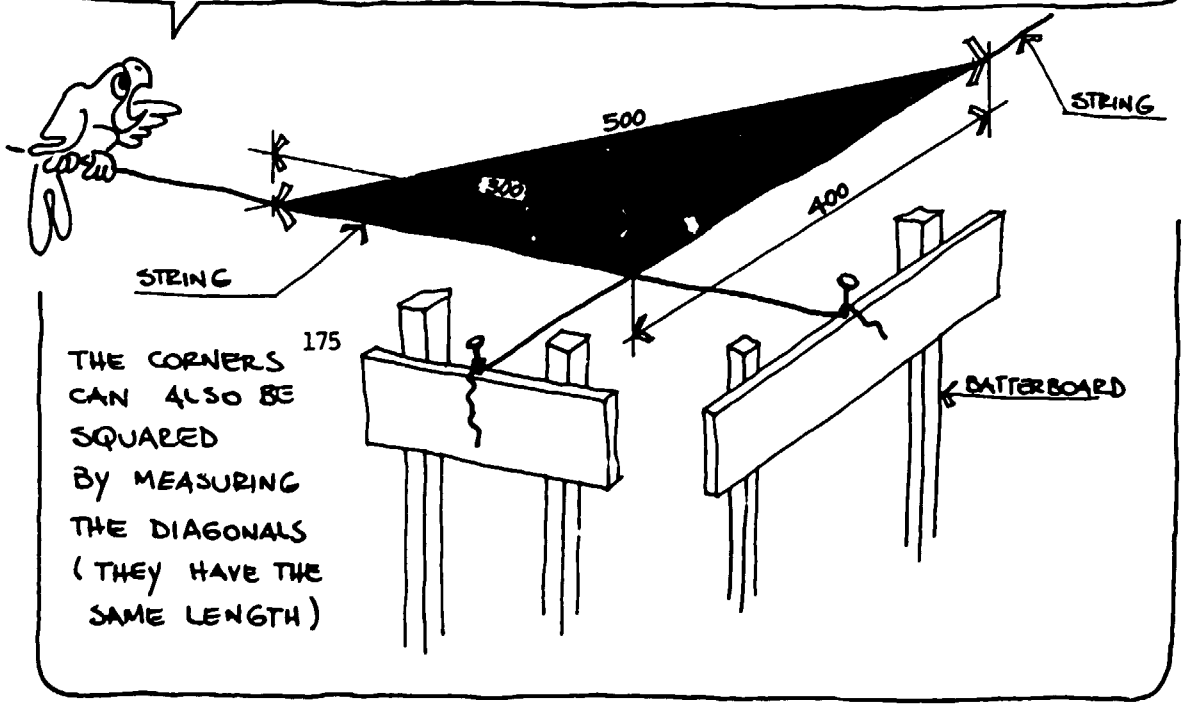


LEVELLING AND FIXING BATTERBOARDS





YOU NOW STRETCH STRINGS BETWEEN THE BATTERBOARDS SQUARING THE CORNERS OF MAIN LINES, THIS WAY...



THE CORNERS CAN ALSO BE SQUARED BY MEASURING THE DIAGONALS (THEY HAVE THE SAME LENGTH)

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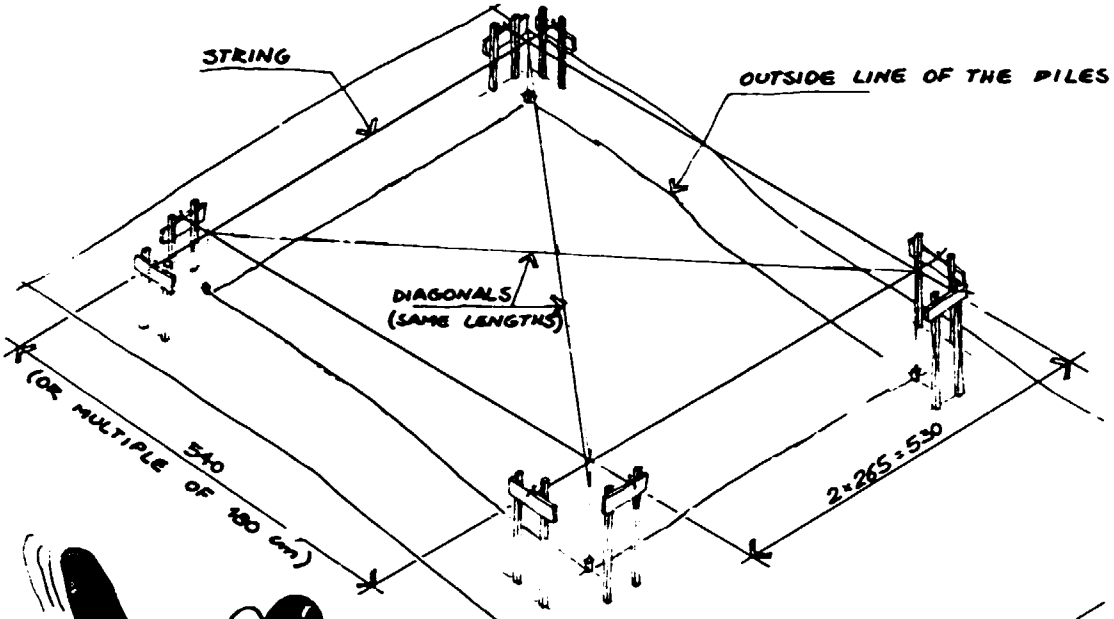
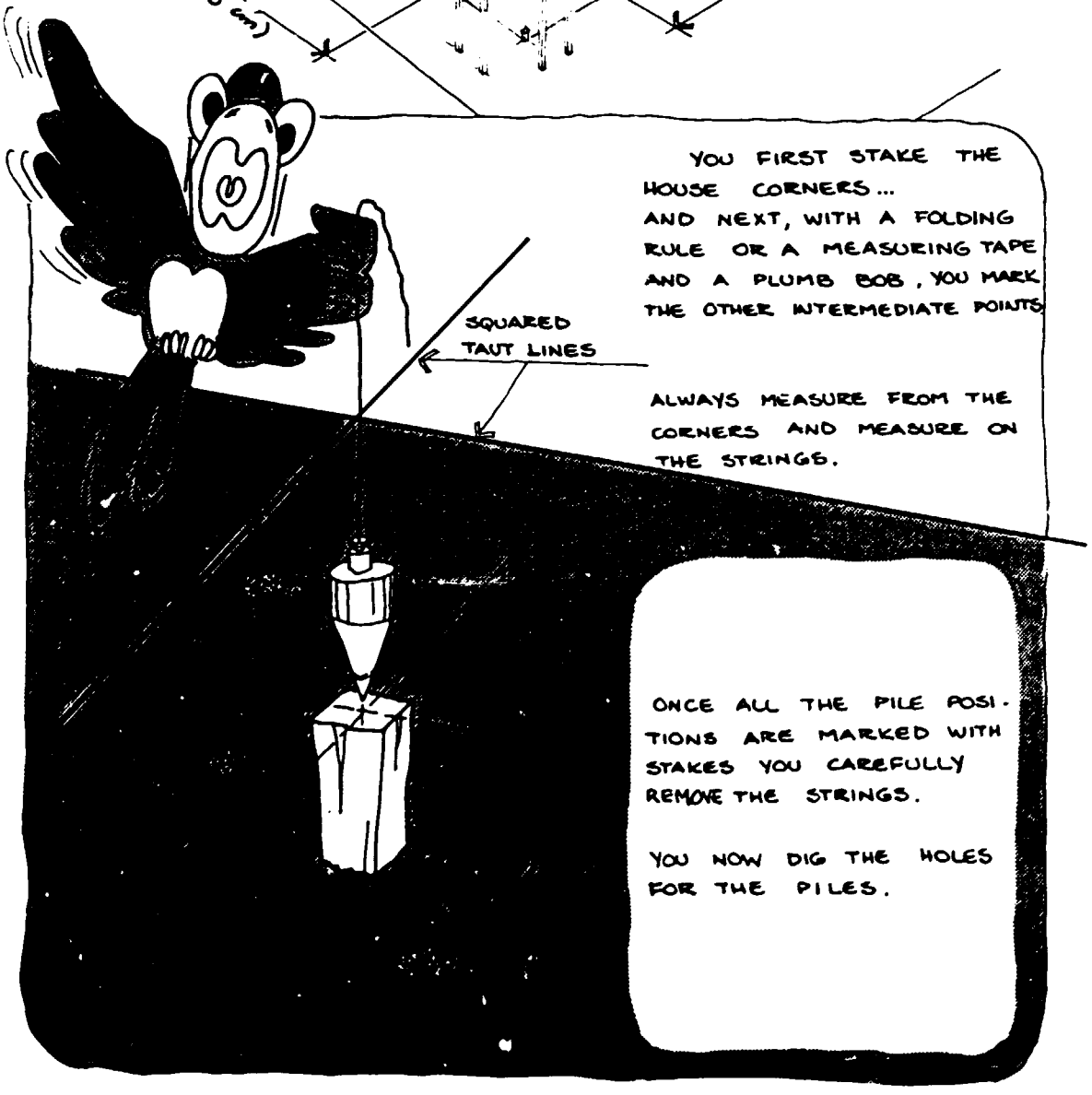
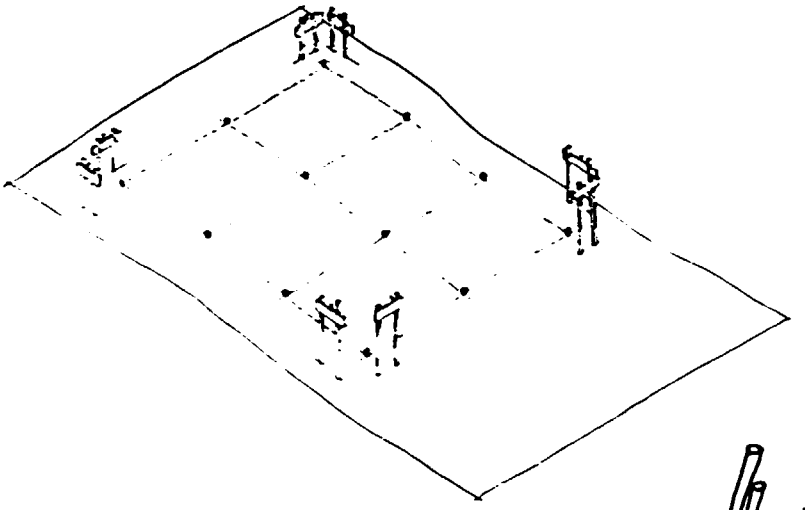
STAKING AND LAYING OUT THE HOUSE...

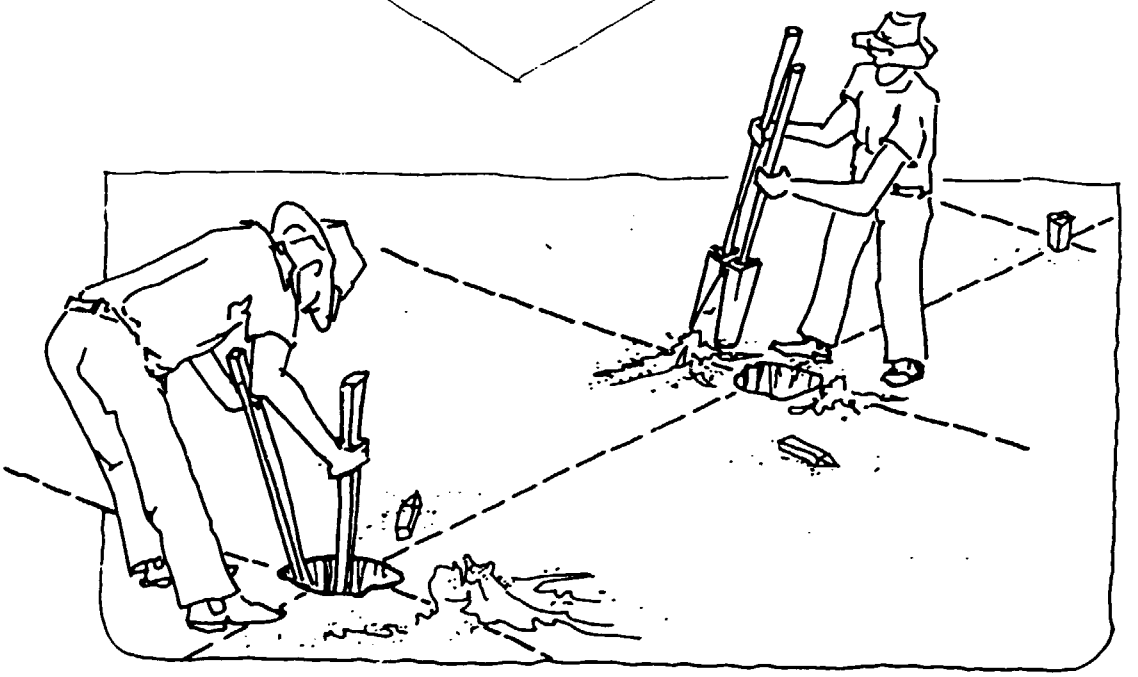


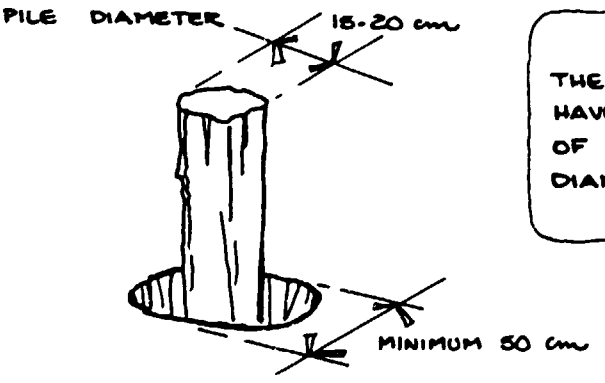


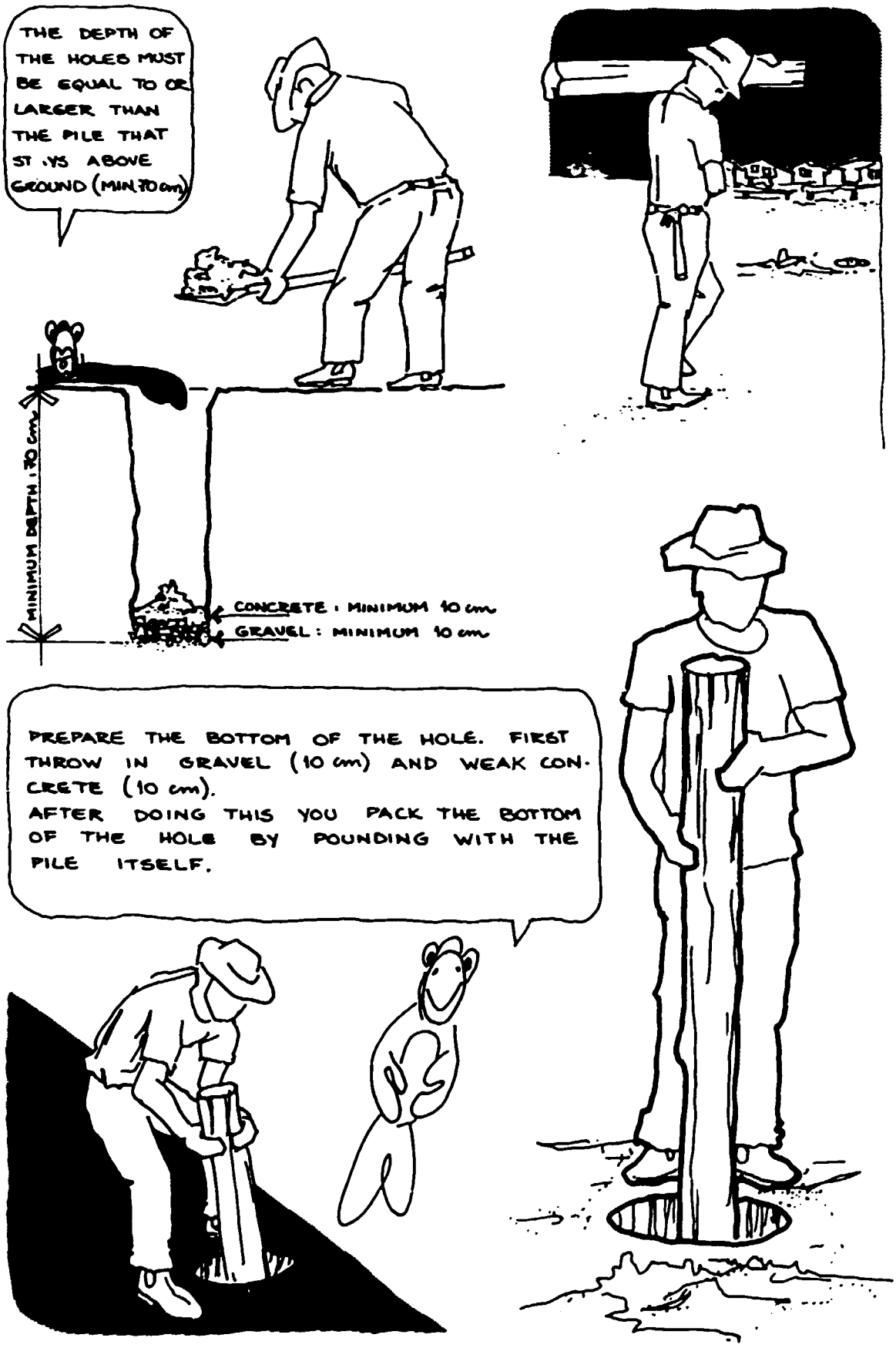
PREPARING PILE HOLES...



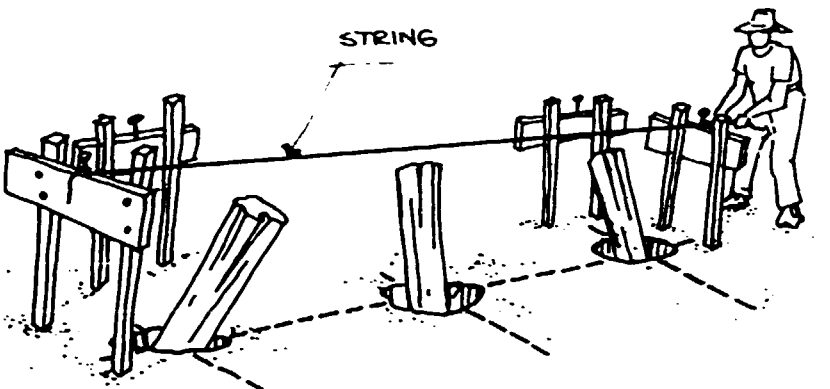
IMPORTANT.
REMOVE ONLY THE STRINGS.
YOU ARE GOING TO USE BATTERBOARDS AGAIN TO POSITION THE PILES, MARK THE SLOTS AND ALIGN THE BEAMS.

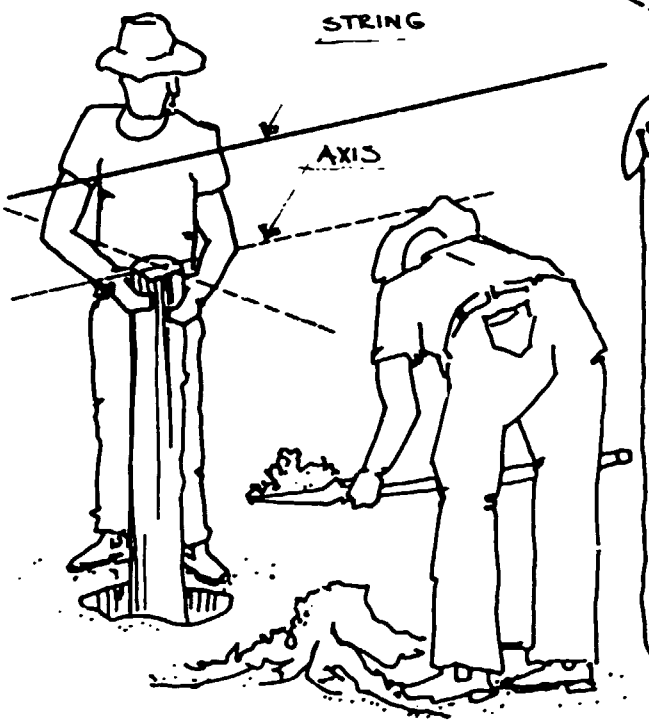





THE DEPTH OF THE HOLES MUST BE EQUAL TO OR LARGER THAN THE PILE THAT STANDS ABOVE GROUND (MIN. 30 cm)
MINIMUM DEPTH : 30 cm
CONCRETE : MINIMUM 10 cm
GRAVEL : MINIMUM 10 cm
PREPARE THE BOTTOM OF THE HOLE. FIRST THROW IN GRAVEL (10 cm) AND WEAK CONCRETE (10 cm).
AFTER DOING THIS YOU PACK THE BOTTOM OF THE HOLE BY POUNDING WITH THE PILE ITSELF.

THE PILES ARE ALIGNED BY STRETCHING THE STRINGS AGAIN.



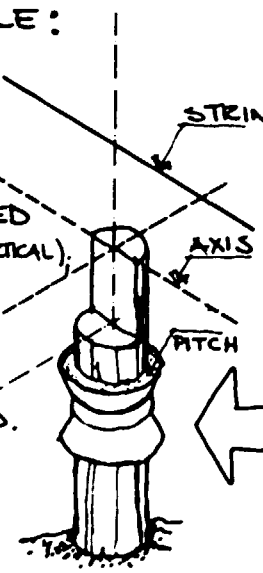


AFTER CHECKING THE ALIGNMENT AND PLUMB, YOU FIX THE PILES BY FILLING THE HOLES WITH A SOIL CEMENT MADE BY MIXING THE EARTH REMOVED FROM THE HOLES WITH CEMENT IN A 1:10 RATIO, WETTING AND STAMPING THE MIXTURE INTO THE HOLE.

THE FREE END OF THE PILE:

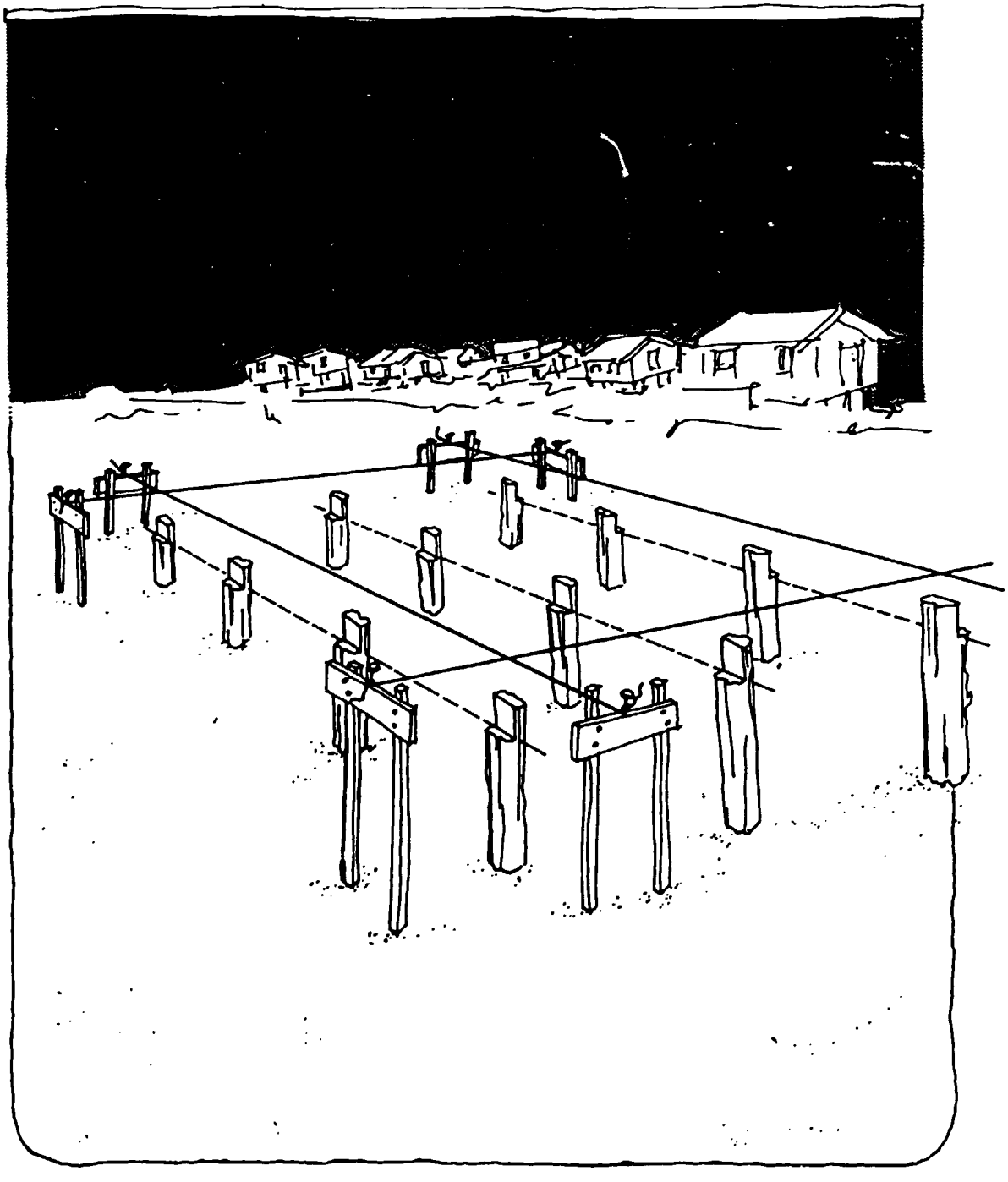
THE PILE IS PREPARED FOR USE BY MAKING:

1. VERTICAL CUTS, ALIGNED AND PLUMBED (MADE VERTICAL);
2. HORIZONTAL CUTS, LEVELLED;
3. BOTH CUTS SQUARED.

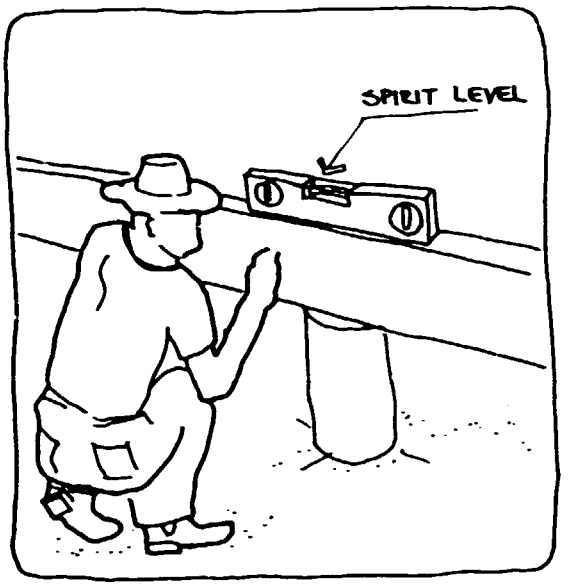


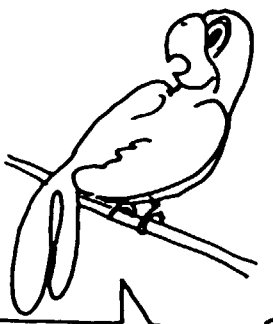
YOU MAY USE A METAL TERMITE SHIELD AS A BARRIER ON PILES TO PROTECT THE REST OF THE HOUSE.
FOR BEST EFFECT FILL THE TOP FUNNEL WITH PITCH.

NOW THAT THE PILES ARE ALL ALIGNED, PLUMBED AND LEVELLED, WE ARE GOING TO PLACE THE **MAIN BEAMS !**



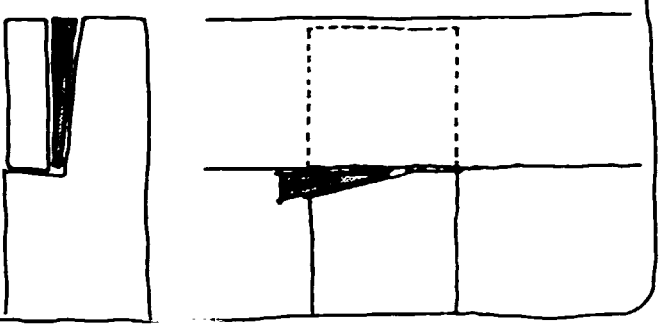
AFTER PLACING THE MAIN BEAM YOU CHECK THE LEVEL . . .



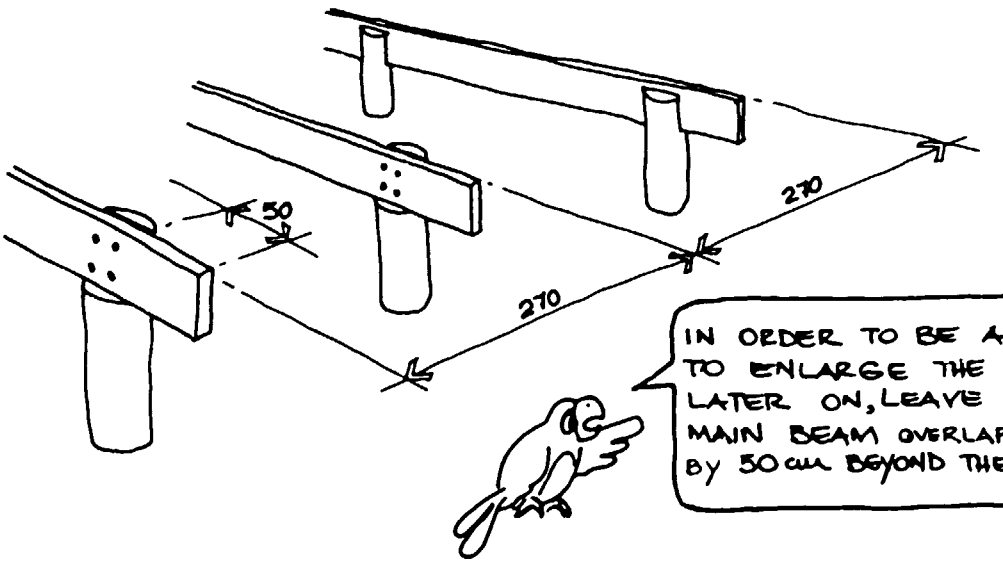


DON'T FORGET TO USE ONLY HEART-WOOD OF DURABLE TIMBER ON MAIN BEAMS.

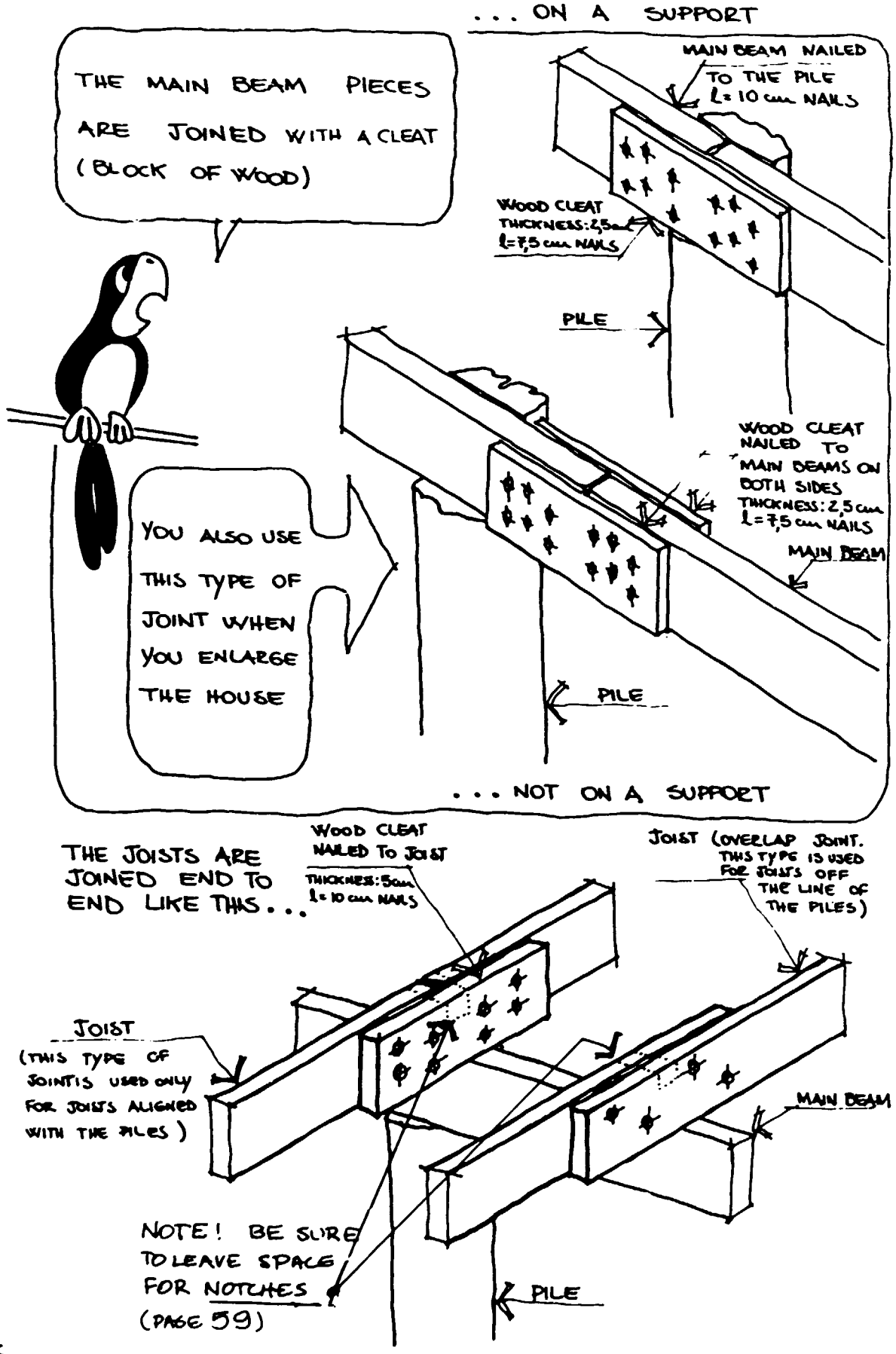
. . . IF NECESSARY USE WEDGES TO SET THE MAIN BEAM AT RIGHT LEVEL AND POSITION.



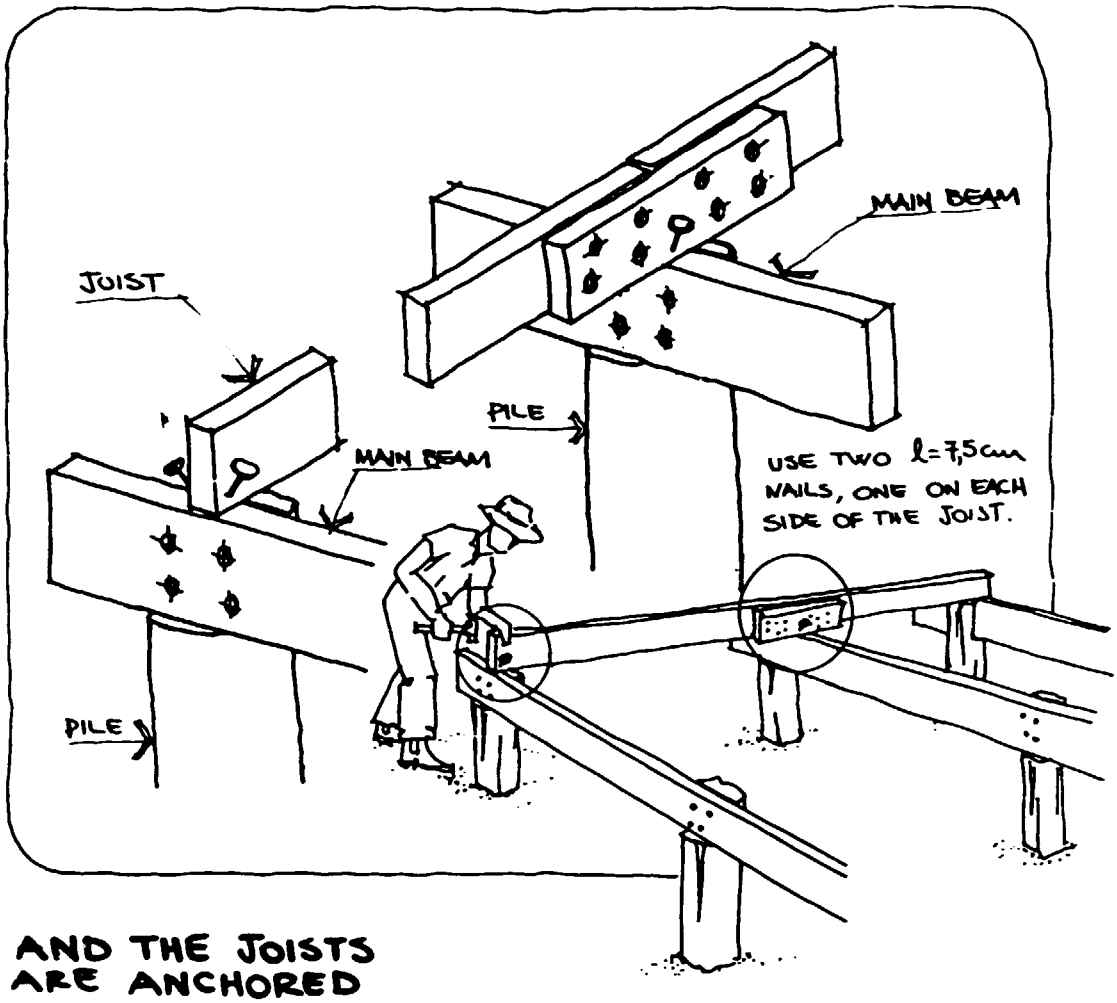
USE l = 10 cm NAILS TO NAIL THE MAIN BEAM TO THE PILES (MINIMUM 4 NAILS).



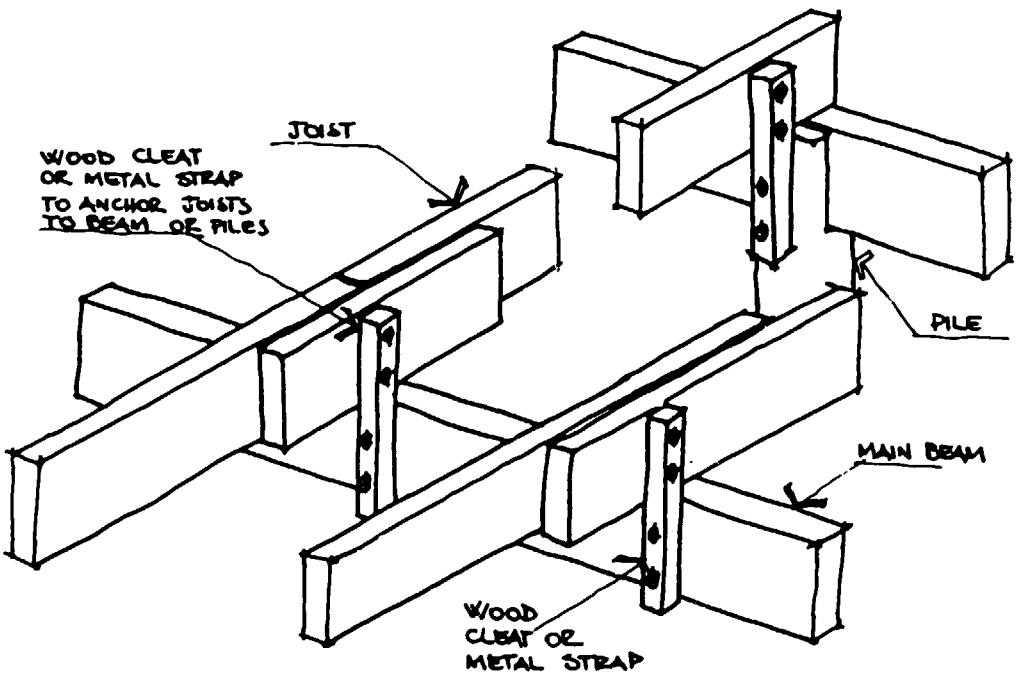
IN ORDER TO BE ABLE TO ENLARGE THE HOUSE LATER ON, LEAVE THE MAIN BEAM OVERLAPPING BY 50 cm BEYOND THE PILE.

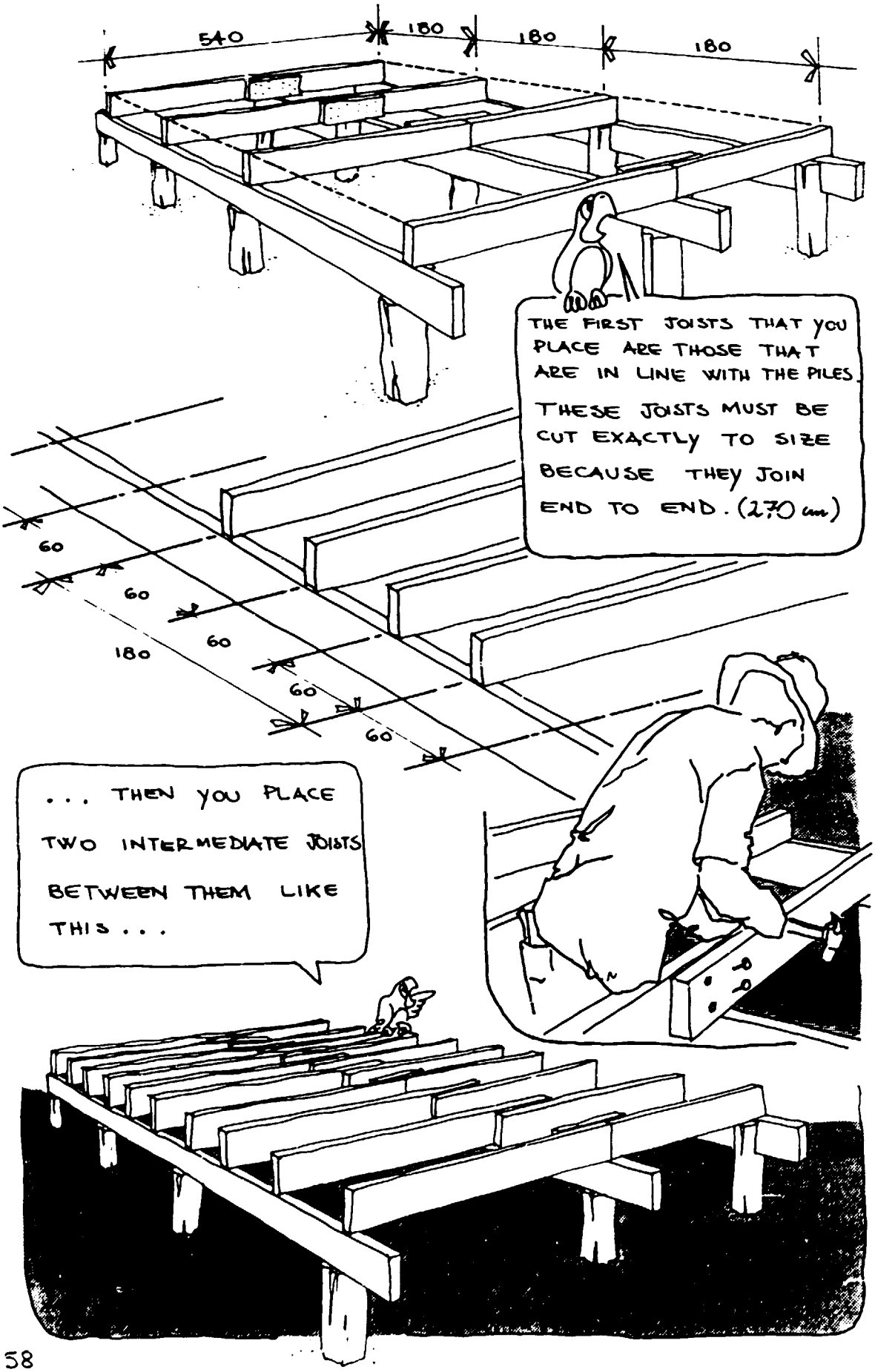

. . . ON A SUPPORT
THE MAIN BEAM PIECES ARE JOINED WITH A CLEAT (BLOCK OF WOOD)
MAIN BEAM NAILED TO THE PILE l = 10 cm NAILS
WOOD CLEAT THICKNESS: 2,5 cm l = 7,5 cm NAILS
PILE
YOU ALSO USE THIS TYPE OF JOINT WHEN YOU ENLARGE THE HOUSE
WOOD CLEAT NAILED TO MAIN BEAMS ON BOTH SIDES THICKNESS: 2,5 cm l = 7,5 cm NAILS
MAIN BEAM
PILE
. . . NOT ON A SUPPORT
THE JOISTS ARE JOINED END TO END LIKE THIS . . .
WOOD CLEAT NAILED TO JOIST THICKNESS: 5cm l = 10 cm NAILS
JOIST (OVERLAP JOINT. THIS TYPE IS USED FOR JOISTS OFF THE LINE OF THE PILES)
JOIST (THIS TYPE OF JOINT IS USED ONLY FOR JOISTS ALIGNED WITH THE PILES)
MAIN BEAM
NOTE! BE SURE TO LEAVE SPACE FOR NOTCHES (PAGE 59)
PILE

THE NAILING OF THE JOISTS TO MAIN BEAMS IS DONE LIKE THIS...

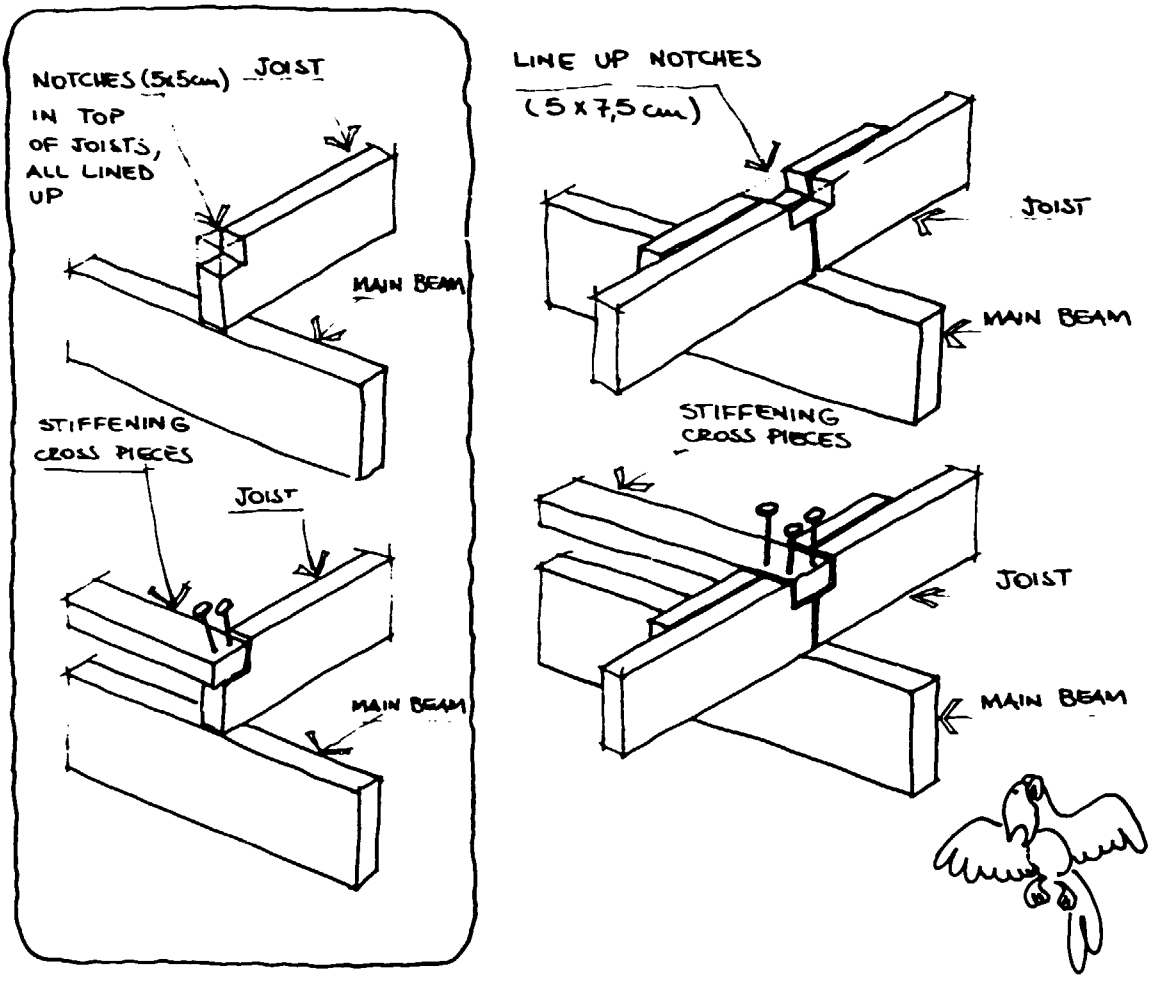


AND THE JOISTS ARE ANCHORED LIKE THIS...

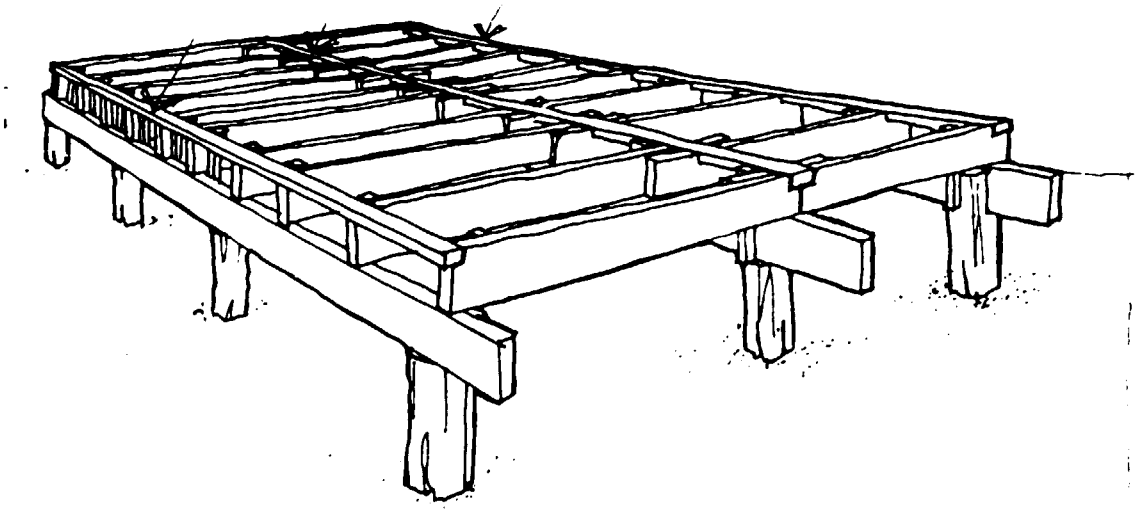



540
180
180
180
THE FIRST JOISTS THAT YOU PLACE ARE THOSE THAT ARE IN LINE WITH THE PILES.
THESE JOISTS MUST BE CUT EXACTLY TO SIZE BECAUSE THEY JOIN END TO END. (270 cm)
60
60
60
180
60
60
. . . THEN YOU PLACE TWO INTERMEDIATE JOISTS BETWEEN THEM LIKE THIS . . .

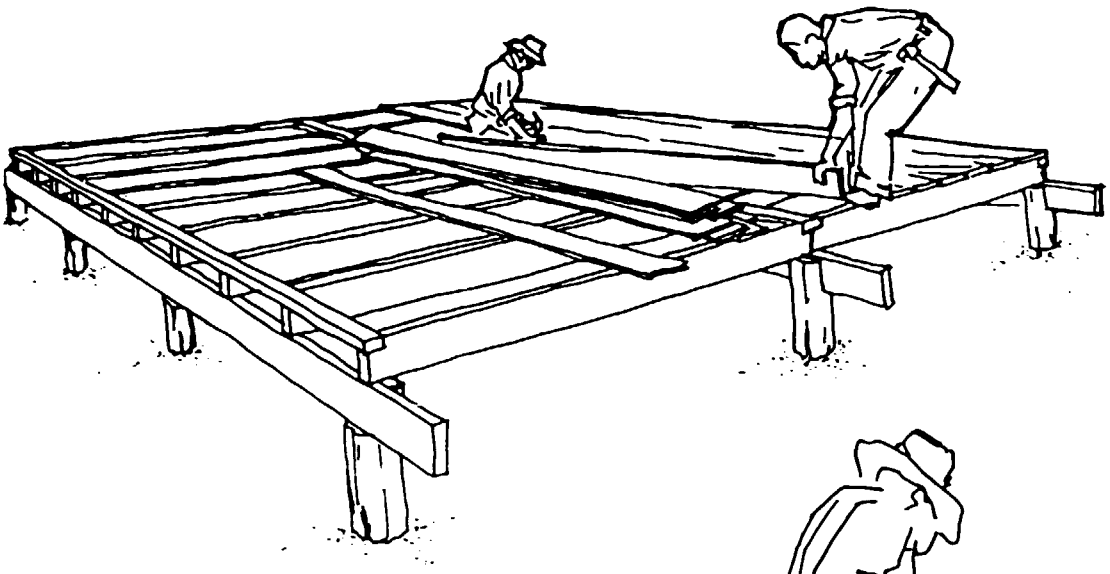
THE NAILING OF JOISTS SPACERS IS DONE LIKE THIS . . .



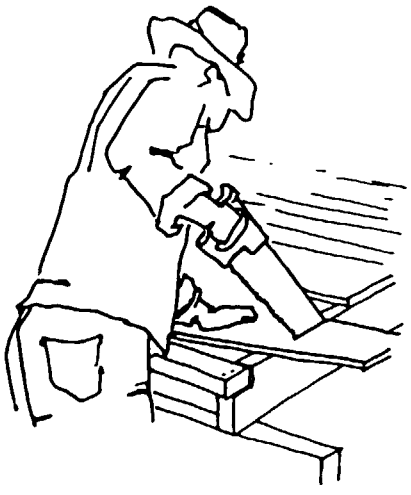
STIFFENING CROSS PIECES

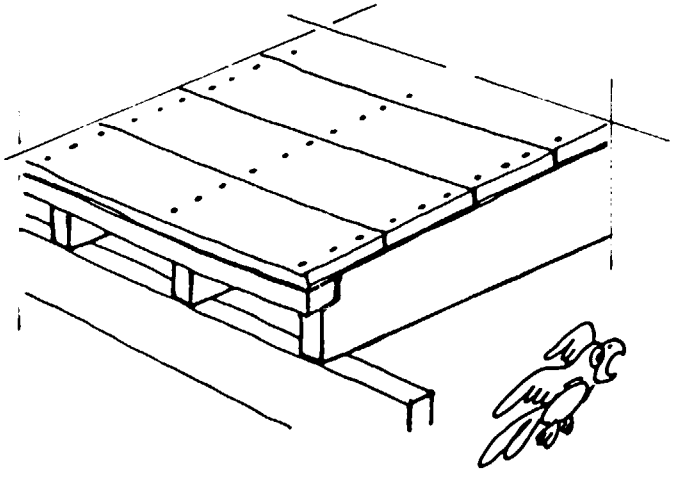


AND FINALLY YOU CAN PLACE THE FLOOR BOARDS...

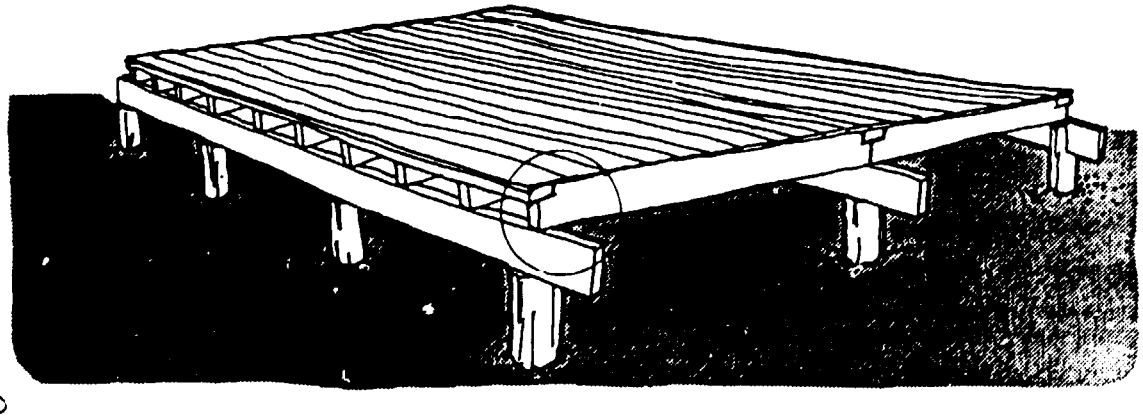


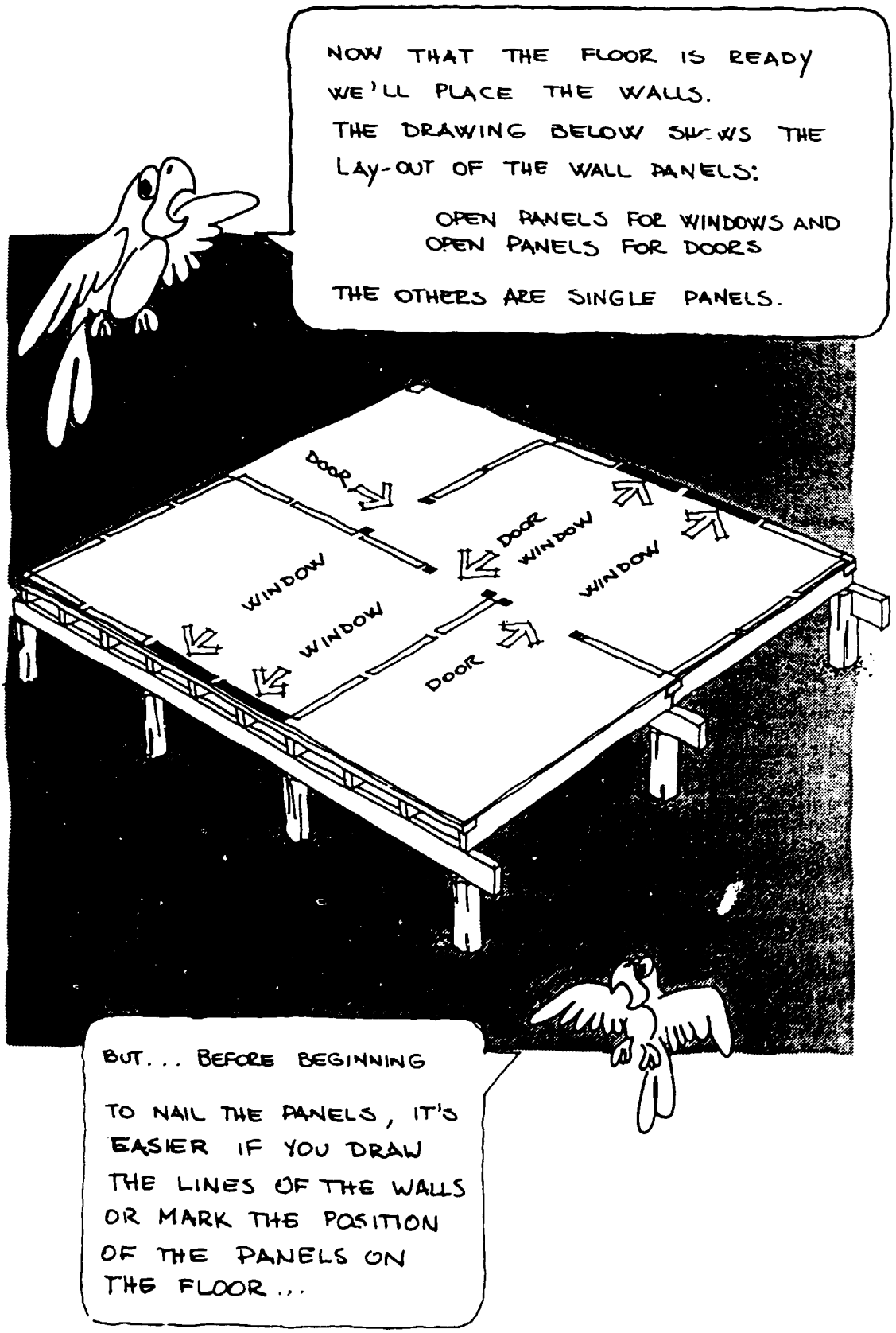
THE FLOOR BOARD JOINTS MUST BE VERY TIGHT. TO NAIL THE FLOOR BOARDS USE THREE $l = 7{,}5$ cm NAILS IN EACH OF THE BOARDS, ON THE LINES OF THE JOISTS.





VERIFY THAT THE EDGES OF THE FLOOR PLATFORM ARE FACED AND WELL FINISHED.

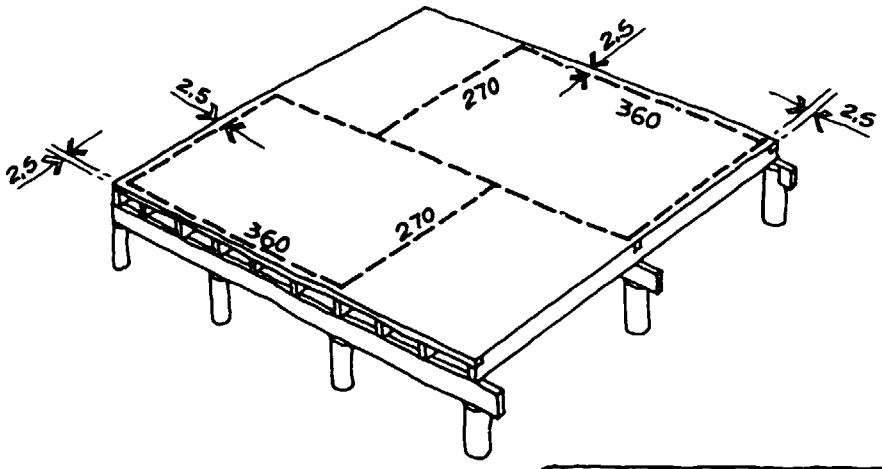


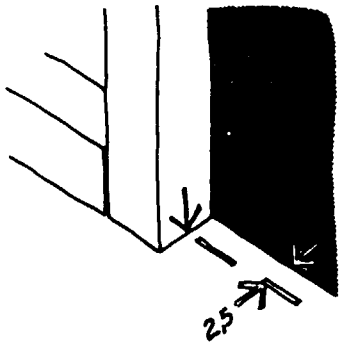

NOW THAT THE FLOOR IS READY WE'LL PLACE THE WALLS.
THE DRAWING BELOW SHOWS THE LAY-OUT OF THE WALL PANELS:
OPEN PANELS FOR WINDOWS AND OPEN PANELS FOR DOORS
THE OTHERS ARE SINGLE PANELS.
DOOR
DOOR
WINDOW
WINDOW
WINDOW
WINDOW
DOOR
BUT... BEFORE BEGINNING
TO NAIL THE PANELS, IT'S EASIER IF YOU DRAW THE LINES OF THE WALLS OR MARK THE POSITION OF THE PANELS ON THE FLOOR...

AND NOW WE ARE GOING TO

POSITION THE PANELS!

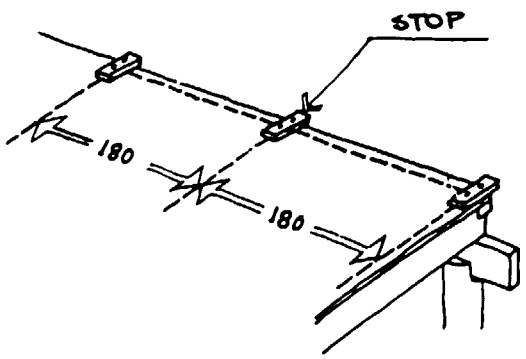
. . . YOU MARK THE FLOOR LIKE THIS TO MAKE THE POSITIONING OF PANELS EASIER.

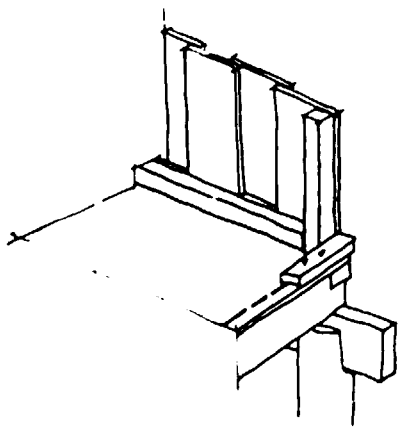


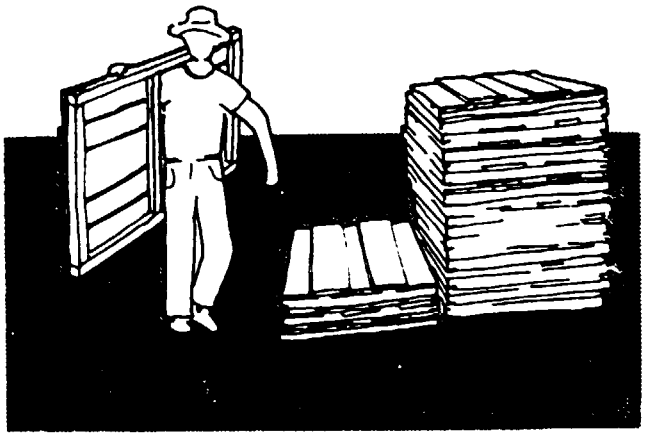


ALWAYS CONSIDER THE LINE AS PASSING THROUGH THE MIDDLE OF THE PANEL FRAME.

LET'S PLACE THE FIRST PANEL. NAIL THREE SMALL STOPS TO MARK THE POSITION OF THE PANELS. NOW PUSH THE BOTTOM OF THE PANEL AGAINST THE STOP LIKE THIS . . .

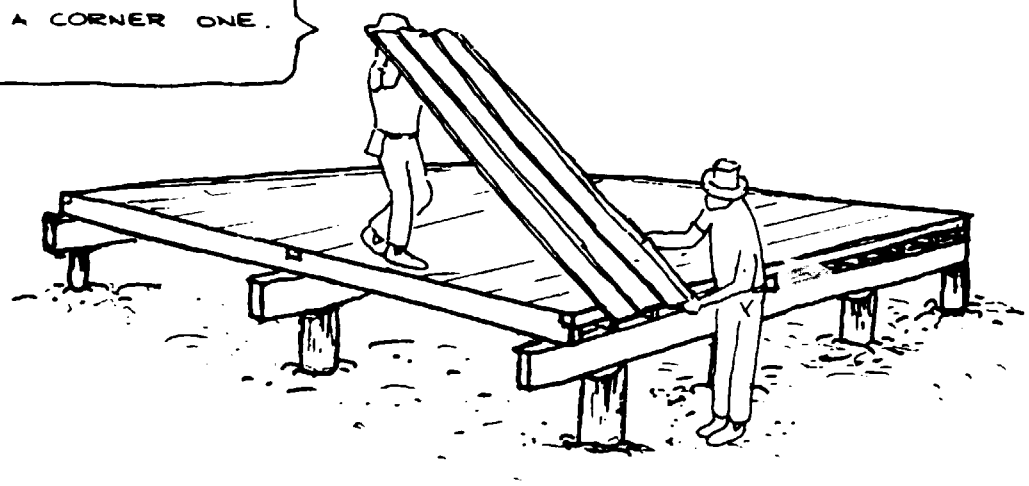




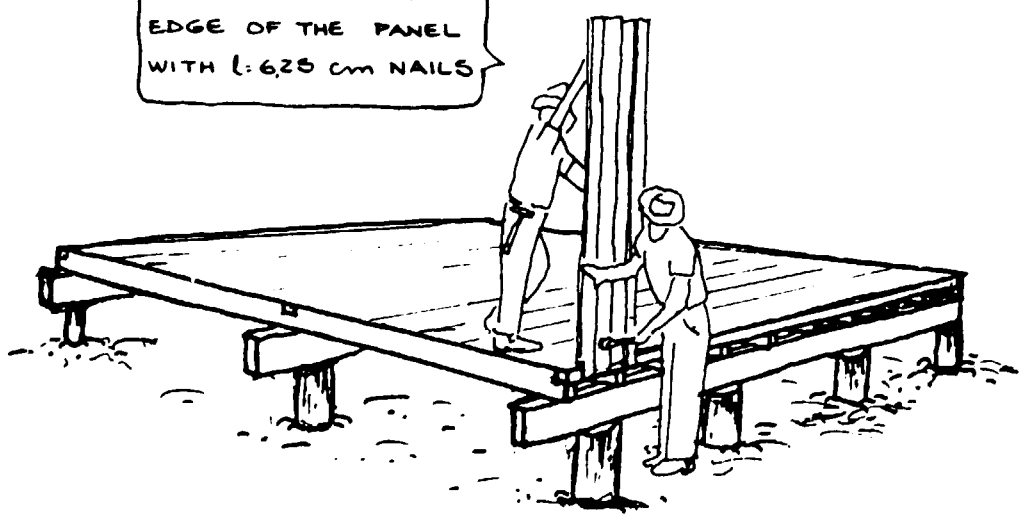


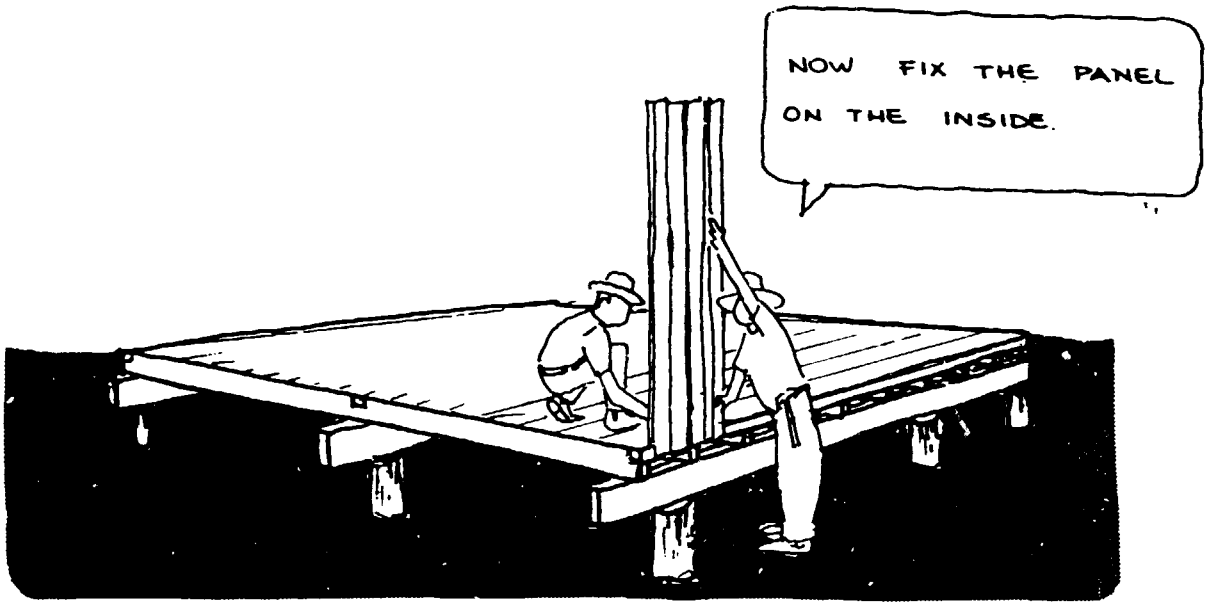
LET US BEGIN INSTALLING THE PANELS.

THE FIRST PANEL IS A CORNER ONE.

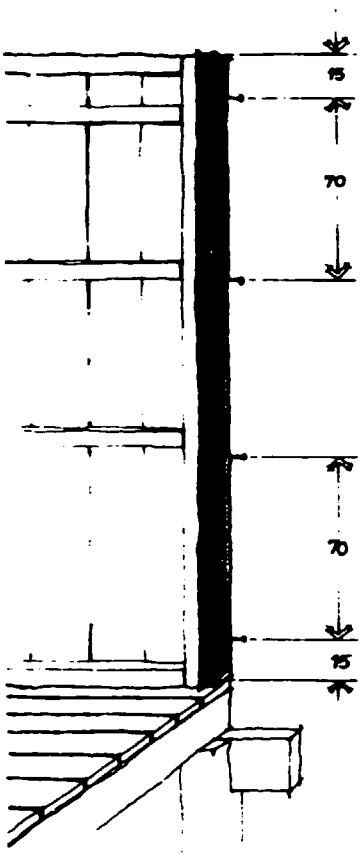


NAIL THE OUTSIDE EDGE OF THE PANEL WITH l: 6,25 cm NAILS



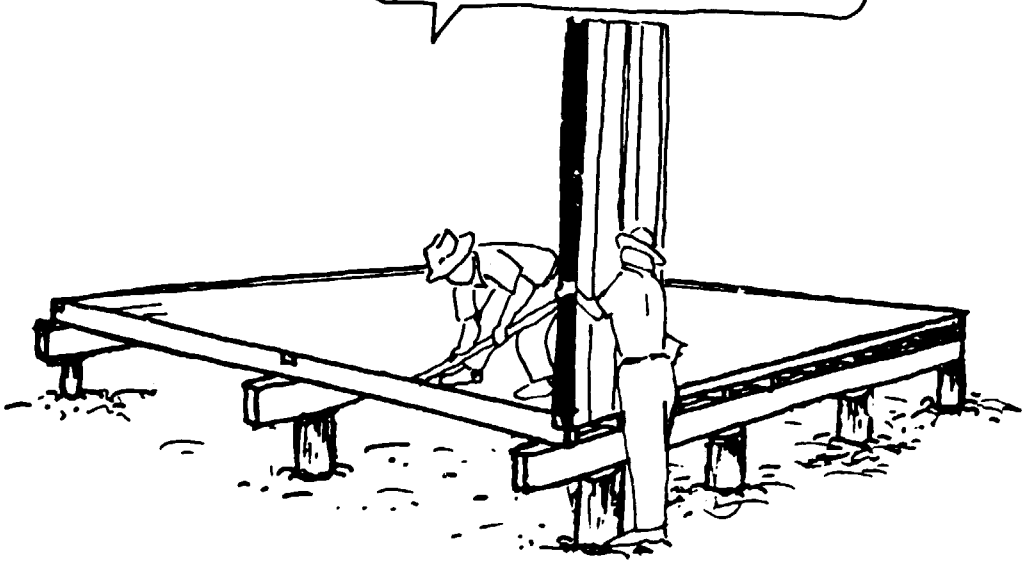

NOW FIX THE PANEL ON THE INSIDE.


THE PANEL IS FIXED WITH
ℓ : 10 cm NAIL AT EACH CORNER

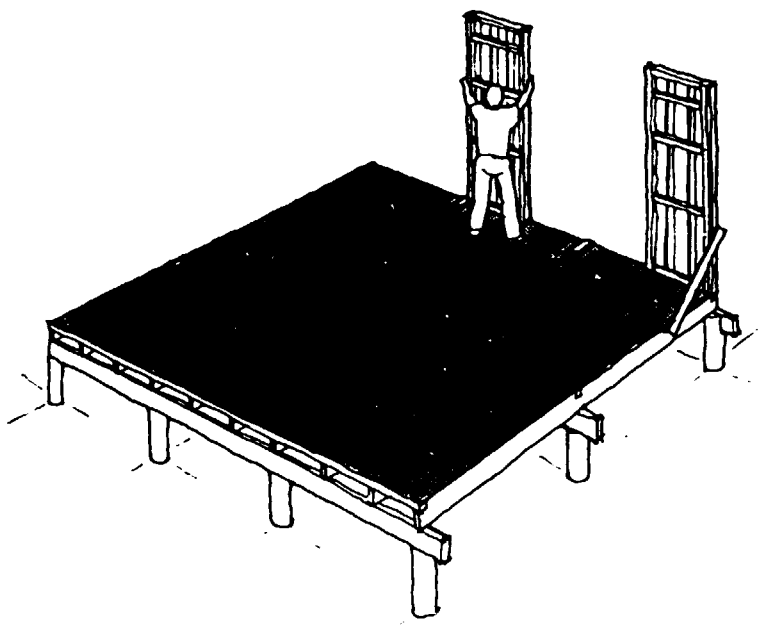


TAKE OFF THE STOP AND NAIL AN INTER-PANEL STUD WITH A LENGTH OF 240 cm TIMBER. USE l = 10cm NAILS.

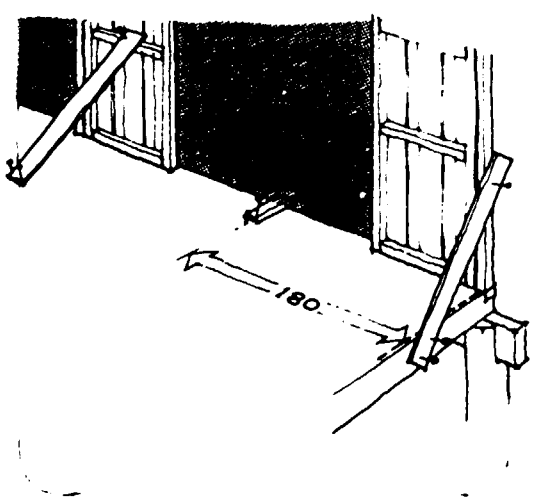
AFTER FIXING THE PANEL UPRIGHT IT MUST BE PROPPED UP TO AVOID TIPPING OVER.



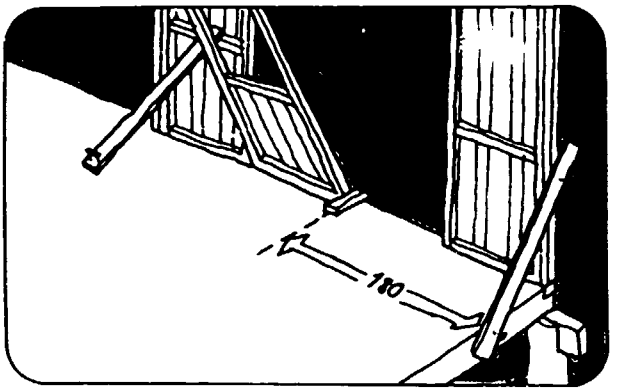
NOW RAISE THE SECOND PANEL. CHECK THAT THE BOTTOM OF THE PANEL IS PUSHED UP AGAINST THE STOP AT THE OTHER SIDE.

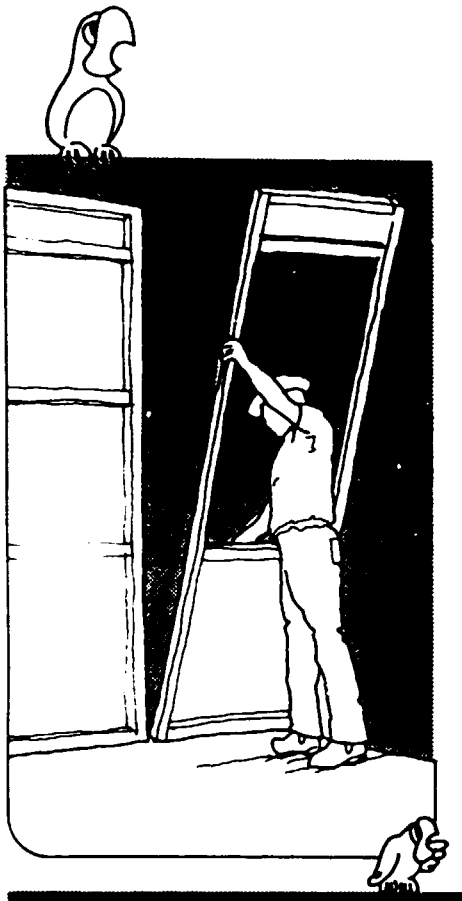


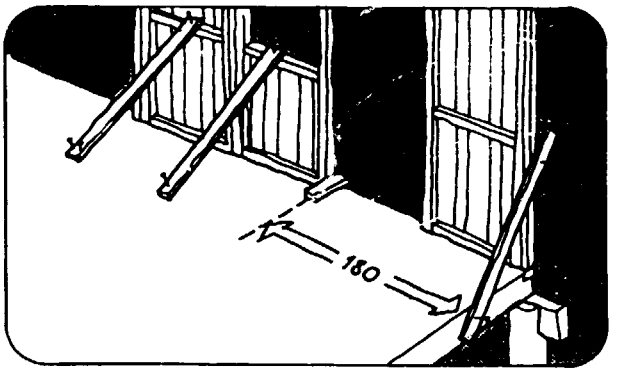
AFTER NAILING THE PANEL AND CHECKING THAT IT IS VERTICAL, YOU ALSO PROP IT UP WITH A BOARD.
NOW FOR THE THIRD PANEL...



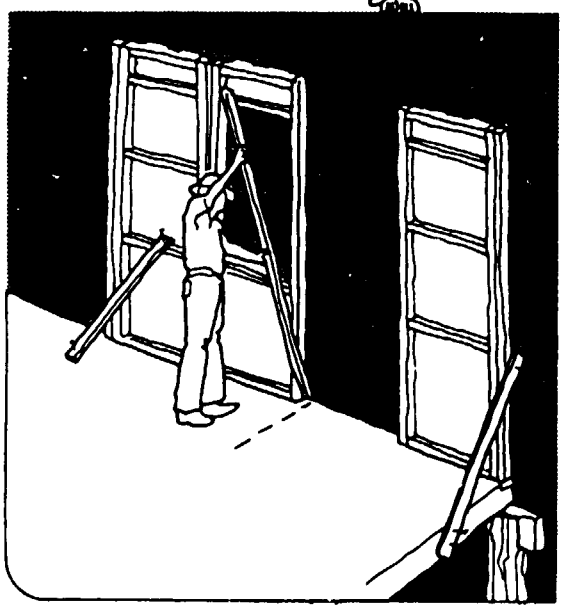
PROP THE THIRD PANEL AGAINST THE MIDDLE STOP.
PUT IT VERTICAL USING A PLUMB BOB.
NAIL AND SUPPORT IT.

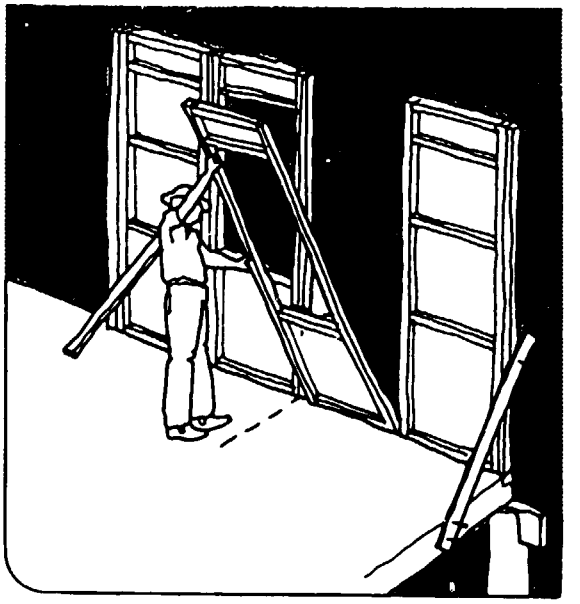


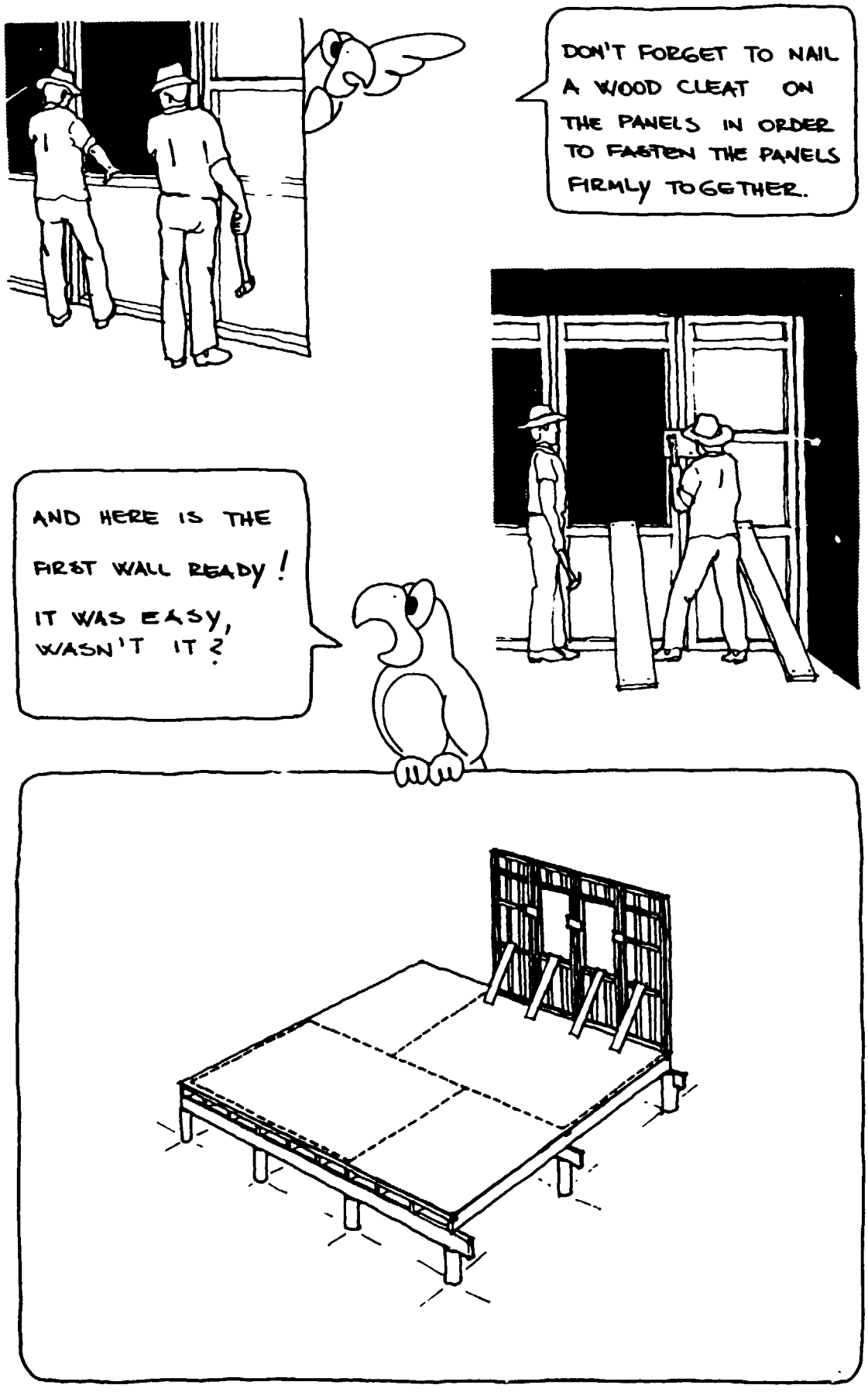




THEN TAKE OFF THE STOP AND NAIL ANOTHER INTER-PANEL STUD AS WAS DONE WITH THE FIRST ONE.
NOW YOU CAN ERECT THE LAST PANEL OF THIS WALL. NAIL AND FASTEN LIKE THE OTHERS. NAIL THE INTER-PANEL STUD TOO.

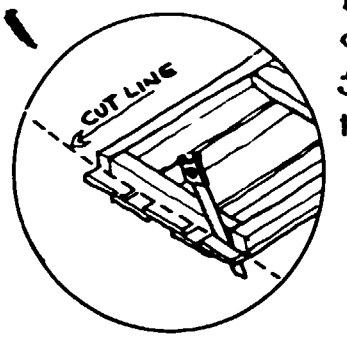




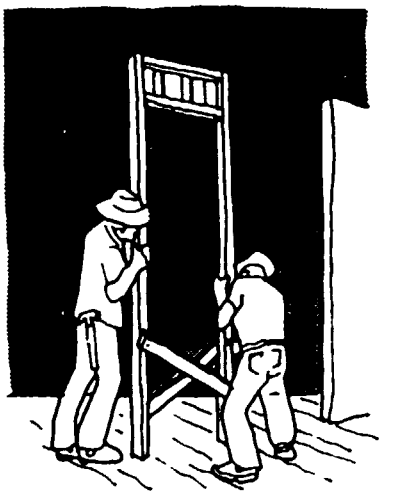

DON'T FORGET TO NAIL A WOOD CLEAT ON THE PANELS IN ORDER TO FASTEN THE PANELS FIRMLY TOGETHER.
AND HERE IS THE FIRST WALL READY!
IT WAS EASY, WASN'T IT?

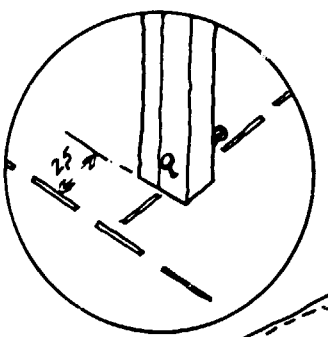
NOW THAT YOU HAVE LEARNED HOW TO MOUNT THE PANELS JUST KEEP ON PUTTING THE OTHERS UP.

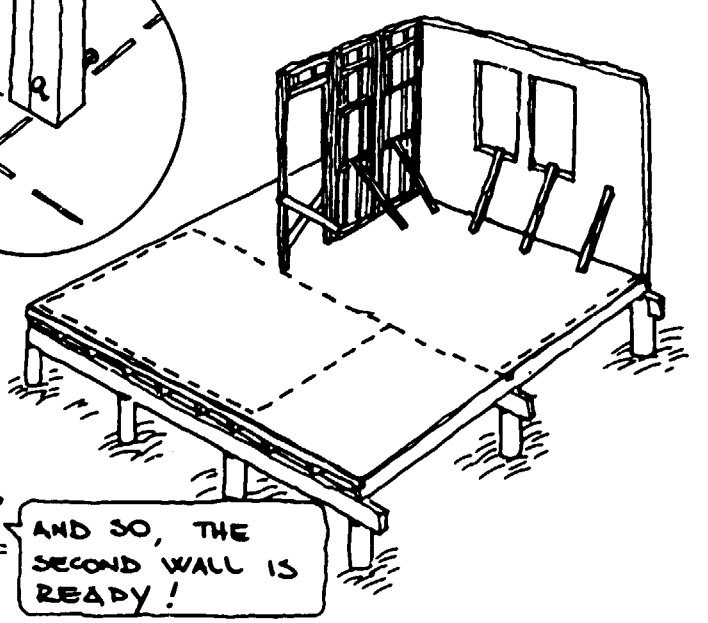
FOR THOSE PANELS THAT ARE GOING TO BE INSTALLED DIRECT ON THE FLOOR BOARDS AND NOT AT AN EDGE, DON'T FORGET TO SAW OFF THE LENGTH OF BOARD JUTTING OUT BEYOND THE FRAME.



FIX THE DOOR PANEL ON THE FLOOR WITH TWO NAILS IN EACH STUD, LEAVING 2,5 cm FROM THE LINE OF THE MIDDLE WALL.
CHECK THE PLUMB AND SUPPORT IT.







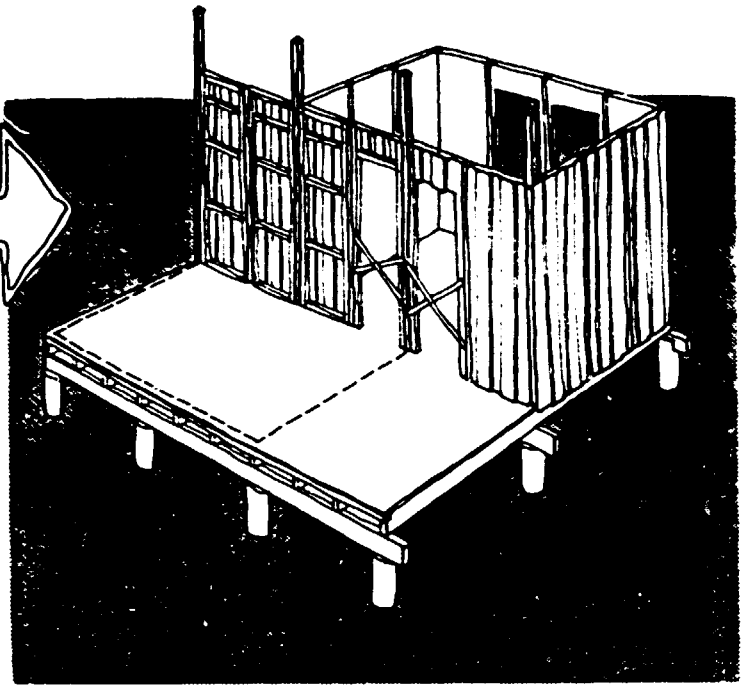
NAIL THE MIDDLE PANEL AFTER CENTERING IT IN THE GAP, DIVIDING EQUALLY THE SPACE ON EACH SIDE.
CHECK THE PLUMB AND SUPPORT IT.
JOIN THE PANELS TOGETHER WITH CLEATS TO STABILIZE THEM.

AND SO, THE SECOND WALL IS READY!

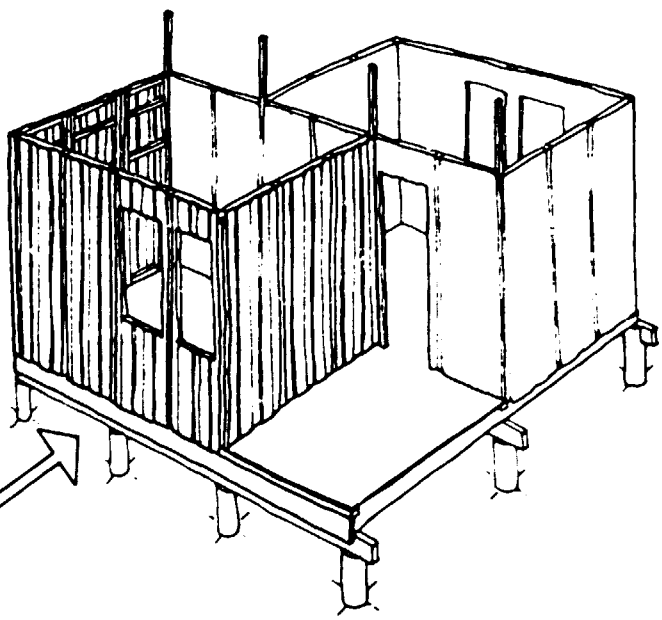
NOW THE MIDDLE WALL. YOU ARE GOING TO UTILIZE INTER-PANEL STUDS :

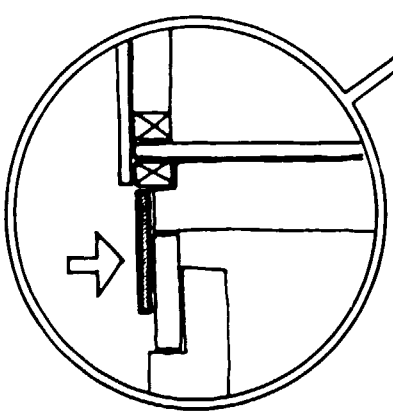
5 x 5 x 325 cm IN LENGTH

THEY WILL SUPPORT THE RIDGE BEAM

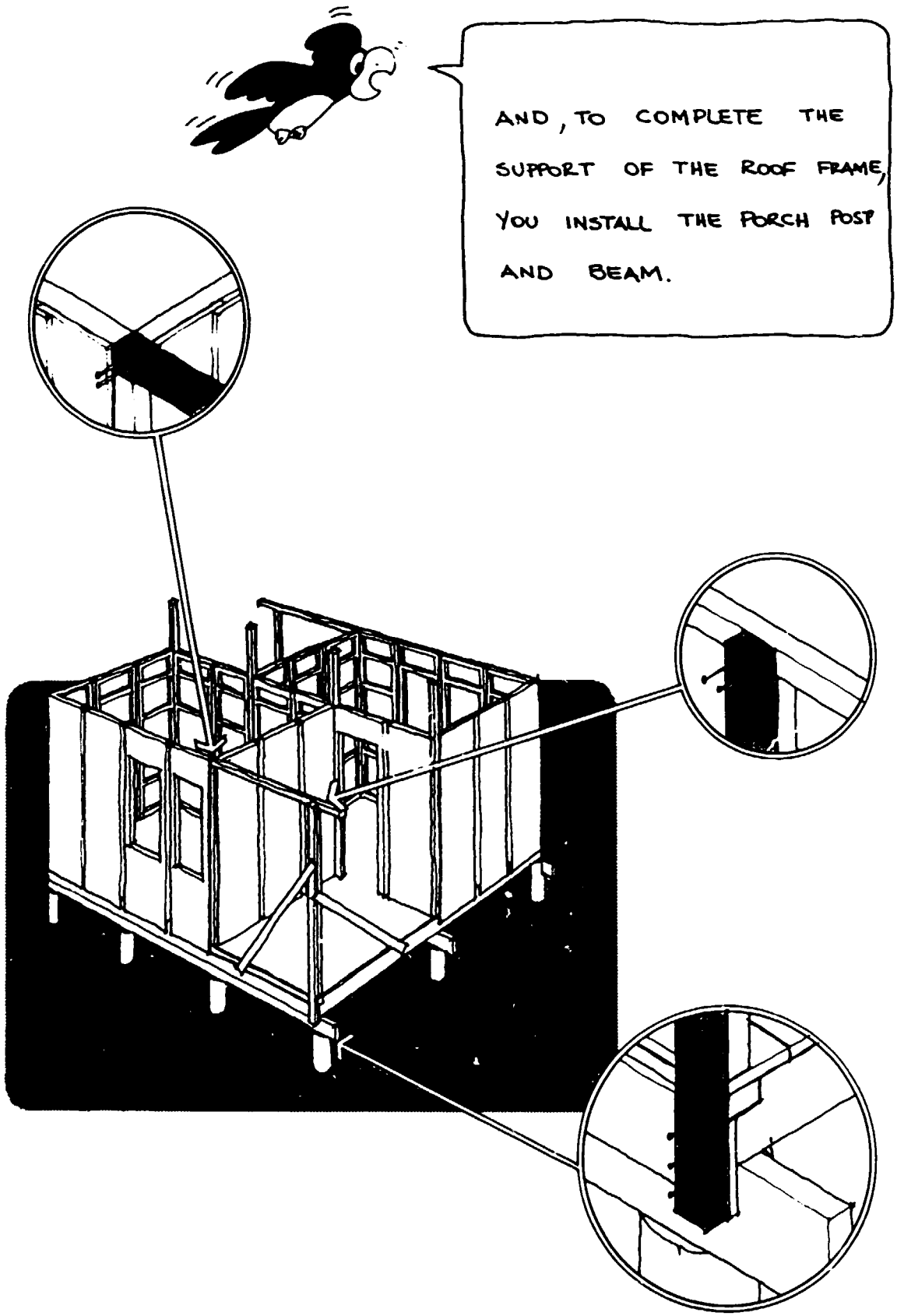


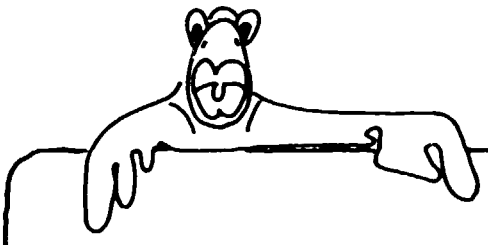
THE FINISHING OF THE FLOOR FRAME IS DONE BY PLACING ONE BOARD OF 2,5 x 20 cm COVERING THE JOISTS ENDS.





JOIST HEADER BOARD

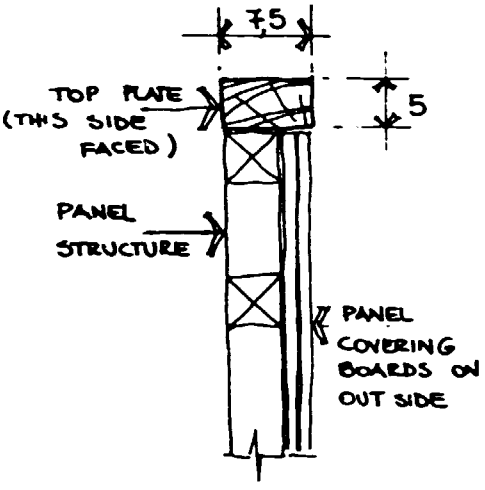

AND, TO COMPLETE THE SUPPORT OF THE ROOF FRAME, YOU INSTALL THE PORCH POST AND BEAM.

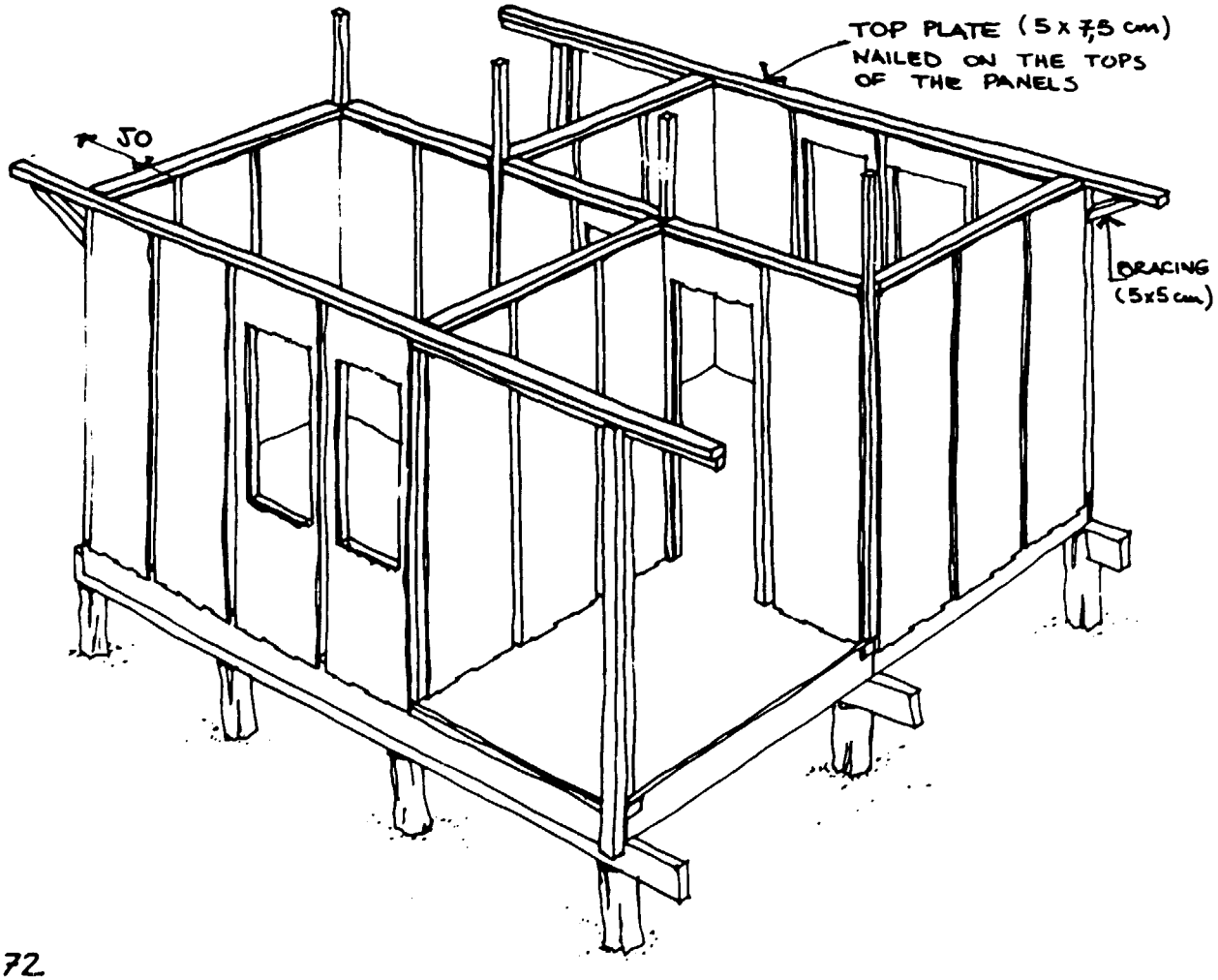


ATTENTION !

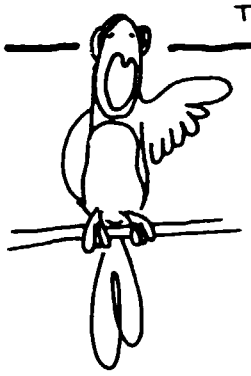
YOU MUST TAKE SOME CARE WHEN NAILING THE TOP PLATE.

- USE ONE $l = 10$ cm NAIL EVERY 45 cm
- ALWAYS USE, IF POSSIBLE, WHOLE PIECES
- MAKE A JOINT ONLY IN THE MIDDLE OF THE PANEL.
- EXPOSED SIDES ARE FACED.



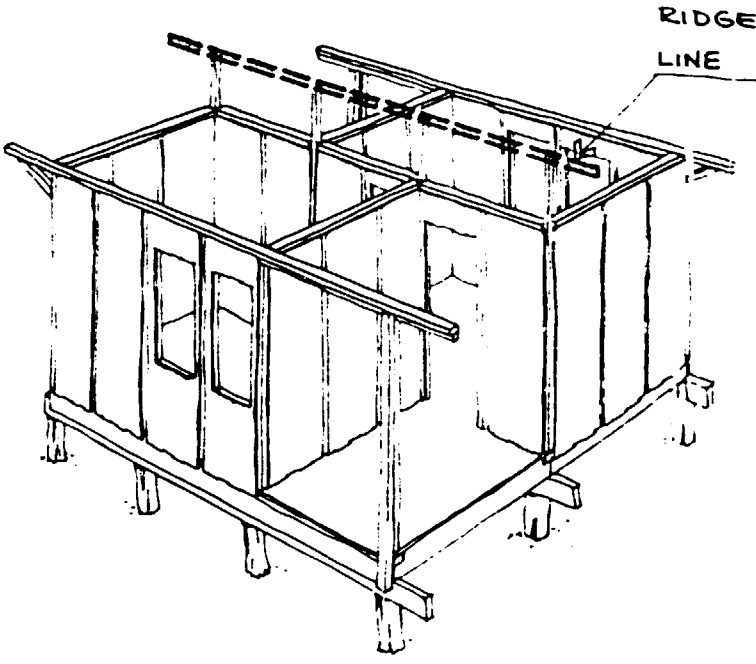


NOW WE ARE GOING TO BUILD THE **ROOF FRAME**

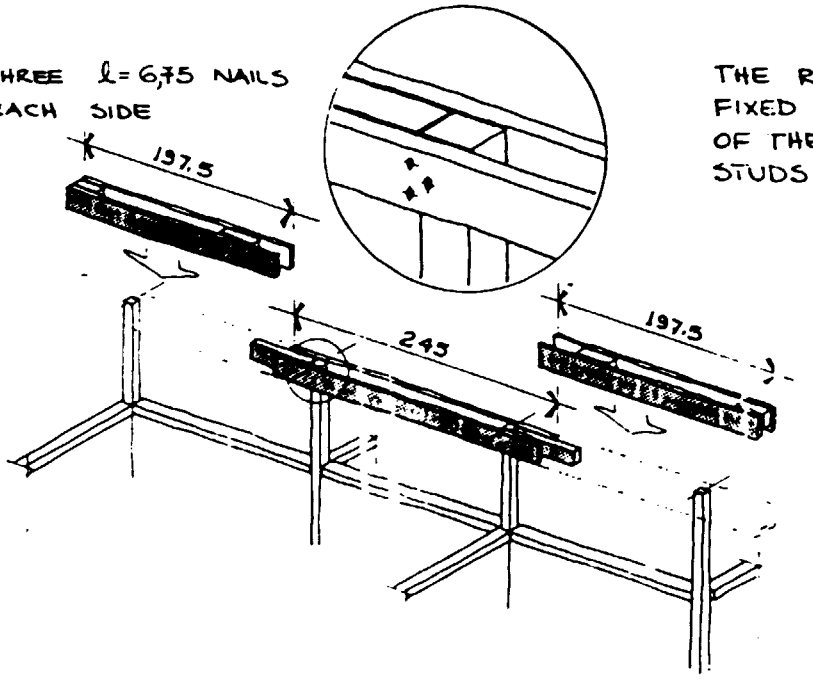


YOU BEGIN MOUNTING THE ROOF FRAME BY JOINING AND FIXING THE RIDGE BEAM.

THE RIDGE BEAM IS COMPOSED OF TWO BEAMS OF 197,5 cm IN LENGTH AND ONE OF 245 cm.

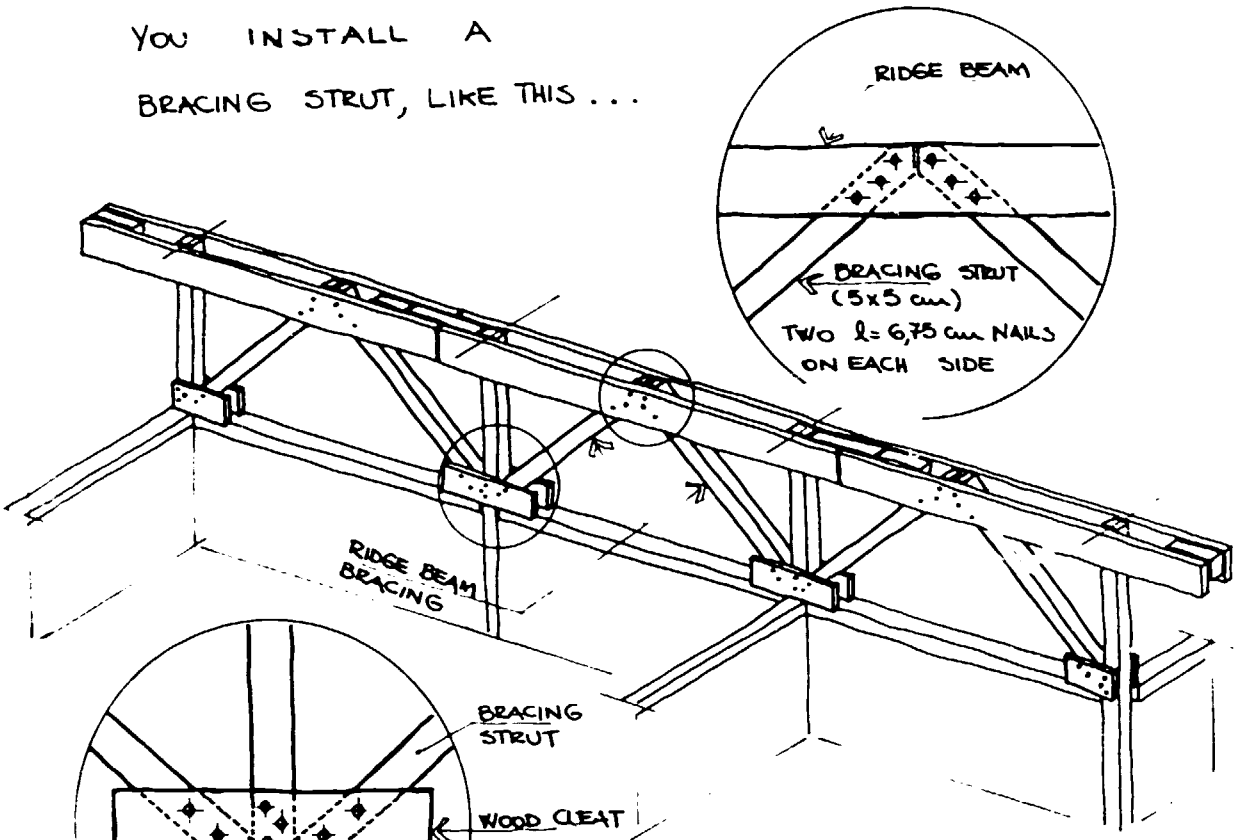


THREE $\ell = 6{,}75$ NAILS EACH SIDE

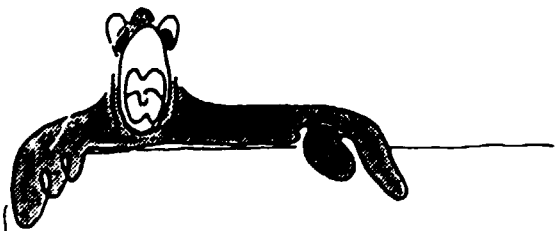


THE RIDGE BEAM IS FIXED ON T. E **TOP** OF THE INTER PANEL STUDS.

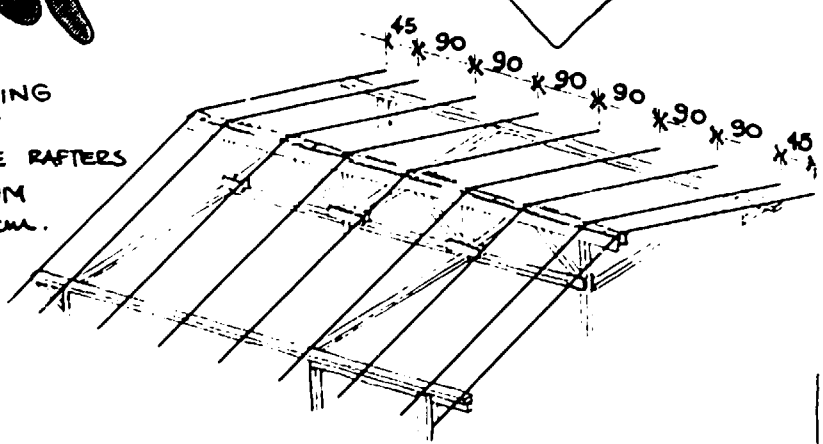
YOU INSTALL A BRACING STRUT, LIKE THIS...

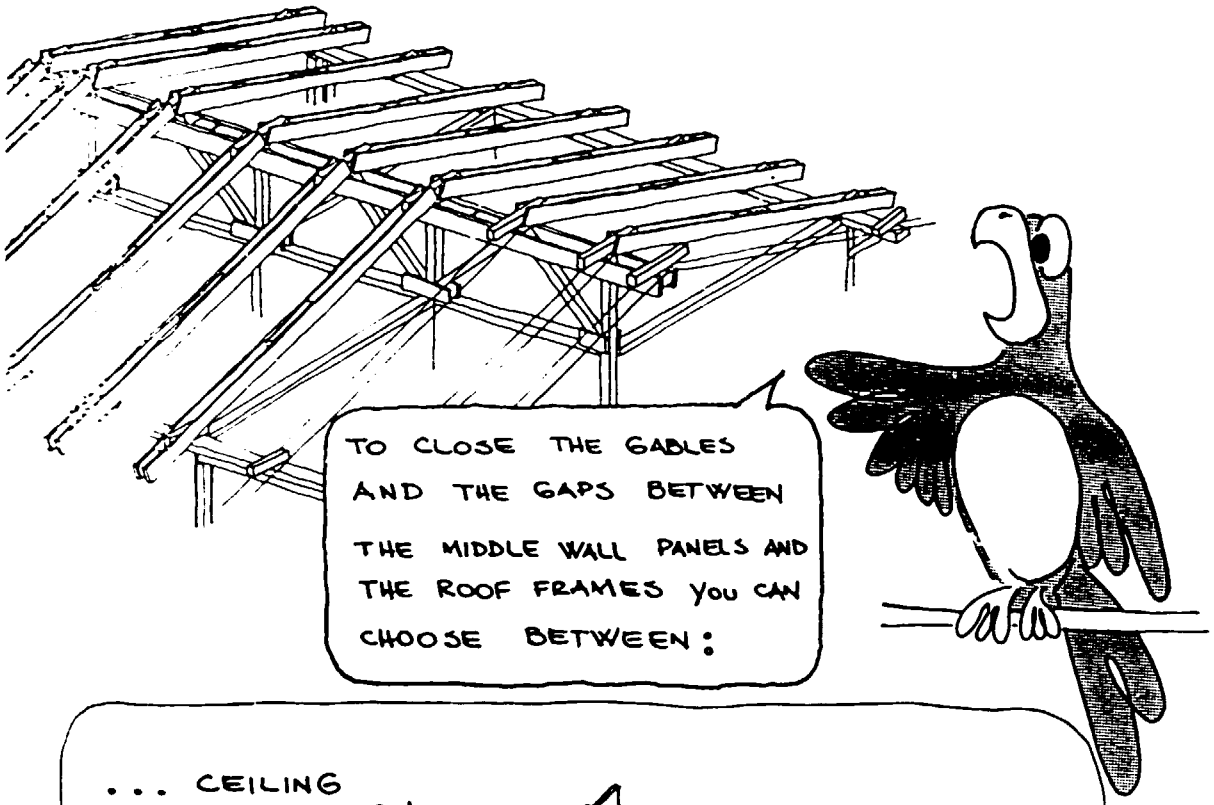


YOU POSITION THE RAFTERS FOLLOWING THE MEASUREMENTS SHOWN BELOW IF YOU ARE GOING TO COVER THE HOUSE WITH ASBESTOS-CEMENT OR ALUMINIUM SHEETS OR SIMILAR.

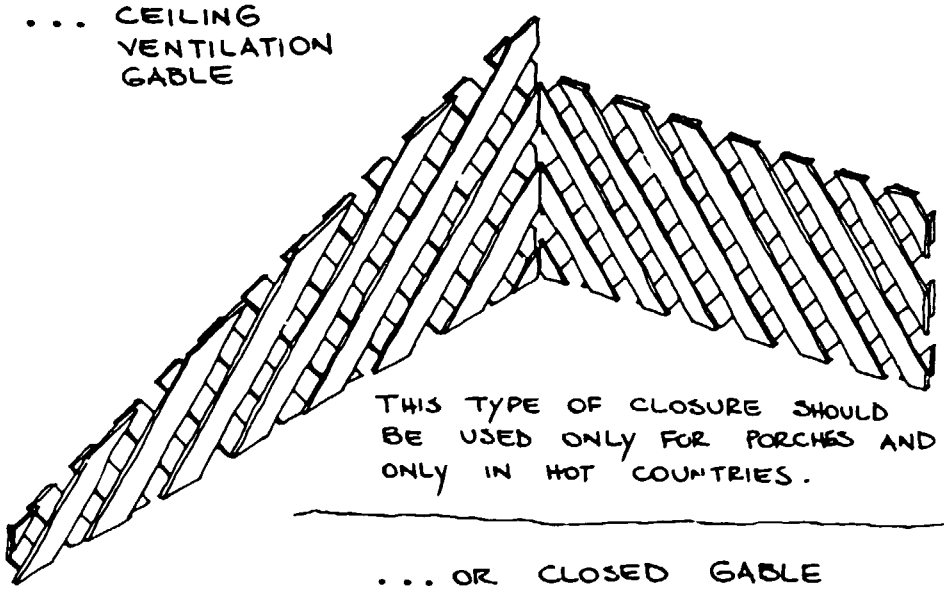


IF YOU ARE GOING TO USE CLAY ROOF TILES, THE RAFTERS HAVE A MAXIMUM SPACING OF 45 cm.





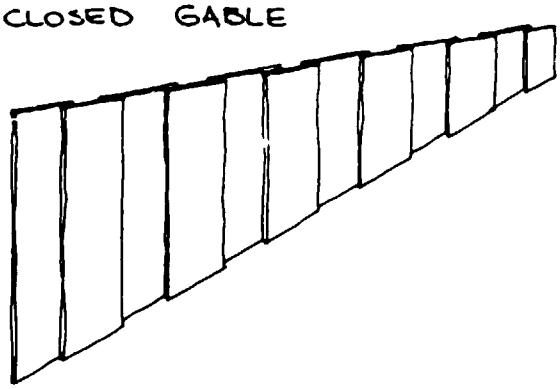
... CEILING VENTILATION GABLE

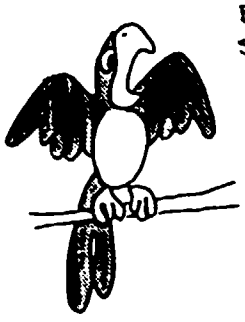


THIS TYPE OF CLOSURE SHOULD BE USED ONLY FOR PORCHES AND ONLY IN HOT COUNTRIES.

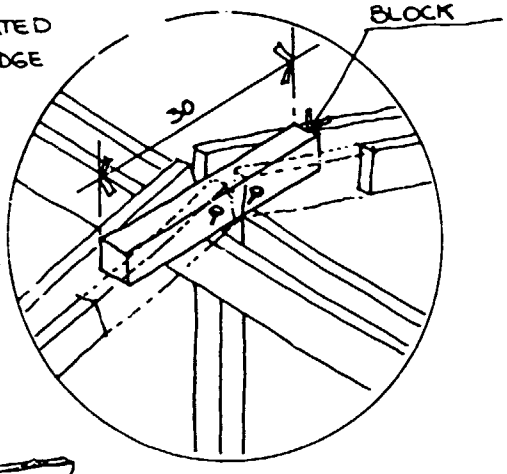
... OR CLOSED GABLE

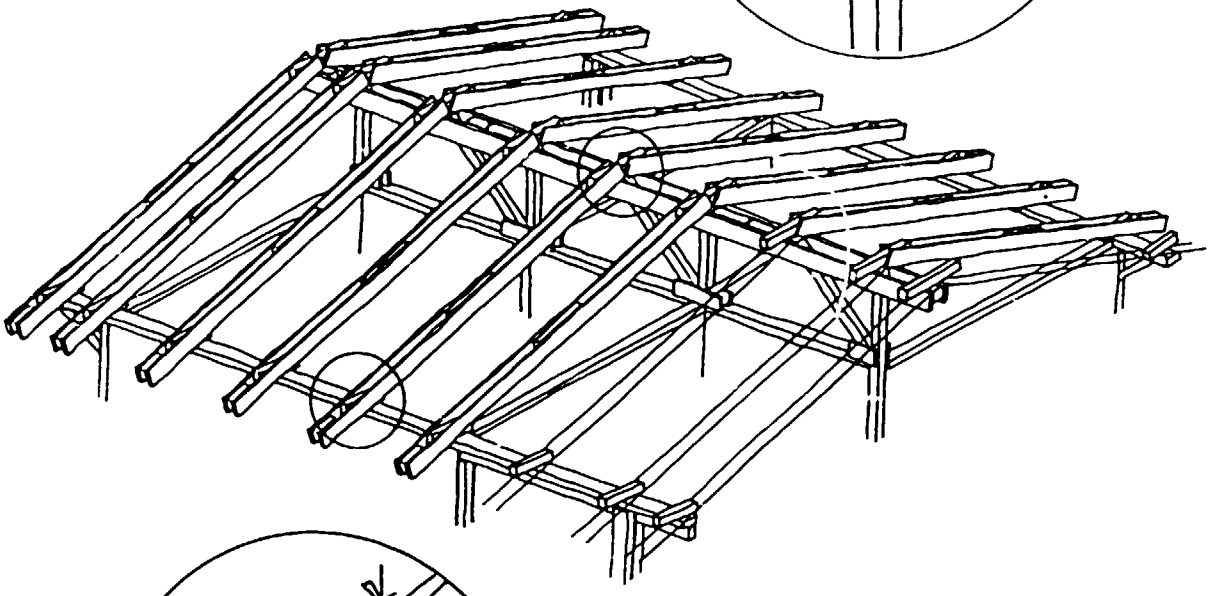
YOU USE THIS TYPE OF CLOSURE WHEN VENTILATION IS NOT NEEDED OR WHEN A PROTECTION FROM WIND AND RAIN IS NECESSARY.

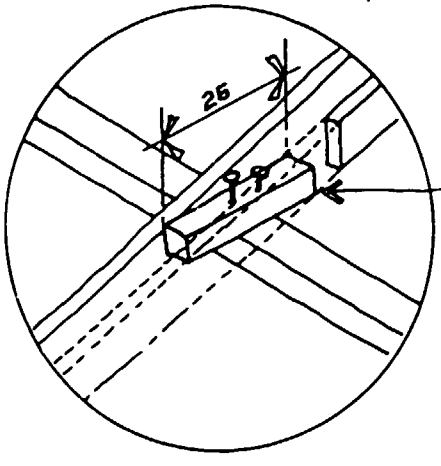




THE RAFTERS ARE LOCATED END TO END ON THE RIDGE BEAM BY A WOOD SPLICING BLOCK OF 5 x 5 x 30 cm WHICH HAS BEEN NAILED TO THE RIDGE BEAM WITH 4 ℓ=7,5 cm NAILS.

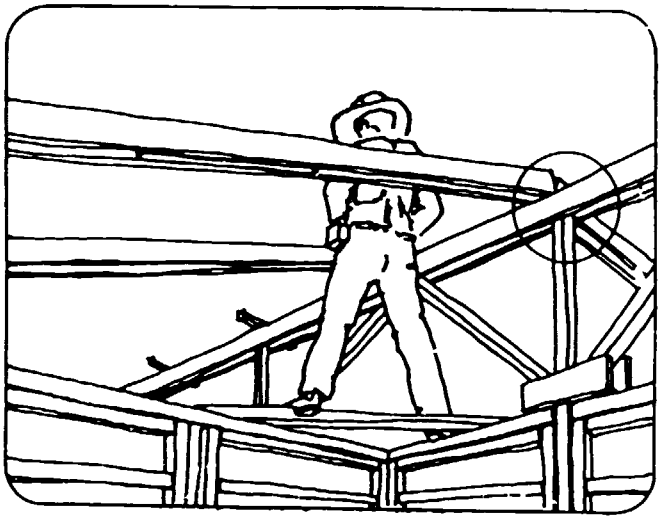


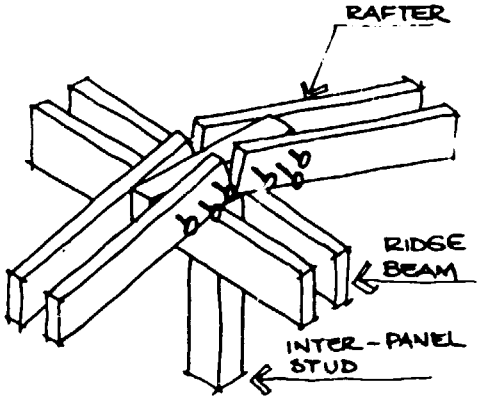


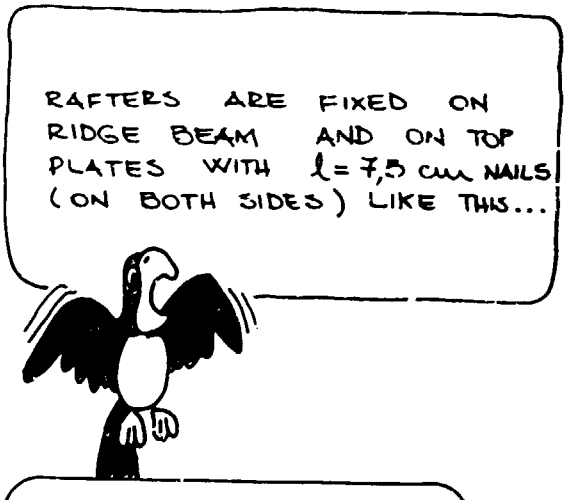


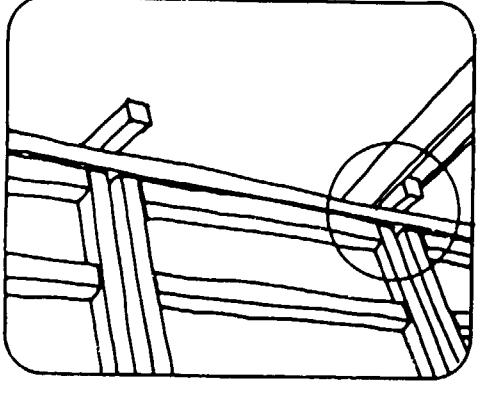
THE RAFTERS ARE LOCATED ON THE TOP PLATE BY A WOOD SPLICING BLOCK OF 5 x 5 x 25 cm NAILED TO THE TOP PLATE WITH 2 ℓ= 10 cm NAILS.

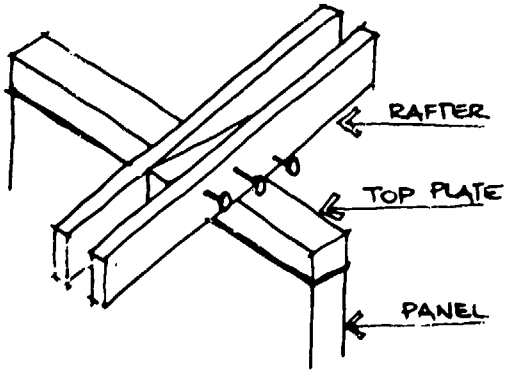

NOW YOU ARE GOING TO SEE HOW THE RAFTERS ARE FIXED.



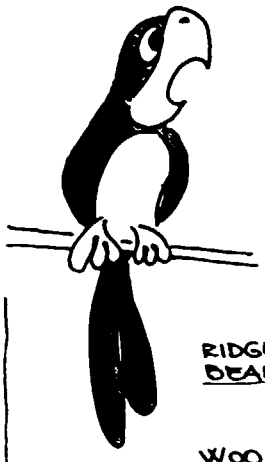

RAFTER
RIDGE BEAM
INTER-PANEL STUD


RAFTERS ARE FIXED ON RIDGE BEAM AND ON TOP PLATES WITH l = 7,5 cm NAILS (ON BOTH SIDES) LIKE THIS...

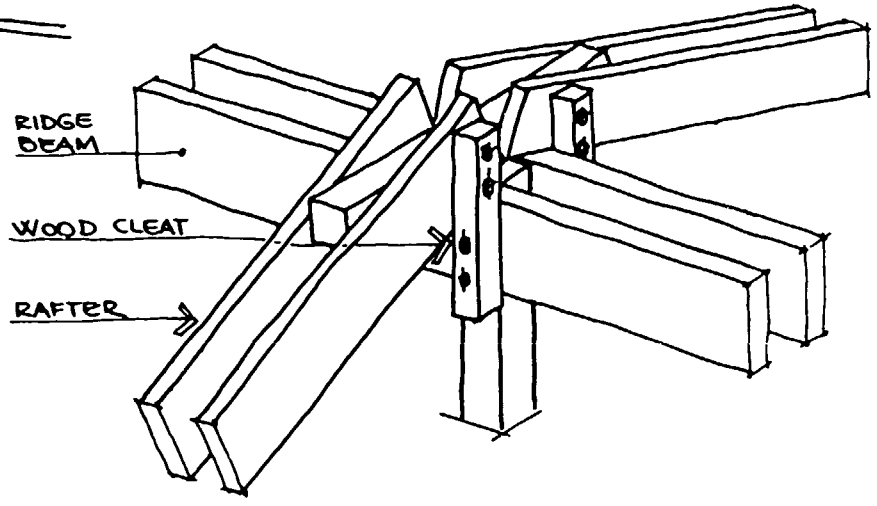


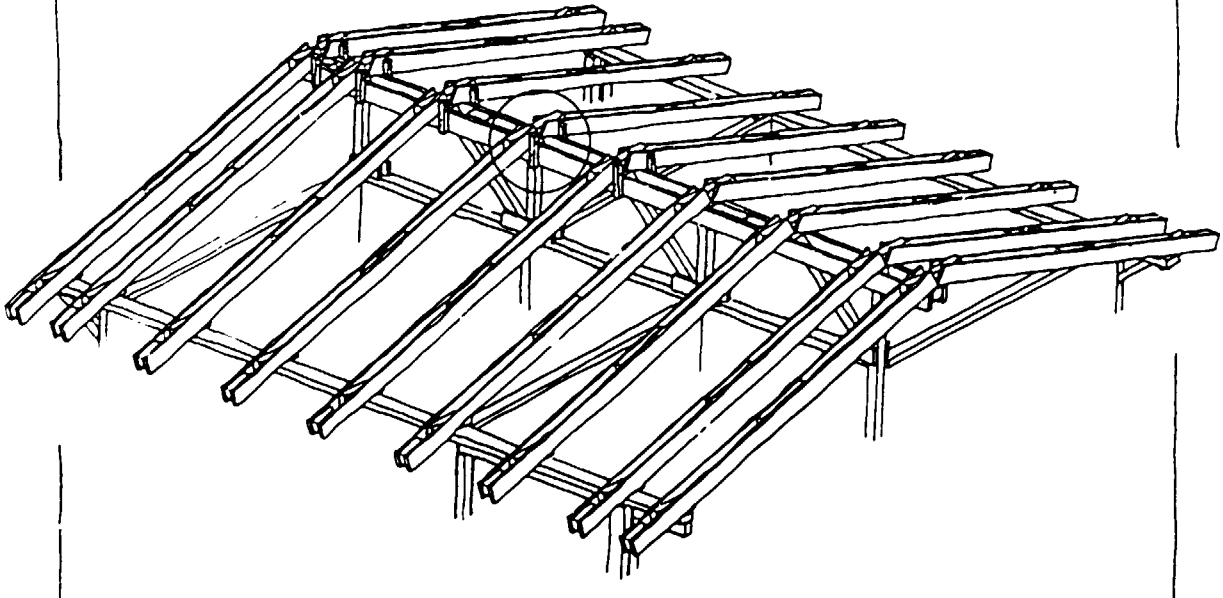

RAFTER
TOP PLATE
PANEL

ANCHORING THE RAFTERS TO RIDGE BEAM...

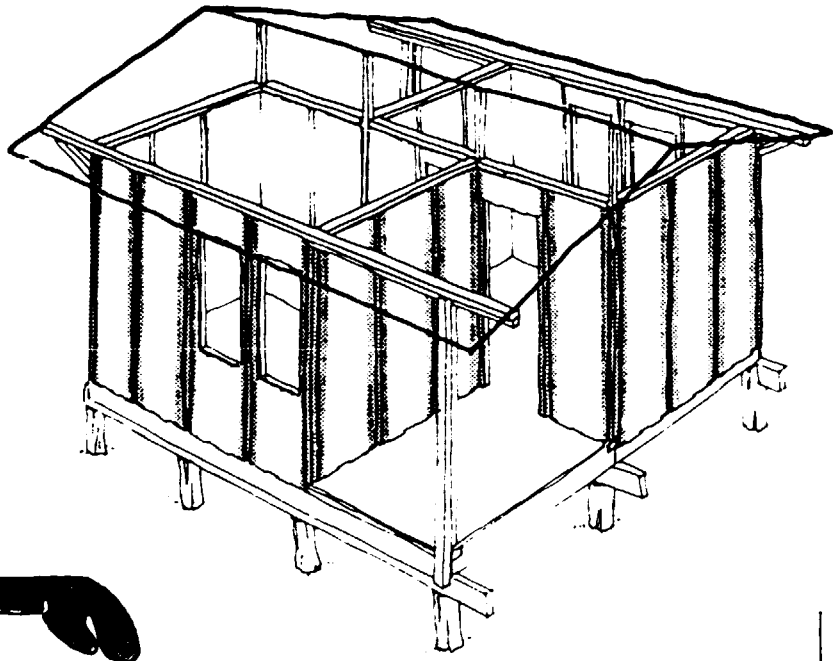


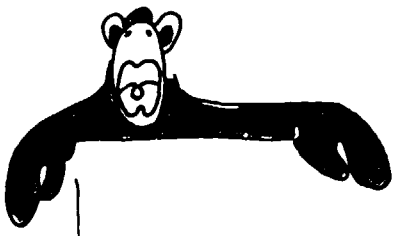
TO ANCHOR THE RAFTERS TO THE RIDGE BEAM USE TWO 5x5 cm WOOD CLEATS (OR METAL STRAPS) NAILED WITH l=8,75cm NAILS.



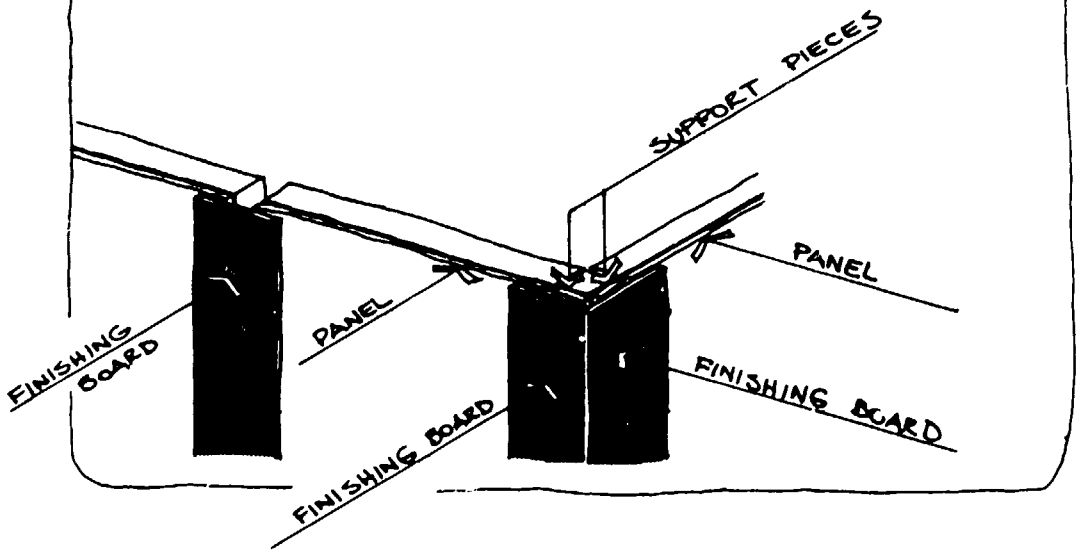


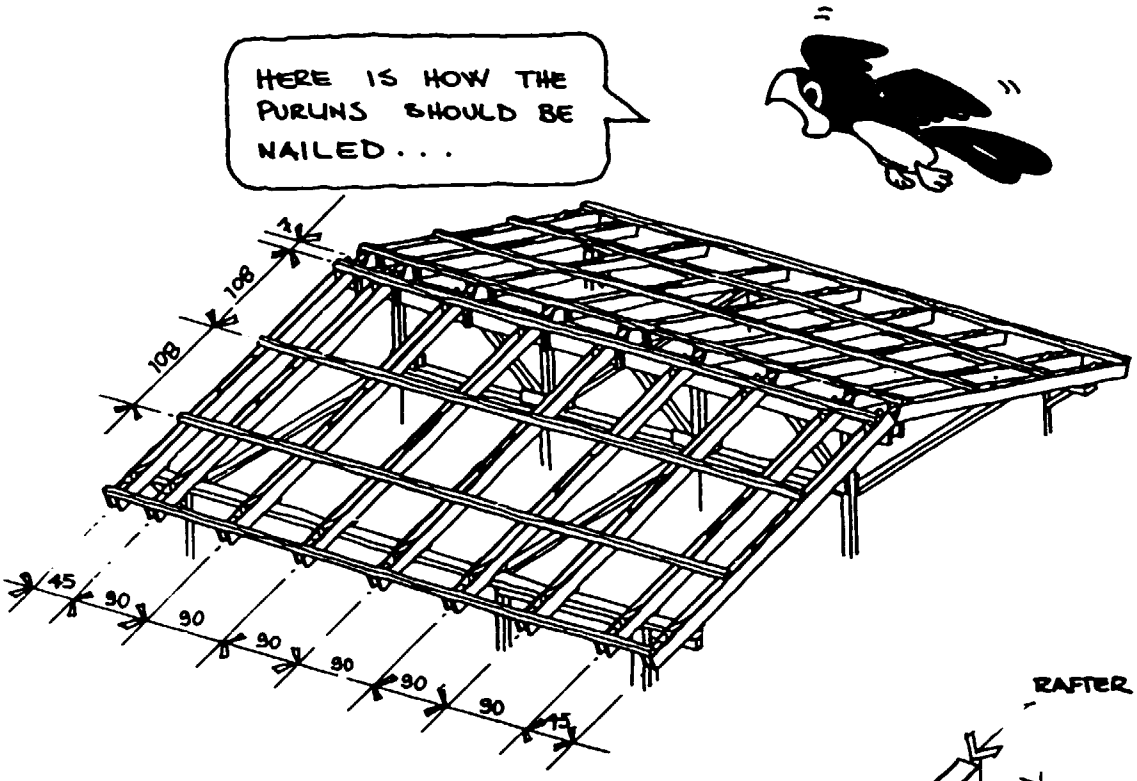
TO FINISH THE WALLS...

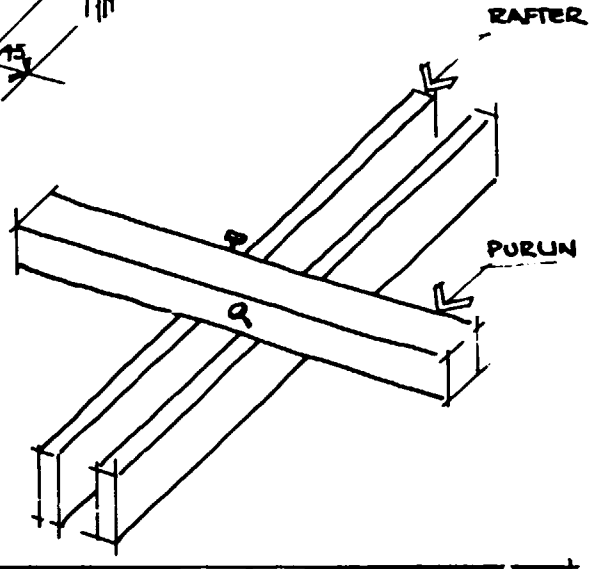




YOU COVER THE GAPS BETWEEN THE PANELS WITH BOARDS. THESE BOARDS ARE THE SAME TYPE AS USED FOR THE PANEL COVERING.

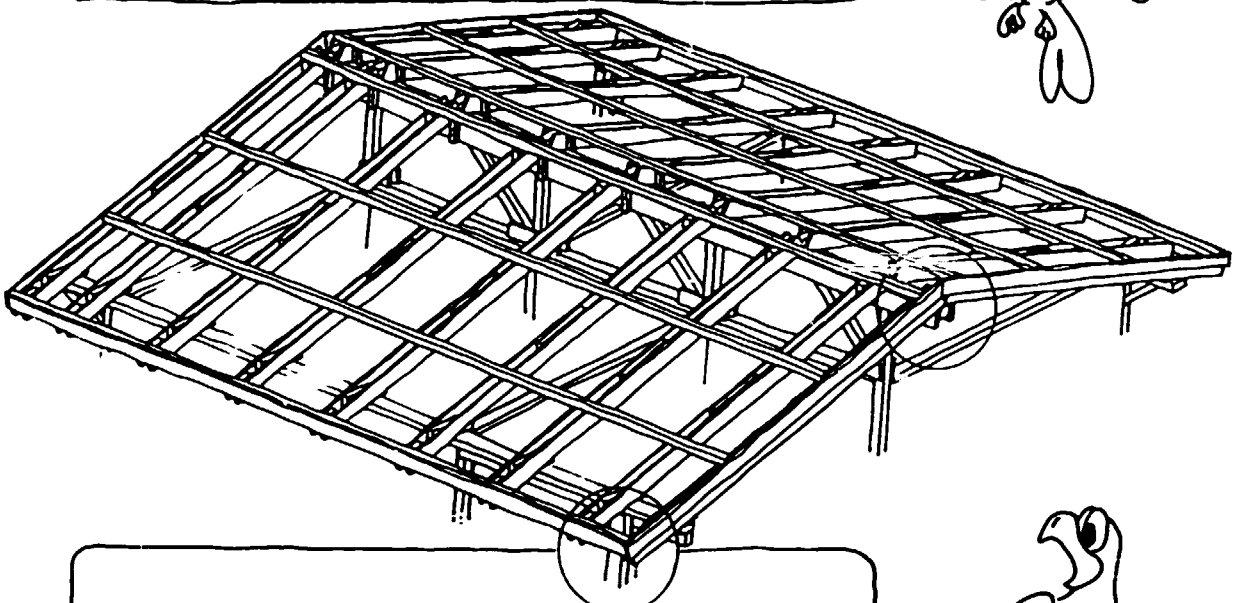



HERE IS HOW THE PURLINS SHOULD BE NAILED . . .
100
100
45
90
90
90
90
90
90
75

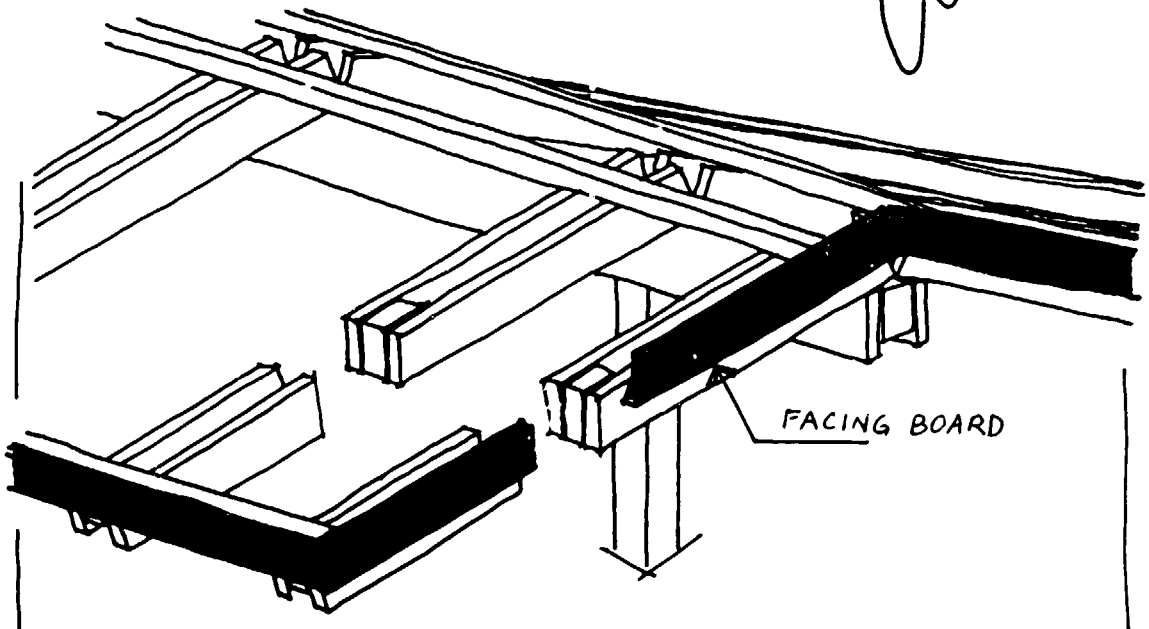

RAFTER
PURLIN

POLLY TOLD ME THAT I MUST FIX THE PURLINS WITH, AT LEAST, TWO NAILS ON EACH SUPPORT.

THE PURLINS HAVE BEEN PLACED AS RECOMMENDED BUT, BEFORE YOU CAN LAY THE TILES, THERE IS JUST ONE MORE TASK...



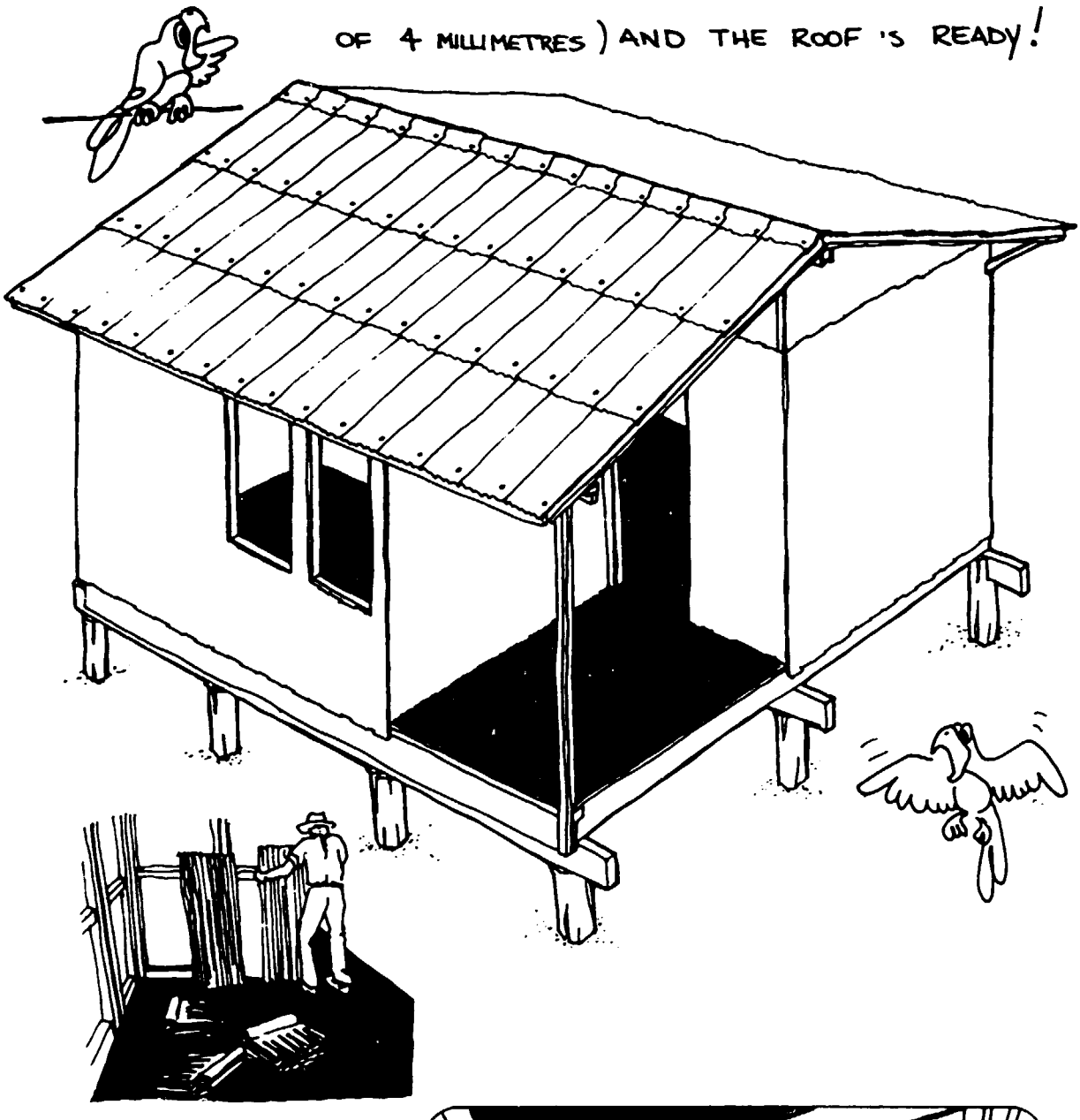
YOU NAIL FACING BOARDS (2,5 x 10 cm) ON THE ENDS OF THE PURLINS AND ROOF BEAMS.



READY !

AND NOW WE CAN LAY ON THE ROOF

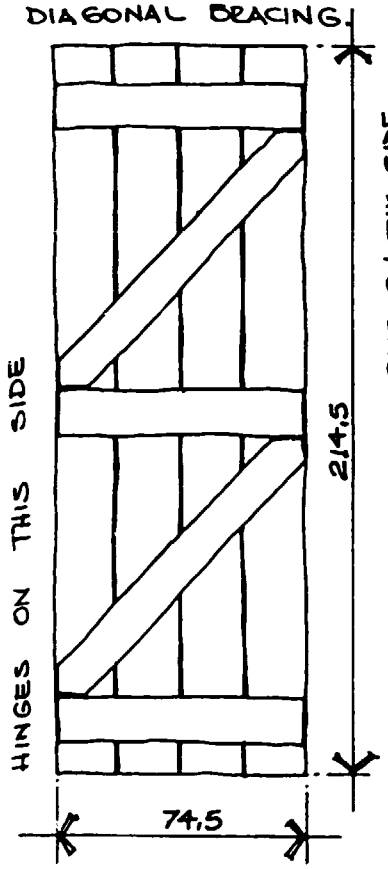
YOU FIX THE TILES (THESE CAN BE OF 4 MILLIMETRES) AND THE ROOF IS READY!



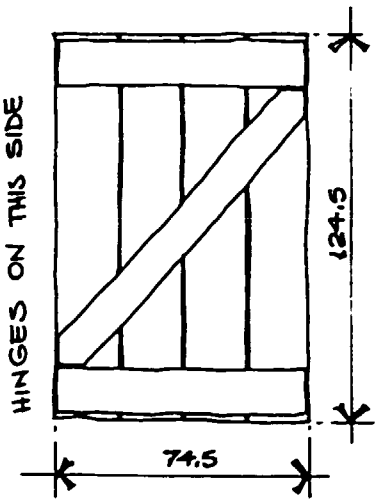
WHEN LAYING ON THE ROOF YOU MUST WALK ON BOARDS VERY CAREFULLY. DON'T FALL AND HURT YOURSELF!

DOORS AND WINDOWS !

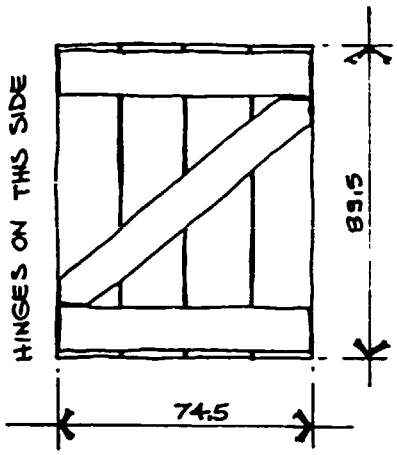
THE DOORS AND WINDOWS CAN BE BOUGHT READY MADE. YOU CAN HAVE THEM MADE TO ORDER OR EVEN MAKE THEM YOURSELF, FOLLOWING THE DRAWINGS AND DIMENSIONS GIVEN BELOW.
USE BOARDS OF 2 OR 2,5 cm THICKNESS AND, IF POSSIBLE, TONGUE AND GROOVE TYPE AND BOARDS OF 2,5 x 10 cm FOR THE CROSS PIECES AND DIAGONAL BRACING.



SHOWING INSIDE OF DOOR

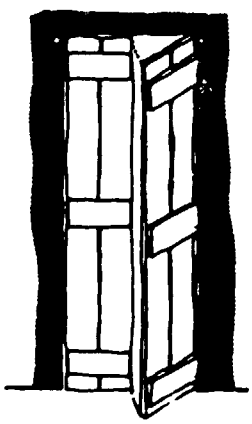


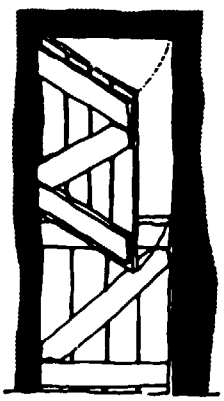
LIVING OR BEDROOM WINDOW



KITCHEN WINDOW

YOU CAN ALSO MAKE THE DOOR WITH TWO SECTIONS.

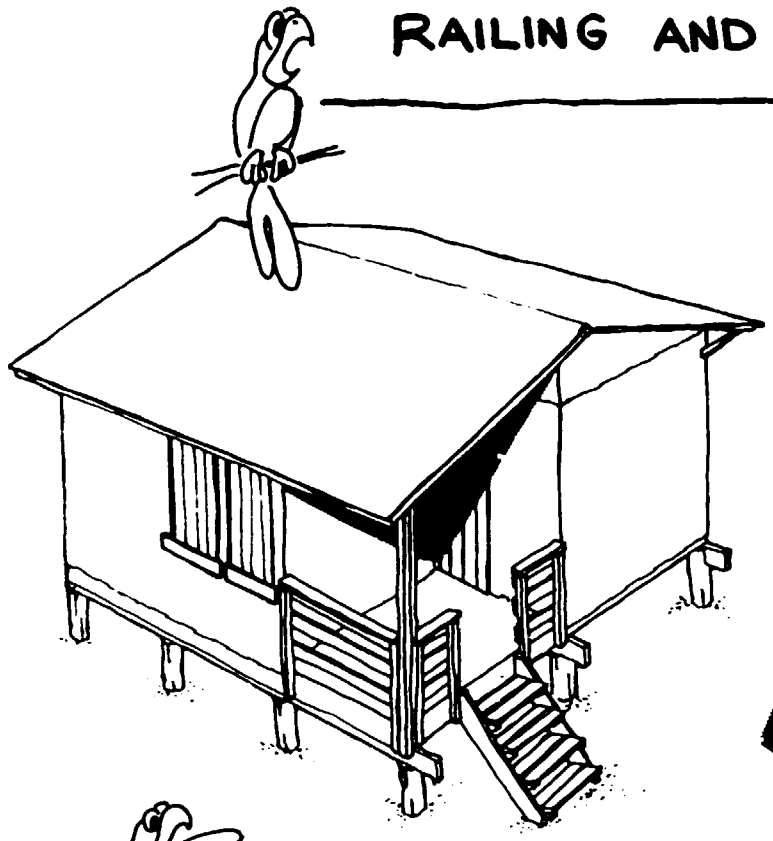




FOLLOW THE DIMENSIONS CORRECTLY !

THE WINDOWS CAN ALSO BE MADE WITH TWO SECTIONS!

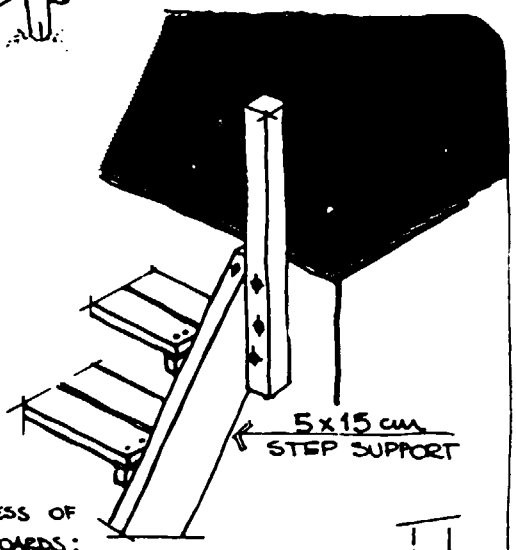
RAILING AND STAIRS!



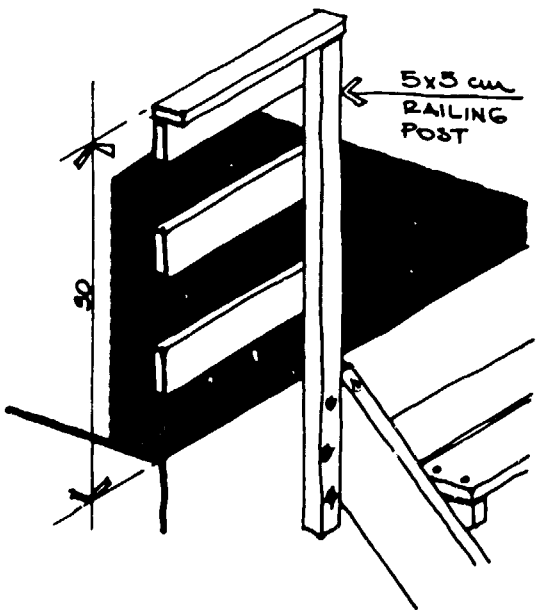
THE RAILING AND THE STAIRS CAN BE DESIGNED AND BUILT BY YOU, TOO.
SEE SKETCHES BELOW.

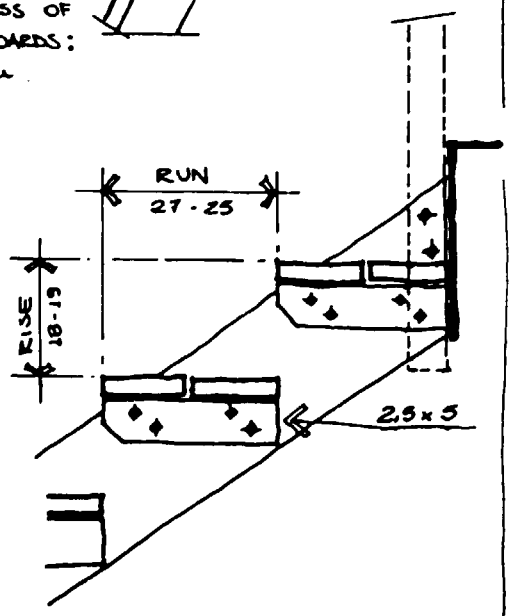
YOU CHOOSE THE POSITION OF THE STAIRS AND . . .

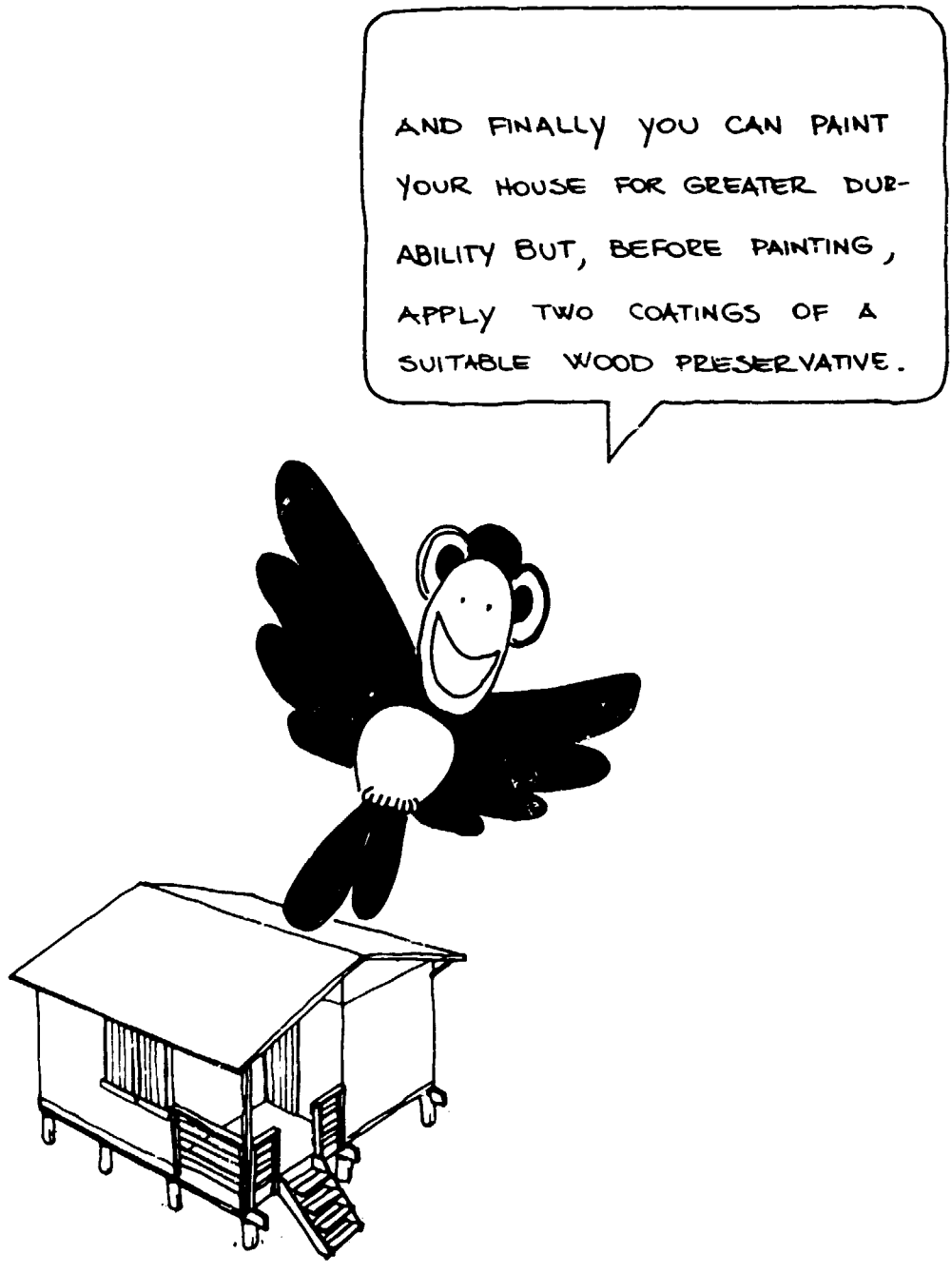
THE RAILING IS BUILT WITH 2,5 x 10 cm BOARDS NAILED TO THE RAILING POSTS WITH THREE l=5 cm NAILS.

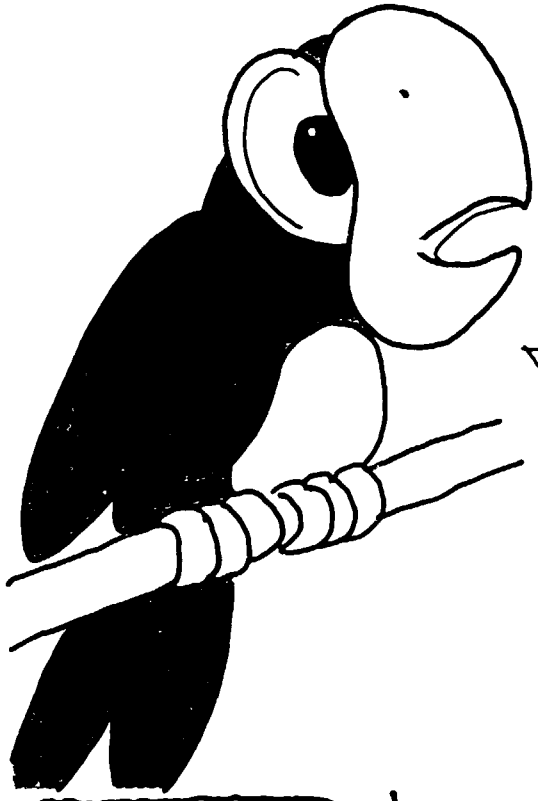


THICKNESS OF STEP BOARDS: 3,5 cm






AND FINALLY YOU CAN PAINT YOUR HOUSE FOR GREATER DURABILITY BUT, BEFORE PAINTING, APPLY TWO COATINGS OF A SUITABLE WOOD PRESERVATIVE.

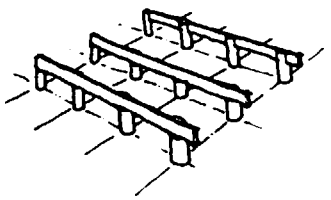


BE CAREFUL WHEN CHOOSING THE WOOD SPECIES. THE TYPES YOU CHOOSE TO MAKE YOUR HOUSE WILL DEPEND ON WHETHER YOU LIVE IN:

- **AFRICA**
- **ASIA** OR
- **LATIN AMERICA**

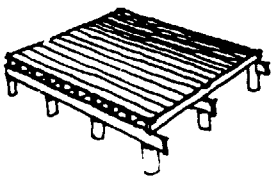
THE MOST SUITABLE TYPES OF WOOD FOR EACH REGION AND EACH FUNCTION ARE LISTED IN THE FOLLOWING TABLE.

1



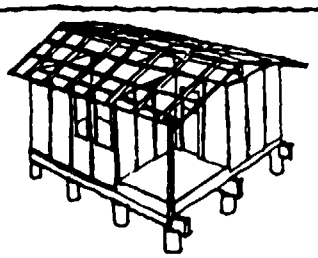
PILES AND MAIN BEAMS

2



FLOOR FRAME AND PLATFORM

3



PANELS, ROOF FRAME AND FINISHINGS

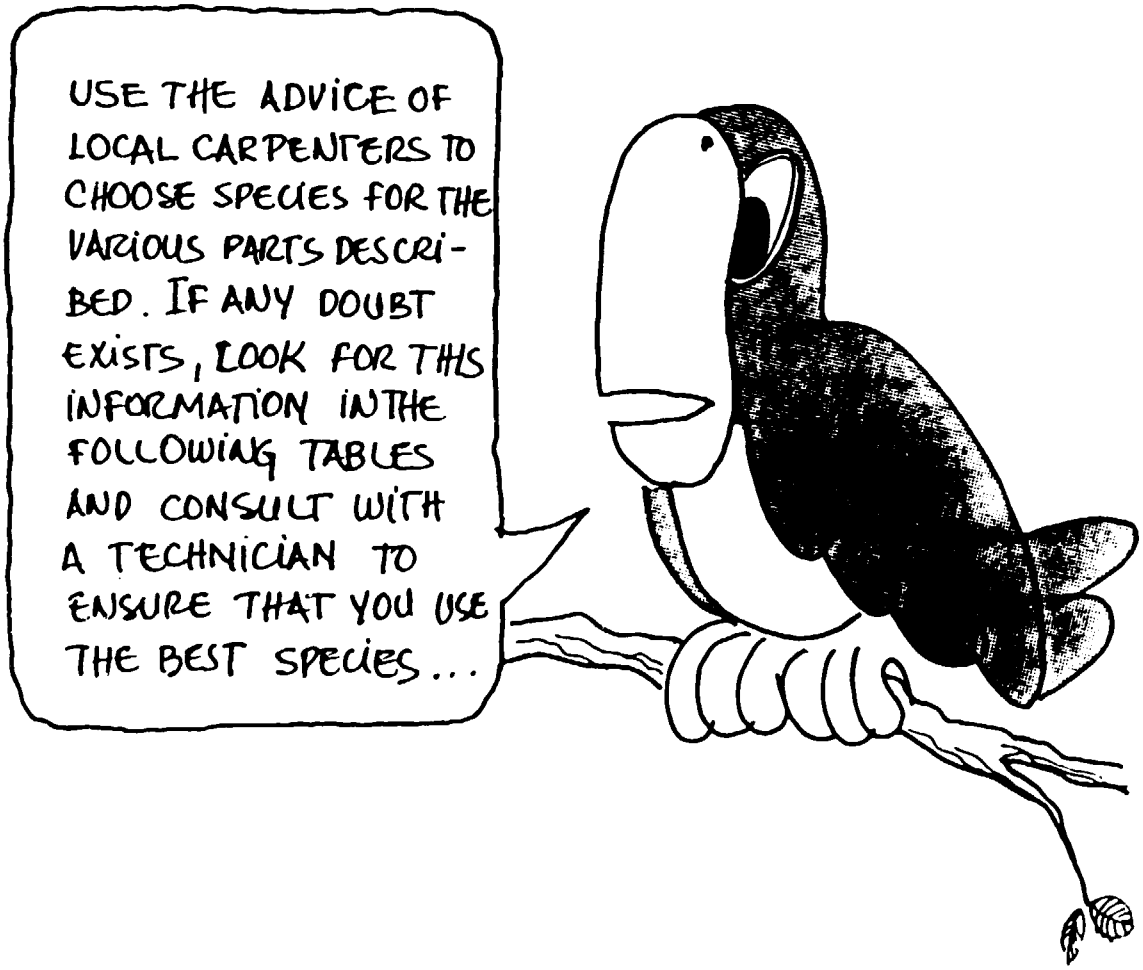

USE THE ADVICE OF LOCAL CARPENTERS TO CHOOSE SPECIES FOR THE VARIOUS PARTS DESCRIBED. IF ANY DOUBT EXISTS, LOOK FOR THIS INFORMATION IN THE FOLLOWING TABLES AND CONSULT WITH A TECHNICIAN TO ENSURE THAT YOU USE THE BEST SPECIES...

Table 1. Wood species that can be used in wooden house construction

Name and species	Where found	Common local names
	AFRICA	
1. Piles and beams		
Afzelia - Afzelia bipindensis (also A. pachyloba, A. africana and A. quanzensis)	West, Middle and East Africa	Lingué (Côte d'Ivoire, Senegal); Papao (Ghana); Apa, Aligna (Nigeria); M'Banga, Doussié (Cameroon); N'Kokongo, Doussié (Angola, Congo); Bolengu (Zaire); Pau Conta (Guinea-Bissau); Mkora, Mbembakaft (United Republic of Tanzania); Chanfuta, Mussacossa (Mozambique); Beyo, Meli, Azza (Uganda)
Danta - Nesogordonia papaverifera	East Africa, from Sierra Leone to Cameroon and northern Gabon	Otutu (Nigeria); Kotibé (Côte d'Ivoire); Owoé (Cameroon); Arborbora (Gabon); Kondo findo (Zaire); Naouya (Angola); Abumana, Ajumaba, Epro (Ghana).
Ekki - Lophira alata	West Africa	Bongossi, Bakunda (Cameroon); Azobé (West Africa); Kabu (Ghana); Eba, Ekki, Aba (Nigeria); Esoré (Côte d'Ivoire); Endwei (Sierra Leone); Akoga (Gabon); Boukole (Congo)
Opepe - Nauclea diderrichii	From Sierra Leone to the Congo and, in the East to Uganda	Jusia, Kusiaba (Ghana); Badi (Côte d'Ivoire); Bilinga, Akondoc (Cameroon); N'Gou, Masa (Angola, Congo, Zaire); Kilingi (Uganda); Aloma (Equatorial Guinea, Gabon)
2. Floor frame and platform		
Idigbo - Terminalia ivorensis a/	From Guinea to Cameroon	Black afara (Nigeria); Framiré (France, Côte d'Ivoire); Emeri (Ghana)
Guarea - Guarea cedrata G. Thompsonii	Ghana, Côte d'Ivoire, southern Nigeria	Bossé (France, Côte d'Ivoire; Kwabo Koro (Ghana); Obobo (Nigeria), Edoucié (Cameroon)

a/ Only for floors.

Name and species	Where found	Common local names
Makoré - Tieghemella heckelii	From Sierra Leone to Cameroon, Gabon and southern Cabinda	Baku (Ghana); Douka, Ukola (Gabon); Makoré (Côte d'Ivoire)
3. Panels, roof frames and finishings		
Abura - Mitragyna ciliata b/	West Africa, from Sierra Leone to the Congo and Angola	Bahia (Côte d'Ivoire); Subaha, Baya (Ghana); M'Boy (Sierra Leone); M'Boy (Liberia); Elolom (Cameroon); Elelon (Gabon), Vuku, M'Voukou (Zaire); Nzingu (Uganda, Zambia)
Agba - Gossweilerodendron balsamiferum	West Africa, southern Nigeria to the Congo basin	Achi, Egba, Emongi, Ayinre (Nigeria); Tola blanc (Congo); Tola branca (Angola), N'Tola (Zaire)
Limba - Terminalia superba	West Africa, from Sierra Leone to Angola and Zaire	Ofram (Ghana); Akom (Cameroon); Limbo, Chêne-Limbo, Fraké, Noyer du Mayombe, Korina (West Africa); Afara (Nigeria); Limba (Angola, (Zaire); N'ganga (Central African Republic)
Niangon - Tarrietia utilis	From Sierra Leone to Ghana, Cameroon and Gabon	Niankom (Ghana); Ogoué (Cameroon) De-Orh (Liberia); Yawe (Sierra Leone)
	ASIA	
1. Piles and beams		
Kapur - Dryobalanops aromatica, D. lanceolata, D. beccarii	Borneo, Sumatra, Malaysia	Keladan, Kapur (Malaysia); Kapoer (Indonesia); Kapor (Sabah)
Kempas - Koompassia malaccensis	Malaysia, Sumatra, Borneo, Indonesia	Impas (Sabah); Mengaris (Sarawak)
Keruing - Dipterocarpus Spp	Indo-Malaysian region	Keruing (Indonesia, Malaysia, Sabah, Sarawak); Gurjun (Myanmar, India); Yang (Thailand), Apitong (Philippines); Eng Or In (Myanmar); (Langan, Keroeing (Indonesia); Dau (Cambodia, Viet Nam)

b/ A preservation treatment is advisable.

Name and species	Where found	Common local names
Merbau - Intsia palembanica, I. bijuga	Indo-Malaysian region, Indonesia, Philippines Australia and western Pacific Islands	Tat-Talum (Myanmar); Lumpha, Lumpho (Thailand); Kwila (New Guinea); Vesi (Fiji Islands); Ipil (Philippines); Merbau (Malaysia)
2. Floor frame and platform		
Dark red meranti - Shorea Spp	Peninsular Malasia, Sabah and Sarawak, Indonesia and Philippines	Saya (Thailand); Red seraya (Malaysia); Meranti, Merah (Indonesia); White lauan, Almon, Mayapis (Philippines)
Kohko - Albizzia lebbek	South and South-East Asia, Myanmar, India, Malaysia and the Philippines	Siris, Siris tree, East Indian walnut
Mengkulang - Heritiera simplicifolia	India, from Malaysia to Indonesia, Philippines and other Pacific islands	Kembang (Malaysia); Kanze (Myanmar); Chuprak (Thailand); Lumsayan, Lumbayau (Philippines); Huynh (Cambodia)
Ramin - Gonystylus bancanus b/	Malaysia, Indonesia and Philippines	Melawis (Malaysia); Garu-Buaja (Indonesia); Janutan-Bagio
3. Panels, roof frame and finishings		
Geronggang - Cratoxylon arborescens b/	South-East Asia, Malaysia, Indonesia, Brunei Darussalam	Serungan (Sabah, Sarawak, Brunei Darussalam)
Krabak - Anisoptera Spp	Myanmar, Indonesia, Malaysia, New Guinea, Philippines, Thailand	Mersawa (Brunei Darussalam, Malaysia); Kanghmu Palosapis (Philippines); Phdiek (Cambodia); Ven-Ven (Viet Nam)
Light red meranti - Shorea Spp	Indonesia, Malaysia and Philippines	Light red seraya, red seraya (Malaysia); Saya (Thailand); Meranti merah (Indonesia); White lauan, Almon, Mayapis (Philippines)
White seraya - Parashorea plicata	Brunei Darussalam, Malaysia and Philippines	Bagtikan (Philippines); Urak Mata (Malaysia)

Name and species	Where found	Common local names
	LATIN AMERICA	
1. Piles and beams		
Balata - Manilkara bidentata	West Indies, Central America and northern part of South America	Chicozapote (Mexico); Ausubo (Puerto Rico, Dominican Republic); Nispero (Panama); Beefwood (Guyana); Bolletri (Suriname); Balate rouge (French Guiana); Maçaranduba (Brazil)
Courbaril - Hymenaea courbaril	South of Mexico, Central America, West Indies, Bolivia, northern part of Brazil and Peru	Cuapinol, Guapinol (Mexico); Guapinol (Central America); Locust, Kawanari (Guyana); Rode lokus (Suriname); Algarrobol (Spanish-speaking Latin America); Jutai, Jatobá, Jatai (Brazil)
Manbarklak - Eschweilera longipes	Amazon basin, Costa Rica, Guyanas and Trinidad	Oxito, Olleto (Panama); Coco de mono, Moutangero (Venezuela); Coco cristal, Tete congo (Colombia); Haudan, Kakeralli (Guyana)
Tonka - Dipteryx odorata	Brazilian Amazon Region, Colombia, Guyanas and Venezuela	Almendro (Costa Rica, Panama); Serrapia (Colombia, Venezuela); Cumaru (Brazil); Charapilla, Cumarut (Peru)
Wallaba - Eperua bijuga	Brazilian Amazon region, Guyanas and Venezuela	Palo machete (Venezuela); Wallaba, Bijlhout (Suriname); Wapa (French Guiana); Apá, Apazeiro, Jébaro (Brazil)
2. Floor frame and platform		
Angelin - Andira inermis	From south of Mexico through Central America and northern part of South America (Brazil and Peru). Also occurs in Guyana and Trinidad	Moca (Cuba, Puerto Rico); Cuilimbuco, Maquilla (Mexico); Barbosquillo, Arenillo (Panama); Rodes kabbes (Suriname); Acapurana (Brazil)
Gronfoloe - Qualea albiflora	Tropical America, from south of Mexico to Peru. Abundant in Brazil and Guyanas	Florencillo (Venezuela); Kouali, Gringnongou (French Guiana); Gronfoloe (Suriname); Quaruba, Mandioqueira (Brazil)

Name and species	Where found	Common local names
Kopie - Goupia glabra	Amazon, Colombia and Guyana	Saino, Sapino (Colombia); Kopi (Suriname); Kabukalli (Guyana); Groupie (French Guiana); Cupiúba (Brazil)
Mahoe - Hibscus elatus	Brazil, Cuba, Jamaica, Mexico, Peru and West Indies	Emajagua excelsa (Puerto Rico); Majagua, Majagua azul (Cuba); Mountain mahoe (Jamaica)
Manni - Symphonia globulifera	West Indies, Central America and northern part of South America	Barillo (Guatemala, Honduras); Cerillo (Costa Rica, Panama); Machare (Colombia); Mani, Paramán (Venezuela); Matalci (Suriname); Manni (Guyana); Breacaspi (Peru); Anani (Brazil)
Nargusta - Terminallia amazonia	From south of Mexico to Central America and northern part of South America. Also occurs in Guyana and West Indies	Almendro (Honduras); Canshán (Mexico); Amarillo carabazuelo (Panama); Guayabo léon (Colombia); Pardillo negro (Venezuela); Pau, Mulato branco (Brazil)
3. Panels, roof frame and finishing		
Determa - Ocotea rubra	Brazil's lower Amazon region, Guyana and Trinidad	Louro vermelho (Brazil); Determa (Guyana); Wana, Wane (Suriname); Grignon rouge (French Guiana)
Crabwood - Carapa guianensis	West Indies, from Cuba to Trinidad, from south Honduras, through Central America to Guyanas and Brazil, Colombia and Peru and high countries of the Orinoco in Venezuela	Cedro-macho (Venezuela); Kapra (Suriname); Figueiro, Tangaré (Ecuador); Andiroba (Brazil, Peru)
Santa Maria - Calophyllum brasiliense	West Indies and from south of Mexico, through Central America to northern part of South America	Bari, Leche de Maria (Mexico); Calaba (Panama); Aceite Maria (Colombia); Edaballi kurahara (Guyana); Balsa Maria (Bolivia); Guanandi, Jacareuba (Brazil)
Roble - Tabebuia rosea, T. heterophylla	West Indies, south of Mexico to Ecuador and Venezuela	Roble (Spanish-speaking Latin America); Amapa, Roble blanco (Mexico); Roble blanco, Roble de sabana (Costa Rica); Roble del rio (Colombia); Apamate (Venezuela)

Table 2. Characteristics of woods from Acariquara (Minquartia guianensis) and Jacareuba (Calophyllum brasiliense)

Properties	Acariquara	Jacareuba
Specific mass (density) at 12% humidity	912 kg/m^2	624 kg/m^2
Volumetric shrinkage, green-dry	14%	12.3%
Static bending strength at 12% humidity		
- Rupture modulus (MOR)	135 MPa	101 MPa
- Elastic modulus (MOE)	16,840 MPa	12,630 MPa
Compression strength along the grain at 12% humidity, maximum strength	69 MPa	48 MPa
Natural durability for fungus and termite attack	Very durable	Moderately durable
Preservability	Not treatable	Sapwood treatable; heartwood not treatable
Easiness of mechanical fixing	Regular	Good
Other observations	Difficult to work	Tendency to split and to warp

Source: Tropical Woods, No. 94 (1954) and No. 103 (1955).

Note: You can compare the characteristics of these types of wood with those of wood found in your area.

Table 3. Requisites for each type of use

Use	Requisites
Piles	High specific mass 700 kg/m^3
Beams	High to very high mechanical properties: Bending strengh Rupture modulus 121 MPa Elastic modulus 15,000 MPa Parallel compression maximum strength 56 MPa Durability: high, resistant to more than 12 years in contact with ground Preservability: easy; permeable Mechanical fixation: easy
Floor frame	Medium to high specific mass 500 kg/m^3 Medium to very high mechanical properties: Bending strength Rupture modulus 86 MPa Elastic modulus 12,000 MPa Parallel compression maximum strength 56 MPa Durability: high, resistant to more than 12 years in contact with ground Preservability: easy/permeable Mechanical fixation: easy
Joists, windows and doors, joists' header boards, inter-panel finishing boards, inter-panel studs, facias, purlins, beams, rafters and posts	Medium to low specific mass 700 kg/m^3 Volumetric shrinkage (percentage of the dimension of green wood): 13.5 % Medium mechanical properties Bending strength Rupture modulus 86 MPa Elastic modulus 12,000 MPa

Use	Requisites
than	Durability: high, resistant to more 12 years in contact with ground Preservability: easy/permeable Mechanical fixation: easy Workability: moderate to very easy

Source : Grupamento de Madeira da Amazônia por similaridade de caracteristicas e usos (Sudam, Instituto de Pesquisas Tecnológicas, 1981).

The following studies relating to wood processing industries have been prepared by the United Nations Industrial Development Organization and some have been issued as sales publications:

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