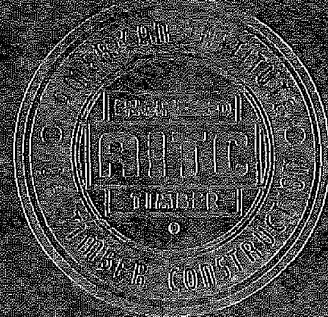


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TIMBER CONSTRUCTION MANUAL

FOURTH EDITION



AMERICAN INSTITUTE OF TIMBER CONSTRUCTION

RESERVE

TIMBER CONSTRUCTION MANUAL

FOURTH EDITION
1994

AMERICAN INSTITUTE OF TIMBER
CONSTRUCTION

Englewood, Colorado



A WILEY-INTERSCIENCE PUBLICATION

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PREFACE

The first edition of the American Institute of Timber Construction (AITC) *Timber Construction Manual* was published in 1966. Changes in the wood products industry, technological advances, and improvements in the structural timber fabricating industry have necessitated several revisions of the *Manual*.

New lumber sizes and revisions in grading requirements for lumber and glued laminated timber were reflected in the second edition published in 1974. The third edition was published in 1985 to reflect new information on timber design methods. This edition of the manual contains the latest design procedures used for timber construction.

The American Institute of Timber Construction has developed this *Timber Construction Manual* for convenient reference by architects, engineers, contractors, teachers, the laminating and fabricating industry, and all others having a need for reliable up-to-date technical data and recommendations on engineered timber construction. The information and the recommendations herein are based on the most reliable technical data available, and reflect the commercial practices found to be most practical. Their application results in structurally sound construction.

The *Manual* has been arranged primarily for convenient use by designers, detailers, and fabricators of engineered timber construction. To avoid repetition, material which pertains to more than one area will be found in only one section. Suitable cross references are made in the other pertinent sections.

Information of an engineering textbook nature, such as derivations of equations, is not included since the purpose of the *Manual* is to present data for design and construction application by those familiar with engineering procedures.

The work of the preparation of the *Timber Construction Manual* was guided by the AITC Technical Advisory Committee, and was carried out by AITC staff engineers and the engineers and technical representatives of AITC member firms.

Suggestions for the improvement of this manual will be welcomed and will receive consideration in the preparation of future editions.

The *Timber Construction Manual* has been adopted by the American Institute of Timber Construction as its official recommendation.

While these data have been prepared in accordance with recognized engineering principles and are based on the most accurate and reliable technical data available, they should not be used or relied upon for any general or specific application without competent professional examination and verification of their accuracy, suitability, and applicability by a licensed

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PREFACE TO THIRD EDITION

This Third Edition has been prepared to update the AITC Timber Construction Manual to reflect current timber design methods. Part I of the manual contains general design data and construction information. Part II contains information on loads and the design of structural elements and their fastenings. Part III contains reference information and AITC recommended standards and specifications for engineered timber construction.

The work of the preparation of the *Timber Construction Manual* was guided by the AITC Technical Advisory Committee and was carried out by AITC staff engineers and by engineers and technical representatives of AITC member firms.

Suggestions for the improvement of this manual will be welcomed and will receive consideration in the preparation of future editions.

The *Timber Construction Manual* has been adopted by the American Institute of Timber Construction as its official recommendation.

The American Institute of Timber Construction has developed this *Timber Construction Manual* for convenient reference by architects, engineers, contractors, teachers, and the laminating and fabricating industry, and all others having need for up-to-date technical data and recommendations on engineered timber construction.

PREFACE TO SECOND EDITION

The first edition of the AITC *Timber Construction Manual* was published in 1966. Changes in the wood products industry and technological advances and improvements in the structural timber fabricating industry have necessitated this revised edition of the *Manual*.

New lumber sizes and revisions in grading requirements for lumber and glued laminated timber are reflected in this second edition. Improved and refined design procedures are also incorporated.

The *Timber Construction Manual* was prepared by the AITC engineering staff with the guidance of the Institute's Technical Advisory Committee. The valuable assistance provided from many sources in developing technical data for the *Manual* is gratefully acknowledged.

vii

PREFACE TO FIRST EDITION

In recent years, technical developments and the establishment of an engineered timber fabricating and laminating industry have had a profound effect on construction. Long clear spans of timber trusses, girders, arches, and decking are now commonplace. Engineered timber is widely used in such diversified construction as schools, churches, commercial buildings, industrial buildings, residences and farm buildings, highway and railway bridges, towers, theater screens, ships, and military and marine installations.

Modern practices combine engineering, quality control, and careful grading with the use of proper working stresses, dependable adhesives, and efficient mechanical fastenings to produce reliable construction. Laminating with strong, durable adhesives permits the manufacture of curved and variable shaped members and thus increases the versatility of timber construction.

The American Institute of Timber Construction is a nonprofit, technical, industrial association of manufacturers and fabricators who may design, plant-laminate, fabricate, assemble, and erect load-carrying sawn and glued timber framing and decking for roofs and other structural parts of schools, churches, commercial, industrial, and other buildings, and for other structures such as bridges, towers, and marine installations.

The American Institute of Timber Construction has developed this *Timber Construction Manual* for convenient reference by architects, engineers, contractors, teachers, the laminating and fabricating industry, and all others having a need for reliable, up-to-date technical data and recommendations on engineered timber construction. The information and the recommendations herein are based on the most reliable technical data available and reflect the commercial practices found to be most practical. Their application results in structurally sound construction.

The *Manual* has been arranged primarily for convenient use by designers, detailers, and fabricators of engineered timber construction. To avoid repetition, material which pertains to more than one area will be found in only one section. Suitable cross references are made in the other pertinent sections.

Information of an engineering textbook nature, such as derivations of formulae, is not included, since the purpose of the *Manual* is to present data for design and construction application by those familiar with engineering procedures.

Part I of the *Manual* contains design data and construction information. Part II contains AITC recommended standards and specifications which will aid the designer in preparing plans and specifications for engineered timber construction.

Material has been compiled from many sources. Where it has been possible

to identify the author of the material reproduced, it is used with the author's permission.

Every precaution has been taken to assure that all the data and information included are as accurate as possible. However, the Institute cannot assume responsibility for errors or omissions resulting from the use of this *Manual* in the preparation of plans or specifications. The Institute does not prepare engineering plans.

The work of the preparation of the *Timber Construction Manual* was guided by the AITC Technical Advisory Committee and was carried out by AITC staff engineers and by engineers and technical representatives of AITC member firms.

Suggestions for the improvement of this *Manual* will be welcomed and will receive consideration in the preparation of future editions.

The *Timber Construction Manual* has been adopted by the American Institute of Timber Construction as its official recommendation.

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CONTENTS

Part I GENERAL

CHAPTER 1.	Design Considerations in the Use of Structural Timber	1-3
1.1	Introduction	1-5
1.2	Designing for Economy	1-5
1.3	Designing for Permanence	1-9
1.4	Designing for Fire Safety	1-21
1.5	Timber Detailing	1-25
1.6	Handling, Storage, Erection, and Seasoning of Structural Timber	1-26
1.7	References	1-28
CHAPTER 2.	Physical Structure of Wood	2-31
2.1	Introduction	2-33
2.2	Weight and Specific Gravity of Commercial Lumber Species	2-37
2.3	Dimensional Stability	2-37
2.4	Thermal Insulating Properties	2-43
2.5	Acoustical Properties	2-49
2.6	Electrical Properties	2-58
2.7	Coefficient of Friction	2-59
2.8	Properties of Sections	2-59
2.9	References	2-61
CHAPTER 3.	Mechanical Properties of Wood	3-63
3.1	Design Values	3-65
3.2	Lumber Grading and Design Values	3-65
3.3	Treatments-Sawn Lumber	3-68
3.4	Structural Glued Laminated Timber Design Values	3-68

3.5	Treatments-Glued Laminated Timber	3-70
3.6	References	3-71

Part II DESIGN

CHAPTER 4.	Loads, Deflection, Tabular Values, and Adjustment Factors	4-75
4.1	Loads	4-77
4.2	Deflection	4-84
4.3	Camber	4-91
4.4	Tabular Design Values	4-93
4.5	Adjustment Factors	4-96
4.6	Application of Adjustment Factors	4-110
4.7	References	4-111
 CHAPTER 5.	 Design of Structural Elements	 5-113
5.1	Introduction	5-117
5.2	Tabular Design Values	5-117
5.3	Adjustments to Tabular Design Values	5-119
5.4	Beams and Bending Members	5-120
5.5	Torsion	5-140
5.6	Design of Glued Laminated Timber Beams	5-141
5.7	Member Subjected to Bending About Both Axes	5-167
5.8	Columns and Compression Members	5-170
5.9	Combined Bending and Axial Stresses	~~5-186~~
5.10	Tapered Straight Beams	5-216
5.11	Curved Members	5-226
5.12	Curved Beams	5-231
5.13	Arches	5-268
5.14	Moment Splices	5-306
5.15	Ponding on Roofs	5-315
5.16	References	5-324
 CHAPTER 6.	 Design of Structural Systems	 6-327
6.1	Introduction	6-329
6.2	Trusses	6-329
6.3	Pole-Type Framing	6-354
6.4	Timber Piles	6-376

and Timber	3-70	6.5	Timber Bridges	6-379
	3-71	6.6	Sheathing, Flooring, and Decking	6-400
		6.7	Structural Diaphragms	6-412
		6.8	References	6-414
ns, and Adjustment	4-75	CHAPTER 7.	Fasteners	7-417
	4-77	7.1	General Considerations	7-421
	4-84	7.2	Bolts	7-442
	4-91	7.3	Lag Screws	4-474
	4-93	7.4	Timber Connectors-Shear Plates and Split Rings	7-493
	4-96	7.5	Wood Screws	7-524
Factors	4-110	7.6	Spiral Dowels	7-536
	4-111	7.7	Drift Bolts and Pins	7-538
	5-113	7.8	Nails and Spikes	7-539
	5-117	7.9	Staples	7-546
Design Values	5-119	7.10	Light Metal Framing Devices	7-547
ers	5-120	7.11	References	7-564
	5-140			
l Timber Beams	5-141		Part III REFERENCE	
ing About Both Axes	5-167	CHAPTER 8.	Reference Information	8-569
Members	5-170	8.1	Introduction	8-571
ial Stresses	5-186	8.2	Section Properties	8-572
	5-216	8.3	Design Values for Dimension Lumber	8-613
	5-226	8.4	Span Load Tables for Glued Laminated Timber	8-650
	5-231	8.5	Cantilever Beam Coefficients	8-729
	5-268	8.6	Panclized Roof Grid Systems-Efficiency	8-738
	5-306	8.7	Material Weights	8-742
	5-315	8.8	Conversion Factors	8-745
	5-324	8.9	Selected AITC Standards	8-749
	6-327			
	6-329			
	6-329			
	6-354			
	6-376			
		Index		I-895

CHAPTER 7

FASTENERS

7.1	GENERAL CONSIDERATIONS	7-421
7.1.1	Lumber Species	7-421
7.1.2	Nominal Design Values	7-422
7.1.3	Adjustment Factors for Fasteners	7-422
7.1.3.1	Duration of Load Factor C_D	7-422
7.1.3.2	Wet Service Factor C_M	7-424
7.1.3.3	Temperature Factor C_t	7-425
7.1.3.4	Group Action Factor C_g	7-425
7.1.3.5	Geometry Factor C_Δ	7-430
7.1.3.6	Geometry Factor for Edge Distance $C_{\Delta e}$	7-430
7.1.3.7	Geometry Factor for End Distance $C_{\Delta n}$	7-430
7.1.3.8	Geometry Factor for Spacing $C_{\Delta s}$	7-430
7.1.3.9	Penetration Depth Factor C_d	7-430
7.1.3.10	End Grain Factor C_{eg}	7-431
7.1.3.11	Metal Side Plate Factor C_{st}	7-431
7.1.3.12	Diaphragm Factor C_{di}	7-431
7.1.3.13	Toe-Nail Factor C_{tn}	7-431
7.1.4	Critical Section	7-431
7.1.5	Angle of Load to Grain	7-431
7.1.6	Spacing of Mechanical Fasteners	7-434
7.1.7	Edge Distance	7-434
7.1.8	End Distance	7-435
7.1.9	Effect of Treatment	7-435
7.1.10	Eccentricity	7-435
7.1.11	Shear Stress in Joints at Ends of Members	7-436
7.1.12	Shear Stress in Joints Away from Ends of Members	7-436
7.1.13	Group Action of Fasteners	7-438
7.1.14	Uplift Loads	7-439
		7-417

7.1.15	Design Values for Dowel Type Fasteners	7-440
7.1.16	Lateral Strength Dowel Type Fasteners	7-440
7.1.17	Lateral Strength for Split Ring and Shear Connectors	7-442
7.1.18	Withdrawal Strength Dowel Type Fastener	7-442
7.2	BOLTS	7-442
7.2.1	General Considerations	7-442
7.2.2	Bolt Design Values	7-442
7.2.3	Adjustment Factors for Bolts	7-443
7.2.4	Single Shear Bolt Connections	7-443
	7.2.4.1 Wood-to-Metal Connections	7-449
7.2.5	Double Shear Connections	7-449
	7.2.5.1 Wood-to-Metal Connections	7-450
7.2.6	Critical or Net Section	7-450
7.2.7	Spacing of Bolts	7-451
7.2.8	End and Edge Distances	7-451
7.3	LAG SCREWS	7-474
7.3.1	General Considerations	7-474
7.3.2	Species and Specific Gravity	7-475
7.3.3	Critical or Net Section	7-475
7.3.4	Angle of Load to Grain	7-475
7.3.5	Spacing, End Distance, and Edge Distance	7-480
7.3.6	Lag Screw Design Values	7-481
7.3.7	Withdrawal Loads	7-486
7.3.8	Lateral Loads	7-486
7.3.9	Combined Lateral and Withdrawal Loads	7-490
7.4	TIMBER CONNECTORS—SHEAR PLATES AND SPLIT RINGS	7-493
7.4.1	Lumber Species	7-493
7.4.2	Connector Design Values	7-494
7.4.3	Adjustment Factors for Timber Connectors	7-498
7.4.4	Critical or Net Section	7-498
7.4.5	Glued Laminated Timber	7-500
7.4.6	Sawn Lumber	7-500
7.4.7	Angle of Load to Grain	7-501
7.4.8	Angle of Axis of Connectors to Grain	7-501
7.4.9	Spacing of Connectors	7-501

			<i>Fasteners</i>	7-419
Fasteners	7-440	7.4.10	Edge Distance	7-511
Fasteners	7-440	7.4.11	End Distance	7-512
and Shear		7.4.12	Timber Connector Design Values in End Grain	7-520
	7-442	7.5	WOOD SCREWS	7-524
Fastener	7-442	7.5.1	General Considerations	7-524
	7-442	7.5.2	Lumber Species and Specific Gravity	7-524
	7-442	7.5.3	Spacing, End Distance, and Edge Distance	7-525
	7-442	7.5.4	Wood Screw Design Values	7-525
	7-443	7.5.5	Withdrawal Loads	7-530
	7-443	7.5.6	Lateral Loads Wood-to-Wood Connections	7-530
ctions	7-449	7.5.7	Wood-to-Metal Connections	7-531
	7-449	7.5.8	Combined Lateral and Withdrawal Loads	7-535
ctions	7-450	7.6	SPIRAL DOWELS	7-536
	7-450	7.6.1	Lumber Species and Specific Gravity	7-536
	7-451	7.6.2	Availability	7-536
	7-451	7.6.3	Spiral Dowel Design Values	7-536
	7-474	7.6.4	Withdrawal Loads	7-538
	7-474	7.6.5	Lateral Loads	7-538
	7-475	7.7	DRIFT BOLTS AND PINS	7-538
	7-475	7.7.1	Withdrawal Loads	7-539
	7-475	7.7.2	Lateral Resistance	7-539
Distance	7-480	7.8	NAILS AND SPIKES	7-539
	7-481	7.8.1	Lumber Species and Specific Gravity	7-541
	7-486	7.8.2	Spacing, End Distance, and Edge Distance	7-541
	7-486	7.8.3	Nail and Spike Design Values	7-541
al Loads	7-490	7.8.4	Withdrawal Loads	7-541
ATES AND		7.8.5	Lateral Loads	7-544
	7-493	7.8.6	Wood-to-Metal Connections	7-546
	7-493	7.9	STAPLES	7-546
	7-494	7.10	LIGHT METAL FRAMING DEVICES	7-547
onnectors	7-498	7.10.1	Framing Anchors	7-547
	7-498	7.10.2	Joist and Purlin Hangers	7-547
	7-500	7.11	REFERENCES	7-564
	7-500			
	7-501			
ain	7-501			
	7-501			

d Nails^{a, b, d}

description	Lateral Load Design Value ^c (lb)
th shank	85
th shank	118
lar thread, nless steel	118
th shank	135
lar thread, nless steel	135
lar ring	174
lar ring	174
lar ring	257
lar ring	257

or greater.

11).

ties and straps. Short nails developed for use with plys used with a metal strap

es for wood members with e determined by using the (7-36) and using the dowel ring strength of side plates

e loads for staples may be design value for one staple equal diameter, provided e, and that the penetration ie points is approximately n requirements and other

provisions regarding seasoning of members, service conditions, and so on apply equally to staples.

7.10 LIGHT METAL FRAMING DEVICES

7.10.1 Framing Anchors

Framing anchors are metal fittings used to provide a more positive connection between wood members than is obtained by toe-nailing. The several types of manufactured framing anchors are right-angle pieces formed from light gage (typically 18 gage) galvanized sheet steel (see Fig. 7.28).

These may be bent to conform with use conditions. The outstanding legs may be of rectangular, triangular, or other shape, and they are predrilled or pre-punched to receive special nails. Nails appropriate to the particular framing anchor should be used in all holes provided in the anchor to develop its full load-carrying capacity. Framing anchors are commonly used in pairs to avoid eccentricity.

Allowable load values for framing anchors are generally determined by test, but an estimate may be based on the lateral resistance of the nails used. Allowable loads for framing anchors are generally given for normal duration of load but may be adjusted for other durations of load. Before making adjustments for duration of load, the manufacturer's literature should be checked to ascertain the duration of load basis on which the recommended values were based and also to make sure that the stress in the anchors or nails are not exceeded by increases for duration of load. The manufacturer's data for the particular type of framing anchor being used should be followed.

7.10.2 Joist and Purlin Hangers

Joist and purlin hangers are standard items fabricated by several manufacturers. The allowable loads shown in the manufacturer's literature are usually determined by tests. Several types of hangers are shown in Fig. 7.29. The manufacturer's data for the particular type of hanger being used should be followed.

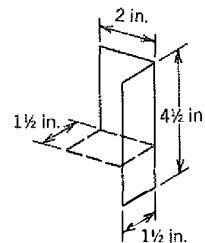


FIGURE 7.28 Typical framing anchor dimensions.

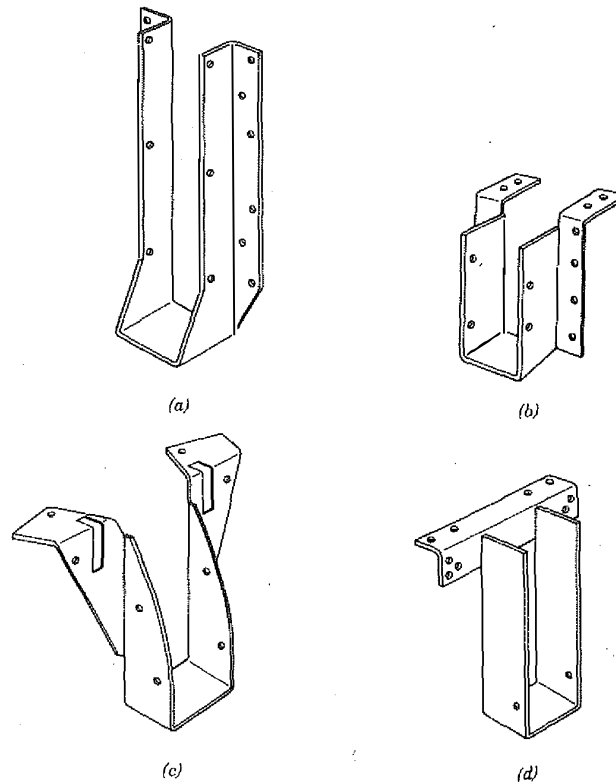
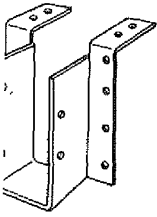


FIGURE 7.29 Typical joist and purlin hanger types. (a) Joist hanger; (b) joist hanger; (c) joist and purlin hanger; (d) joist and beam hanger.

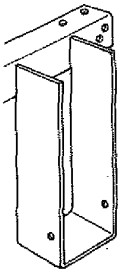
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(b)



(d)

ger; (b) joist hanger; (c) joist and

1991, *National Design Specification*[®]

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standard B18.2.1—1981, *Square and*

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