



JAMES COOK CYCLONE STRUCTURAL TESTING STATION

CYCLONE TESTING STATION

WITHDRAWAL STRENGTH OF GROOVED NAILS IN PINE

Part 2 — RECOMMENDATIONS as
BATTEN / RAFTER JOINTS

TECHNICAL REPORT No. 17

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DEPARTMENT OF CIVIL & SYSTEMS ENGINEERING
POST OFFICE JAMES COOK UNIVERSITY
TOWNSVILLE QLD 4811

CYCLONE TESTING STATION

WITHDRAWAL STRENGTH OF GROOVED NAILS IN PINE

Part 2

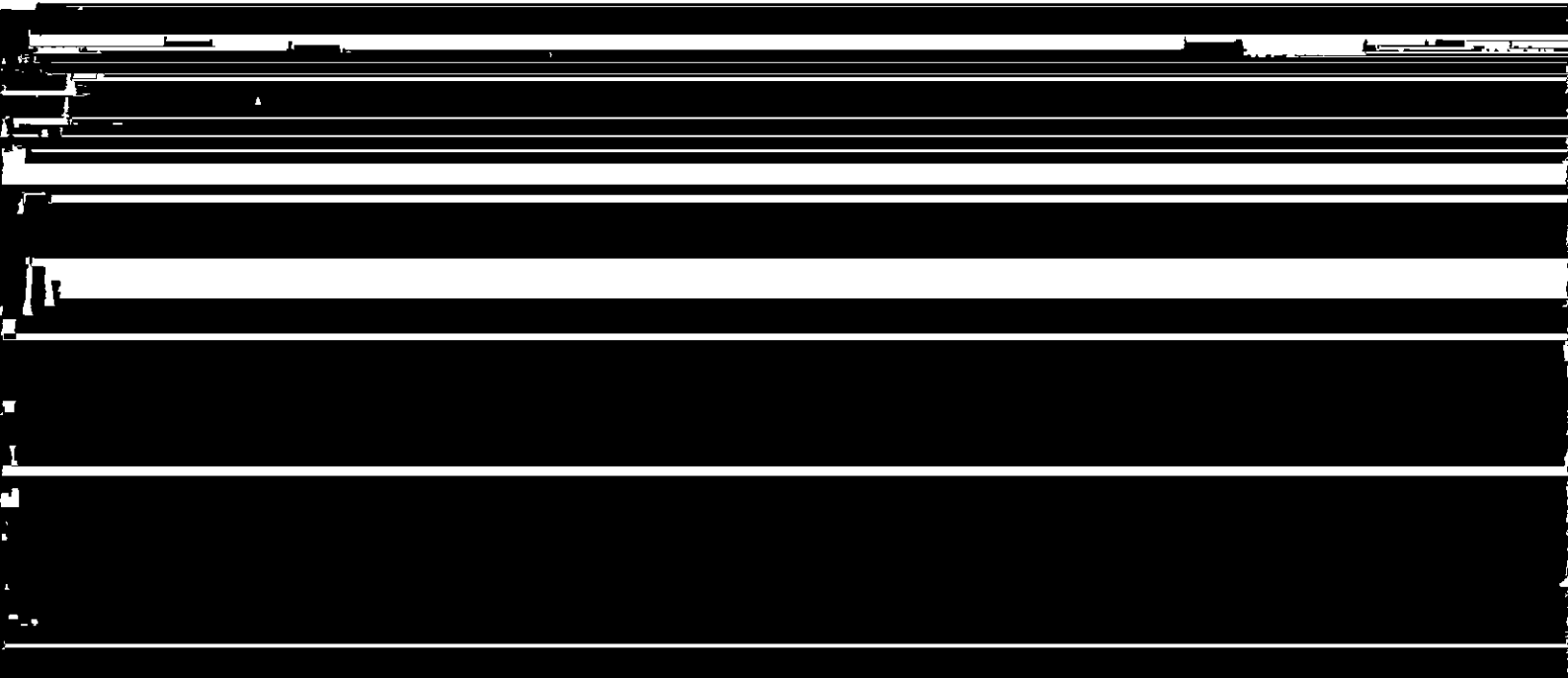
Recommendations as Batten/Rafter Joints

G.F. Reardon

Technical Report No. 17

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Reardon, G.F. (Gregory Frederick), 1937-



TECHNICAL REPORT NO 17

WITHDRAWAL STRENGTH OF GROOVED NAILS IN PINE

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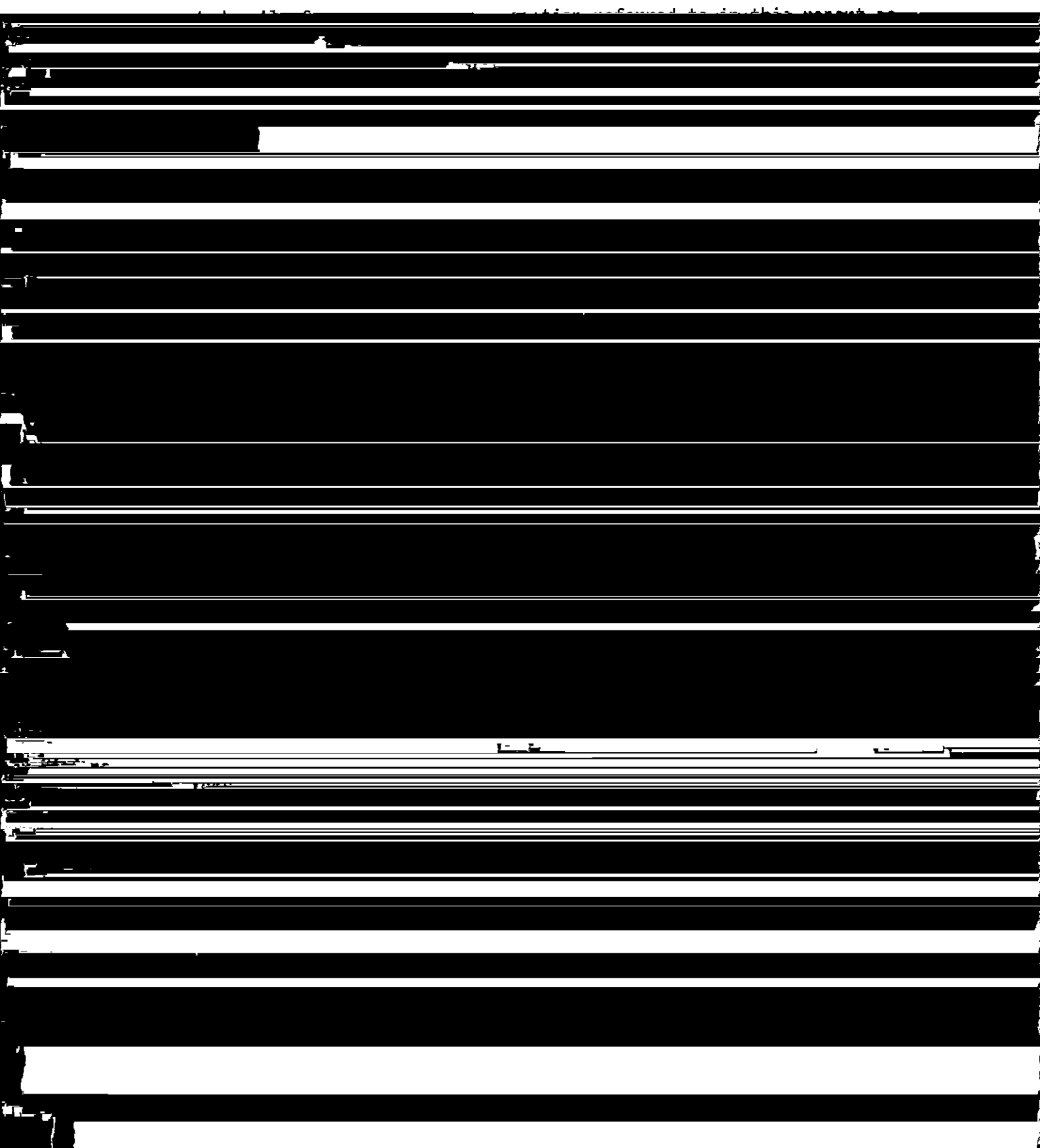
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1. INTRODUCTION

The first of the two main parts of the book is the one most important

2.1 Nail Types

The nails were all nominally 75 mm long and varied in diameter of ungrooved section from 3.15 mm to 3.75 mm. Figure 1 shows the nails tested. They were supplied by Mayne Industries (National nail), Sidney Cooke, Bostitch, Able Staples and Jambro. Two different nails were supplied by Jambro, a



The pine rafters were either 70 x 35 mm or 90 x 35 mm. The intent in dressing the battens and driving the nails flush was to ensure that each nail had the same penetration into the pine. However this intent was somewhat thwarted because the actual length varied between nail types. The hand driven nails were 75 mm from point to bottom of the head. The power driven ones measured 75 mm to the top of the head. No attempt was made to correct this apparent anomaly as it did represent the actual situation, some nails were longer than others.

Table 1 gives details of each nail type.

TABLE 1

DETAILS OF GROOVED NAILS

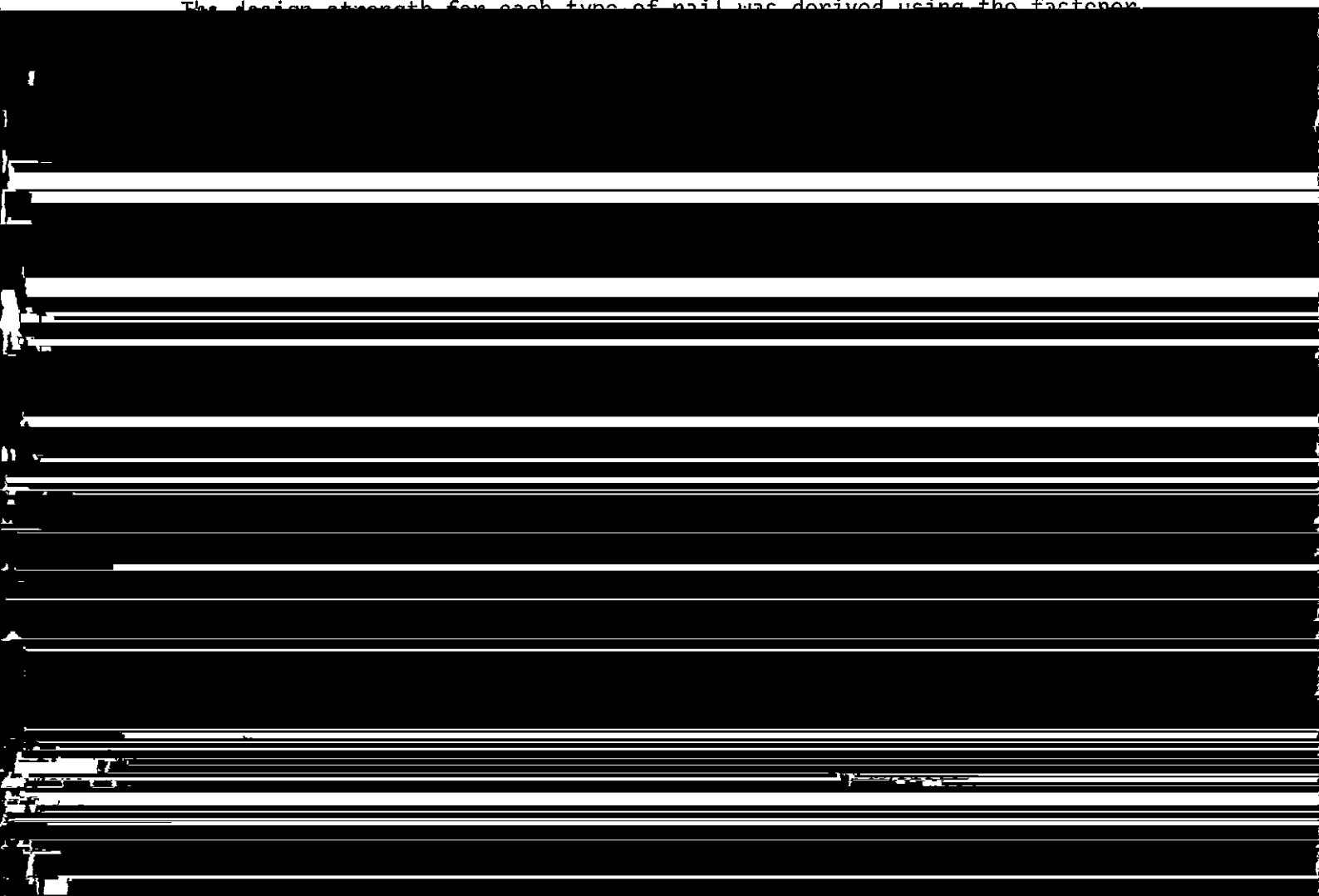
Brand	Hand or	Type of	Measurements (mm)			No. of
			Length	Shank dia.	Head dia.	

research aspect, there is little practical value in recommending separate details for joints made from each of the pine species. For the builder, the classification "seasoned pine" is sufficient. This broad classification has been used throughout this publication.

2.3 Design Strengths

2.3.1 Grooved nails

The design strength for each type of nail was derived using the fastener

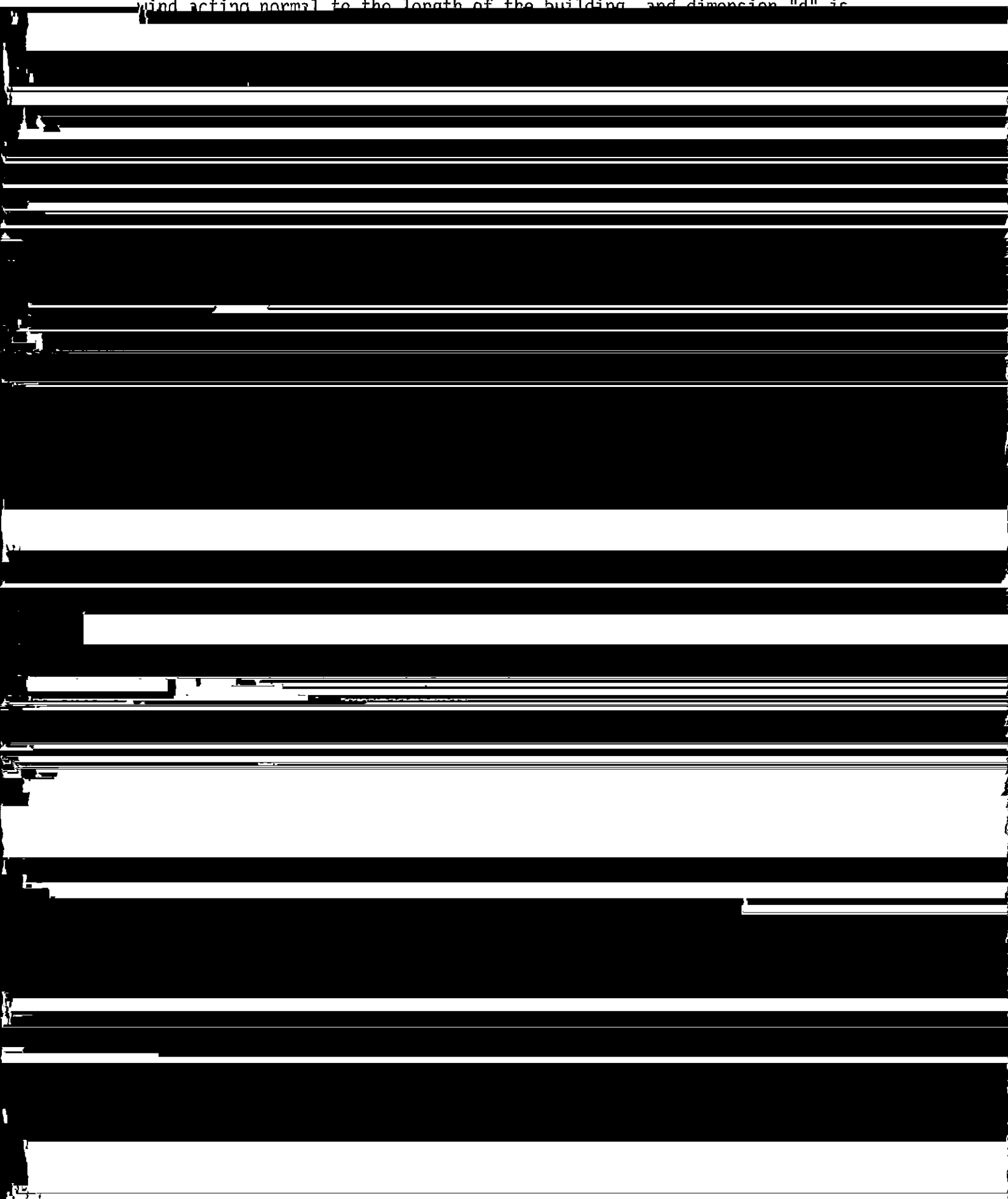


different strength. However it is suggested that the values listed in

Table 1 are for a thickness of 17-20 mm thick but there are

2 1 1 [REDACTED] 7 [REDACTED] 661-5-1-1

local zones of suction that occur near corners or at abrupt changes in slope. Figure 2 broadly indicates the Wind Loading Code requirements for roofs of low rise buildings in this regard. The sketch assumes the wind acting normal to the length of the building and dimension "d" is



and pressurizes the roof space.

The relatively short duration of wind squalls associated with thunderstorm activity means that the probability of windborne debris from the other buildings is small. Therefore, in areas not likely to be affected by tropical cyclones it is reasonable to expect house windows to remain intact during a wind storm. The internal pressure in such cases is much below the maximum used in the design for cyclone areas. For the calcul

pressure coefficient is the arithmetic sum of the two coefficients.
Table 3 summarizes total pressure coefficients for roofs, according to the provisions of AS 1170/2 - 1981.

3.1.4 Design wind speeds

Table 4 lists the basic wind speeds for a fifty year return period for the capital cities of Australia, together with the design wind speeds for 6 m height in terrain categories 1, 2 and 3.

TABLE 4

WIND SPEEDS FOR CAPITAL CITIES

City	Basic wind	Design Wind Speeds (m/s) at 6 m height for		
		Terrain	Terrain	Terrain

The draft clarifies an anomaly in the current code in respect of wind acting parallel to the length of the building. It allows progressive

TABLE 5

PRESSURE COEFFICIENTS FOR ROOFS
(from draft AS 1170/2 - 1983)

Parameters (for $\theta = 0^\circ$)	Roof pitch	Roof area code (see Figure 3)	Non cyclonic ($C_{p_i} = 0.2$)			Cyclonic ($C_{p_i} = 0.8$)		
			Cp for roof area at distance			Cp for roof area at distance		
			1h from end	2h from end	3h from end	1h from end	2h from end	3h from end
$h/d = 3/8$	10°		1.1	1.1	1.1	1.7	1.7	1.7
			1.55	1.55	1.55	2.15	2.15	2.15
			2.0	2.0	2.0	2.6	2.6	2.6
			1.1	0.7	0.6	1.7	1.3	1.2

represent typical cases. The single storey building is equivalent to a house 7 x 14 m with wall height 2.7 m above ground.

The table illustrates the influence of both transverse and longitudinal

W.A. Deutsher Pty Ltd
Jambro Pty Ltd
Mayne Industries
Sidney Cooke Fasteners Pty Ltd

7. REFERENCES

Holmes, J.D. (1978), Mean and Fluctuating Internal Pressures Induced by Wind. James Cook University, Wind Engineering Report 5/78.

TABLE A1

SUITABLE TYPES OF GROOVED NAILS
 (two nails/batten into seasoned JD4 pine rafters)

Design Wind Speed = 33 m/s (see Table 4)
 (For appropriate pressure coefficient, see Table 3 or Table 5)

Roof area Code (see	Type of	Batten Spacing	Joint Type* for Rafter Spacing of (mm)
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TABLE A2

SUITABLE TYPES OF GROOVED NAILS

TABLE A3

SUITABLE TYPES OF GROOVED NAILS
(two nails/batten into seasoned JD4 pine rafters)

Design Wind Speed = 33 m/s (see Table 4)
(For appropriate pressure coefficient, see Table 3 or Table 5)

Roof area Code (see Fig. 2 or Fig. 3)	Type of Roofing	Batten Spacing (mm)	Joint Type* for Rafter Spacing of (mm)			
			450	600	900	1200

TABLE A4

SUITABLE TYPES OF GROOVED NAILS

1. The first step in the process is to identify the problem or issue that needs to be addressed. This involves gathering information and understanding the context of the problem.

2. Once the problem is identified, the next step is to define the objectives and goals of the project. This helps to clarify what needs to be achieved and provides a clear direction for the team.

3. The third step is to develop a plan or strategy to address the problem. This involves breaking down the problem into smaller, manageable tasks and determining the resources needed to complete each task.

4. The fourth step is to implement the plan. This involves assigning tasks to team members, setting deadlines, and monitoring progress to ensure that the project is on track.

5. The final step is to evaluate the results of the project. This involves comparing the actual outcomes with the objectives and goals to determine the effectiveness of the project and identify areas for improvement.

TABLE A5

SUITABLE TYPES OF GROOVED NAILS

TABLE A6

SUITABLE TYPES OF GROOVED NAILS
(two nails/batten into seasoned JD4 pine rafters)

Design Wind Speed = 41 m/s (see Table 4)

(For appropriate pressure coefficient, see Table 3 or Table 5)

Roof area Code (see Fig. 2 or Fig. 3)	Type of Roofing	Batten Spacing (mm)	Joint Type* for Rafter Spacing of (mm)			
			450	600	900	1200
 $C_p = 0.95$	heavy tile	330	A	A	A	A
	metal tile	370	A	A	A	B
	sheet	600	A	A	B	B
	sheet	900	B	B	C	D
	sheet	1200	B	B	D	NS

TABLE A7

SUITABLE TYPES OF GROOVED NAILS
(two nails/batten into seasoned JD4 pine rafters)

Design Wind Speed = 41 m/s (see Table 4)

(For appropriate pressure coefficient, see Table 3 or Table 5)

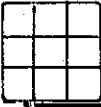
Roof area Code (see Fig. 2 or Fig. 3)	Type of Roofing	Batten Spacing (mm)	Joint Type* for Rafter Spacing of (mm)			
			450	600	900	1200
 Cp = 1.1	heavy tile	330	A	A	A	A
	metal tile	370	A	A	B	B
	sheet	600	A	B	B	C
	sheet	900	B	B	D	E
	sheet	1200	B	C	E	NS
 Cp = 1.55	heavy tile	330	A	A	A	B
	metal tile	370	A	A	B	B
	sheet	600	B	B	C	E
	sheet	900	B	C	E	NS
	sheet	1200	C	E	NS	NS
	heavy tile	330	A	A	B	B
	metal tile	370	A	B	B	D
	sheet	600	B	B	E	NS

TABLE A8

SUITABLE TYPES OF GROOVED NAILS
 (two nails/batten into seasoned JD4 pine rafters)

Design Wind Speed = 41 m/s (see Table 4)

Roof area	Type	Batten	Joint Type*
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TABLE A9

SUITABLE TYPES OF GROOVED NAILS
(two nails/batten into seasoned JD4 pine rafters)

Design Wind Speed = 47 m/s (see Table 4)

(For appropriate pressure coefficient, see Table 3 or Table 5)

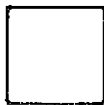
Roof area Code (see Fig. 2 or Fig. 3)	Type of Roofing	Batten Spacing (mm)	Joint Type* for Rafter Spacing of (mm)			
			450	600	900	1200
 $C_p = 0.7$	heavy tile	330	A	A	A	A
	metal tile	370	A	A	A	B
	sheet	600	A	A	B	B
	sheet	900	A	B	B	D
	sheet	1200	B	B	D	NS
 $C_p = 0.95$	heavy tile	330	A	A	A	B
	metal tile	370	A	A	B	B
	sheet	600	A	B	B	D
	sheet	900	B	B	E	NS
	sheet	1200	B	D	NS	NS
	heavy tile	330	A	A	A	B

TABLE A10

SUITABLE TYPES OF GROOVED NAILS
(two nails/batten into seasoned JD4 pine rafters)

Design Wind Speed = 47 m/s (see Table 4)

TABLE A11

SUITABLE TYPES OF GROOVED NAILS
 (two nails/batten into seasoned JD4 pine rafters)

Design Wind Speed = 47 m/s (see Table 4)

(For appropriate pressure coefficient, see Table 3 or Table 5)

Roof area Code (see Fig. 2 or Fig. 3)	Type of Roofing	Batten Spacing (mm)	Joint Type* for Rafter Spacing of (mm)			
			450	600	900	1200
	heavy tile	330	A	A	A	B
	metal tile	370	A	A	B	B
	sheet	600	B	B	C	E

TABLE A12

SUITABLE TYPES OF GROOVED NAILS
(two nails/batten into seasoned JD4 pine rafters)

Design Wind Speed = 47 m/s (see Table 4)

(For appropriate pressure coefficient, see Table 3 or Table 5)

Roof area Code (see Fig. 2 or Fig. 3)	Type of Roofing	Batten Spacing (mm)	Joint Type* for Rafter Spacing of (mm)			
			450	600	900	1200
	heavy tile	330	A	A	B	B

TABLE A 13

SUITABLE TYPES OF GROOVED NAILS
(two nails/batten into seasoned JD4 pine rafters)

Design Wind Speed = 52 m/s (see Table 4)

Roof area Code (see Fig. 2 or Fig. 3)	Type of Roofing	Batten Spacing (mm)	Joint Type* for Rafter Spacing of (mm)			
			450	600	900	1200
	heavy tile	330	A	A	A	A
	metal tile	370	A	A	A	B
	sheet	600	A	B	B	C
	sheet	900	B	B	D	E

TABLE A 14

SUITABLE TYPES OF GROOVED NAILS
 (two nails/batten into seasoned JD4 pine rafters)

Design Wind Speed = 52 m/s (see Table A)

TABLE A 15

SUITABLE TYPES OF GROOVED NAILS
(two nails/batten into seasoned JD4 pine rafters)

Design Wind Speed = 52 m/s (see Table 4)

(For appropriate pressure coefficient, see Table 3 or Table 5)

TABLE A16

SUITABLE TYPES OF GROOVED NAILS
 (two nails/batten into seasoned JD4 pine rafters)

Design Wind Speed = 52 m/s (see Table 4)
 (For appropriate pressure coefficient, see Table 3 or Table 5)

Roof area	Type	Batten	Joint Type*

TABLE A17

SUITABLE TYPES OF GROOVED NAILS

(two nails/batten into seasoned JD4 pine rafters)

Design Wind Speed = 42 m/s (see Table 4)

(For appropriate pressure coefficient, see Table 3 or Table 5)

15

TABLE A 18

SUITABLE TYPES OF GROOVED NAILS
(two nails/batten into seasoned JD4 pine rafters)

Design Wind Speed = 42m/s (see Table 4)
(For appropriate pressure coefficient, see Table 3 or Table 5)

Roof area Code (see Fig. 2 or Fig. 3)	Type of Roofing	Batten Spacing (mm)	Joint Type* for Rafter Spacing of (mm)			
			450	600	900	1200

TABLE A 19

SUITABLE TYPES OF GROOVED NAILS
(two nails/batten into seasoned JD4 pine rafters)

Design Wind Speed = 42 m/s (see Table 4)

TABLE A 20

SUITABLE TYPES OF GROOVED NAILS
(two nails/batten into seasoned JD4 pine rafters)

Design Wind Speed = 42 m/s (see Table 4)
(For appropriate pressure coefficient, see Table 3 or Table 5)

Roof area Code (see Fig. 2 or Fig. 3)	Type of Roofing	Batten Spacing (mm)	Joint Type* for Rafter Spacing of (mm)			
			450	600	900	1200
 Cp = 2.1	heavy tile	330	A	B	B	C
	metal tile	370	B	B	C	D
	sheet	600	B	C	E	NS
	sheet	900	D	E	NS	NS
	sheet	1200	E	NS	NS	NS

TABLE A 21

SUITABLE TYPES OF GROOVED NAILS
(two nails/batten into seasoned JD4 pine rafters)

Design Wind Speed = 51 m/s (see Table 4)

(For appropriate pressure coefficient, see Table 3 or Table 5)

Roof area Code (see Fig. 2 or Fig. 3)	Type of Roofing	Batten Spacing (mm)	Joint Type* for Rafter Spacing of (mm)			
			450	600	900	1200
 $C_p = 1.3$	heavy tile	330	A	A	B	B
	metal tile	370	A	B	B	D
	sheet	600	B	B	E	NS
	sheet	900	C	E	NS	NS
	sheet	1200	E	NS	NS	NS
 $C_p = 1.55$	heavy tile	330	A	B	B	C
	metal tile	370	B	B	C	E
	sheet	600	B	D	NS	NS
	sheet	900	D	NS	NS	NS
	sheet	1200	NS	NS	NS	NS

TABLE A 22

SUITABLE TYPES OF GROOVED NAILS
(two nails/batten into seasoned JD4 pine rafters)

Design Wind Speed = 51 m/s (see Table 4)
(For appropriate pressure coefficient, see Table 3 or Table 5)

Roof area Code (see Fig. 2 or Fig. 3)	Type of Roofing	Batten Spacing (mm)	Joint Type* for Rafter Spacing of (mm)			
			450	600	900	1200
	heavy tile	330	A	B	B	C
	metal tile	370	B	B	C	E
	sheet	600	B	D	NS	NS
	sheet	900	D	NS	NS	NS

TABLE A 23

SUITABLE TYPES OF GROOVED NAILS
 (two nails/batten into seasoned JD4 pine rafters)

Design Wind Speed = 51 m/s (see Table 4)
 (For appropriate pressure coefficient, see Table 3 or Table 5)

Roof area	Type	Batten	Joint Type*
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TABLE A 24

SUITABLE TYPES OF GROOVED NAILS
(two nails/batten into seasoned JD4 pine rafters)

Design Wind Speed = 51 m/s (see Table 4)

(For minimum pressure coefficient see Table 2 or Table 5)

TABLE A 26

SUITABLE TYPES OF GROOVED NAILS
(two nails/batten into seasoned JD4 pine rafters)

Design Wind Speed = 50 m/s (see Table A)

TABLE A 27

SUITABLE TYPES OF GROOVED NAILS
(two nails/batten into seasoned JD4 pine rafters)

~~Design Wind Speed - 60 mph (see Table A)~~

TABLE A 28

SUITABLE TYPES OF GROOVED NAILS
(two nails/batten into seasoned JD4 pine rafters)

Design Wind Speed = 60 m/s (see Table 4)
(For appropriate pressure coefficient, see Table 3 or Table 5)

Roof area Code (see	Type of	Batten Spacing	Joint Type* for Rafter Spacing of (mm)
			450 + 600 + 900 + 1200

TABLE A 29

SUITABLE TYPES OF GROOVED NAILS
 (two nails/batten into seasoned JD4 pine rafters)

Roof area Code (see Table A 28) Batten Spacing (mm) Joint Type* for Rafter Spacing of (mm)

Roof area Code (see	Type of	Batten Spacing	Joint Type* for Rafter Spacing of (mm)
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TABLE A 30

SUITABLE TYPES OF GROOVED NAILS
 (two nails/batten into seasoned JD4 pine rafters)

Design Wind Speed = 65 m/s (see Table 4)
 (For appropriate pressure coefficient, see Table 3 or Table 5)

Roof area Code (see	Type of	Batten Spacing	Joint Type* for Rafter Spacing of (mm)
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TABLE A 31

SUITABLE TYPES OF GROOVED NAILS
(two nails/batten into seasoned JD4 pine rafters)

Design Wind Speed = 65 m/s (see Table 4)
(For appropriate pressure coefficient, see Table 3 or Table 5)

Def. used	Type	Batten	Joint Type*
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TABLE A 32

SUITABLE TYPES OF GROOVED NAILS
 (two nails/batten into seasoned JD4 pine rafters)

Design Wind Speed = 65 m/s (see Table 4)
 (For appropriate pressure coefficient, see Table 3 or Table 5)

Roof area	Type	Batten	Joint Type*
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