

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT FEDERAL HOUSING ADMINISTRATION	Series and Series No.
	USE OF MATERIALS BULLETIN NO. UM-25d Supersedes No. UM-25c
TO: AREA OFFICE DIRECTORS INSURING OFFICE DIRECTORS	Date September 5, 1973

SUBJECT: APPLICATION AND FASTENING SCHEDULE
Power Driven, Mechanically Driven And Manually Driven Fasteners

Members of the HUD Staff processing cases and inspecting construction shall use this information in determining acceptability of the subject material for the uses indicated.

This bulletin should be filed with Bulletins on Special Methods of Construction and Materials as required by prescribed procedures. Additional copies may be requisitioned by the field offices.

The technical description, requirements and limitations expressed herein do not constitute an endorsement, approval or acceptance by the Federal Housing Administration of the subject matter, and any statement or representation, however made, indicating approval or endorsement by the Federal Housing Administration is unauthorized and false, and will be considered a violation of the United States Criminal Code 18, U.S.C. 709.

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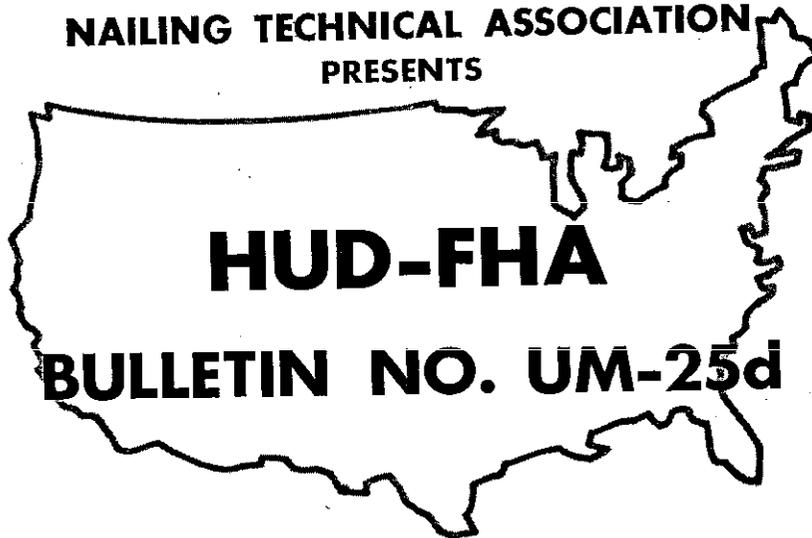
Subject to good workmanship, compliance with local codes, and the methods of application listed herein, the materials described in the bulletin may be considered suitable for FHA mortgage Insurance or Low Rent Public Housing Programs.

The eligibility of a property under these Programs is determined on the property as an entity and involves the consideration of underwriting and other factors not indicated herein. Thus, compliance with this bulletin should not be construed as qualifying the property as a whole, or any part thereof, as to its eligibility.

The methods of application for the materials listed herein are to be considered as part of the FHA Minimum Property Standards and shall remain effective until this bulletin is cancelled or superseded.



**INDUSTRIAL STAPLING
AND
NAILING TECHNICAL ASSOCIATION
PRESENTS**



APPLICATION AND FASTENING SCHEDULE

POWER DRIVEN

MANUAL DRIVEN

FASTENERS

MECHANICALLY DRIVEN



DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
FEDERAL HOUSING ADMINISTRATION
WASHINGTON, D.C. 20411

September 4, 1973

IN REPLY REFER TO:

Mr. R. H. Szymanski
Technical Director
Industrial Stapling and
Nailing Technical Association
P. O. Box 3072
City of Industry, California 91744

Dear Mr. Szymanski:

Subject: FHA Use of Materials Bulletin No. UM-25-d
Dated September 5, 1973
APPLICATION AND FASTENING SCHEDULE
Power Driven, Mechanically Driven, and Manually Driven Fasteners

We are enclosing herewith a copy of the subject bulletin as it was transmitted to our printing department. You may reproduce this bulletin in any quantity provided that the bulletin is reproduced in its entirety. Any use in sales promotion or advertising is not authorized.

If you will provide us with 1500 copies of the field manual (5 1/2" X 8 1/2" size) that you wish to prepare, we will make proper distribution to all of our HUD/FHA field offices.

We greatly appreciate the cooperation that you, on behalf of the I-SANTA organization, have given us in the development of UM-25-d. We look forward to continued cooperation with your association.

Sincerely,

James A. McCullough
James A. McCullough
Director, Architecture and
Engineering Division

Enclosure

ERRATA - SHEET

FOR

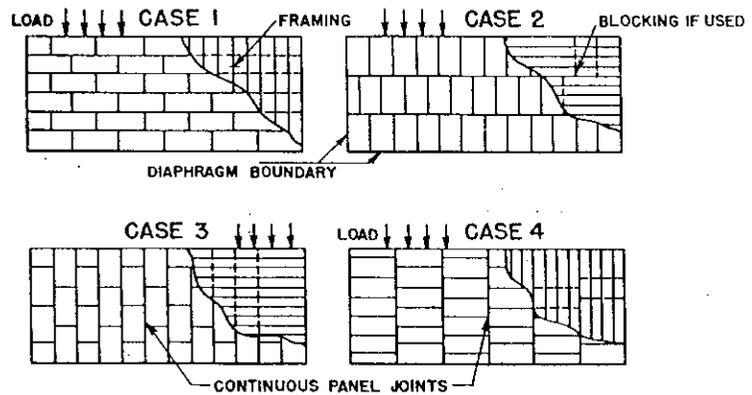
HUD-FHA BULLETIN No. UM-25d

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I-SANTA MANUAL No. 2-19-73 HUD-FHA

The drawing illustrated on this sheet was inadvertently omitted from the Manual No. 2-19-73 HUD-FHA section of this document.

When using Tables III through VII "Horizontal Plywood Diaphragms" located on pages 6 through 10 refer to the drawing below for Cases 1 through 4 for blocked and unblocked diaphragms.



NOTE: Framing may be located in either direction for blocked diaphragms.

This Bulletin is based upon MANUAL NO. 2-19-73 HUD-FHA of the Industrial Stapling and Nailing Technical Association (I-SANTA). The entire MANUAL is included herein and shall be considered as an integral part of this Bulletin.

Section I - General

This Bulletin (MANUAL NO. 2-19-73 HUD-FHA) sets forth specifications and conditions of use for power driven, mechanically driven fasteners and hand driven bulk nails wherever listed as nails in the tables. The tables describe the materials attached with the various fasteners with required spacing or number of fasteners per assembly or per bearing. All fastener specifications are detailed in each table as to their wire gauge or diameter of wire, overall leg length and corrosion resistant coatings when exposed to the weather.

The tables are separated into two groupings for diaphragm and non-diaphragm construction.

Section II - Materials

The material used to manufacture the fasteners shall comply with the Federal Specification FF-N-105B - March 17, 1971, and amendments for Nails, Brads, Staples and Spikes, Sections 3.1.1 - Steel Wire, 3.1.6 - Aluminum alloy wire, 3.2.1 - Zinc coating, 3.3 - Altered shapes and power driven nails and staples and in the following pages of MANUAL NO. 2-19-73 HUD-FHA under "Principal Uses and Stock Dimensions of Specific Products" paragraph B. - 2.

The fastener and application tables of this Bulletin do not give special consideration to coatings applied to the fasteners. In the event FF-N-105B is revised to incorporate special coatings, these considerations will become a part of this Bulletin.

Section III - Conditions of Use

This Bulletin (MANUAL NO. 2-19-73 HUD-FHA) covers requirements for the attachment of various materials as described in the tables and the following pages: Paragraph C. - Details of Installation of Product, paragraphs 1 through 8.

Section IV - Reference Literature

There are four (4) documents that are officially recognized by HUD-FHA which support the total contents of this Bulletin and are described and available by direct order as follows:

- (1) Wood Handbook - Agriculture Handbook No. 72.

From: Superintendent of Documents
U. S. Government Printing Office
Washington, D. C. 20406

- (2) FF-N-105B - Federal Specification
Nails, Brads, Staples and Spikes:
Wire, Cut and Wrought

From: General Services Administration
Federal Supply Service
Washington, D. C. 20406

From: Industrial Stapling And Nailing Technical Association
P. O. Box 3072
City of Industry, California 91744

- (3) National Design Specifications for Stress Grade
Lumber and its Fastenings - 1973 Edition

From: The National Forest Products Association
1619 Massachusetts Ave., N. W.
Washington, D. C. 20036

- *(4) MANUAL NO. 2-19-73 HUD-FHA
Pneumatic & Mechanically Driven Building Construction
Fasteners

From: Industrial Stapling And Nailing Technical Association
P. O. Box 3072
City of Industry, California 91744

*(Included herein)

All fasteners and attachment material shall comply with those listed in MANUAL NO. 2-19-73 HUD-FHA for a particular material and condition of use.

This Bulletin supersedes Use of Material's Bulletin No. UM-25c - "APPLICATION AND FASTENING SCHEDULE - Power Driven, Mechanically Driven and Manually Driven Fasteners," and all previous issuances (including letters) regarding power driven, mechanically driven and manually driven fasteners.

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**INDUSTRIAL STAPLING
AND
NAILING TECHNICAL ASSOCIATION**

**MANUAL No.
2-19-73 HUD-FHA**

**PNEUMATIC & MECHANICALLY DRIVEN
Building Construction Fasteners**

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Description and Use of Products

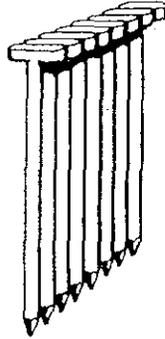
A. General Characteristics

1. STAPLES:



The staples are manufactured from round, semiflattened or flattened, plain or galvanized steel wire. The staples are cohered in clips or strips. Staple crown widths and leg lengths specified in this manual are over-all dimensions. The staples are designed for a variety of uses as indicated in the tables in this manual. Staples are driven with pneumatic or mechanical devices.

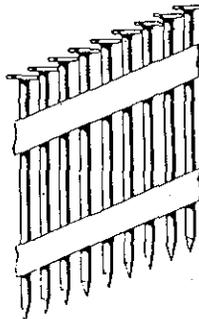
2. T-NAILS:



The T-nails are formed from plain or galvanized steel wire with T-shaped heads. The T-nails are supplied with smooth, coated or mechanically deformed shanks, and are assembled or cohered in clips, strips or coils. The length of the T-nails are over-all dimensions, and the wire diameters and shank lengths are specified in the application tables of this manual. T-nails are driven with pneumatic or mechanical devices.

3. MODIFIED ROUND HEAD NAILS:

CONVENTIONAL ROUND HEAD NAILS: The nails are formed from plain or galvanized steel wire



with standard diameter round heads, or modified round heads. The nails are manufactured with smooth, coated or mechanically deformed shanks, and are assembled or cohered in clips, strips or coils. The various wire diameters, shank lengths and uses are specified in the application tables of this manual. Nails are driven with pneumatic or mechanical devices.

4. THREADED NAILS:

RING OR SCREW SHANK: The nails are formed from steel wire and have annular rings (ring shank)



or vertical flutes (screw shank) formed onto the wire from which the nail is made. The nails have modified or conventional round heads and are available galvanized or plain, cohered in clips, strips or coils. The various wire diameters, shank lengths and uses are specified in the Application Tables of this manual. Ring or Screw Shank Nails have the same values as comparable "penny" size Common Nails. The nails are driven with pneumatic or mechanical devices.

5. **SPECIAL HARDENED:**

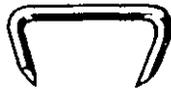
SCREW SHANK NAILS: The special hardened Screw Shank Nails are formed from 0.120 diameter wire and have vertical flutes (Screw Shank) formed onto the nail shank from the top of the diamond nail point to within ½" from the underside of the nail head. The nails are heat-treated and tempered to permit driving them through No. 14 gauge steel by a pneumatic nailing device. The nails have modified or conventional round heads and are cohered in clips, strips or coils. For application details see sub-paragraph C-3.



6. **CORRUGATED FASTENERS:** The Corrugated Fasteners are manufactured from .020-inch thick A.I.S.I. C 1010 steel, the fasteners have a 1-inch width with ½-inch long tapered legs and are cohered in clips or strips. The fasteners are driven with a pneumatic tool. For application details see sub-paragraph C-4.



7. **TYING FASTENERS:** The Tying Fasteners are formed from plain or galvanized wire into a "U" shaped form, assembled in clips. The Tying Fasteners are applied with a pneumatic tying machine. Dimensions of the fasteners are specified in the Application Table XXIII of this manual.



B. Principal Uses and Stock Dimensions of Specific Products

1. Principal uses: The fasteners are used as an alternate method for attaching various materials used in construction in place of hand hammer driven conventional fasteners.
2. Stock dimensions: Detailed stock dimensions of each fastener are specified in the Application Tables of this manual.
3. Stock tolerances: All staples and nails shall conform to the tolerances specified for the particular type fastener as listed in FF-N-105B, March 17, 1971, Federal Specification entitled "Nails, Brads, Staples and Spikes: Wire, Cut and Wrought". Copies of this specification may be obtained from General Services Administration, Washington, D.C., or from I-SANTA.

C. Details of Installation of Product:

1. All staples and T-nails attaching diaphragm and non-diaphragm plywood or 1-inch nominal sheathing shall be installed with the T-nail heads or crowns of the staple parallel to the long dimension of the framing members. All fasteners are driven flush with the surface of sheathing.
2. The crown width and gauge of staples and the leg length and diameter of T-nails, modified round head or round head nails specified in the Tables of this manual are minimum sizes. Larger dimensions than specified may be used for all applications.
3. The special hardened Screw Shank Nails are driven with a pneumatic device for the attachment of sub-flooring directly to 0.0747-inch (No. 14 gauge) steel floor joists providing a minimum penetration through the top bearing surface of the steel floor joist of $\frac{1}{2}$ inch. Nail spacing for plywood is 6-inches on center at panel edges and boundary members and 12-inches on center at intermediate supports. Two nails per board per bearing are required for tongue and groove nominal 1-by sheathing.
4. Corrugated fasteners are intended for use in fabricating wood-frame wall construction or non-bearing truss members as follows:
 - a. Two corrugated fasteners installed on each side of stud to plate connections are equivalent to the two 16-penny box nails set forth in Table No. XIV.
 - b. Top plates connected with corrugated fasteners spaced 24 inches on center located on each side of the plate are equivalent to the 16-penny box nails spaced 24 inches on center set forth in Table No. XIV.
 - c. Top plate splices connected with two fasteners located on each side of the plate lap are equivalent to the two 16-penny box nails set forth in Table No. XIV.
 - d. End gable framing or roof jack connections provided two fasteners are used in each side.
5. Roof Trusses: (Staple-glued trussed rafters) Where staples are used to hold the glue line on plywood gusset plates, 16 gauge, $\frac{7}{16}$ " crown, $1\frac{1}{2}$ " long staples are required, spaced not over three inches on centers. Use a double row for members up to 4", and a triple row for 6" members. Plywood Gusset Plates must be installed on both sides of each joint.
6. Tying Fasteners: The tying fasteners are manufactured from plain and galvanized steel wire, assembled in cohered strips or clips, and are tied or closed around the metal lath and metal receiving members by a pneumatic automatic tying machine.
7. Where fasteners in this report comply with the dimensional characteristics of fasteners described in other Use of Materials Bulletins they may be used provided installation is as described in the individual Bulletins.
8. The spacing, wire diameter or wire gauge and over-all dimensions of the fasteners conform to the diaphragm and non-diaphragm Tables I through XXIII as follows.

TABLE NO. I
FASTENER TYPES DIMENSIONS & ALLOWABLE LOADS
FOR DESIGNED STRUCTURES

Item No.	FASTENER ¹ DESCRIPTION ²	WIRE DIA.	WIRE GA.	Penetration Required for Lateral Strength (Inches) into Main Member	ALLOWABLE LOAD (In Pounds) ⁵⁻⁷	
					Lateral ³ Strength ⁴	Withdrawal Strength ⁶
1	6 d Cooler Nail	.0915	13	1	46	27
2	6 d Box Nail	.099	12 ½	1 ½	52	29
3	T-Nail	.097				
4	Staple	.0625	16	1	52	36
5	6 d Casing Nail	.099	12 ½	1 ½	52	—
6	Finish T-Nail	.097				
7	6 d Common Nail	.113	11 ½	1 ¼	63	34
8	8 d Cooler Nail					
9	8 d Box Nail					
10	T-Nail					
11	6 d Ring Shank Nail	.120	11	—	—	—
12	6 d Screw Shank Nail					
13	8 d Casing Nail	.113	11 ½	1 ¼	63	—
14	Finish T-Nail					
15	Staple	.072	15	1	64	42
16	10 d Cooler Nail	.1205	11	1 ¾	69	36
17	Staple	.080	14	1	75	46
18	10 d Box Nail	.128	10 ½	1 ½	76	38
19	12 d Box Nail					
20	10 d Casing Nail	.128	10 ½	1 ½	76	—
21	Finish T-Nail					
22	8 d Common Nail	.131	10 ¼	1 ½	78	39
23	T-Nail					
24	8 d Ring Shank Nail					
25	8 d Screw Shank Nail					
26	16 d Box Nail	.1350	10	1 ½	81	41
27	Staple	.0915	13	1	92	53
28	10 d Common Nail	.148	9	1 ¾	94	44
29	T-Nail					
30	10 d Ring Shank Nail					
31	10 d Screw Shank Nail					
32	12 d Common Nail	.148	9	1 ¾	113	62
33	16 d Sinker Nail					
34	12 d Ring Shank Nail					
35	12 d Screw Shank Nail					
36	Staple	.1055	12	1 ½	113	62
37	16 d Common Nail	.162	8	1 ¾	107	49
38	16 d Ring Shank Nail	.148	9			
39	16 d Screw Shank Nail					

¹ Special length T-Nails or nails with shank diameters as noted above having smooth, barbed, screw or ring shanks may be used provided the total length of fastener provides the penetration into the receiving member plus the thickness of the attachment material. These fasteners will have the same values as tabulated above.

² Staples shall have a 7/16" minimum O.D. Crown Width.

³ For wood diaphragms resisting wind or seismic loading these values may be increased 30 percent in addition to the 33-1/3 percent increase permitted for duration of load.

⁴ The tabulated allowable lateral values are for fasteners installed in Douglas Fir, Larch or Southern Pine (Group II Species). To determine the allowable values for Groups I, III & IV Species as shown in the "Appendix" multiply the value tabulated for Group II Species by the following factors: I-1.24, III-.81, IV-.65.

⁵ Allowable values shall be adjusted for duration of load in accordance with standard engineering practices. Where metal side plates are used, lateral strength values may be increased 25 percent.

⁶ Withdrawal values are for fasteners inserted perpendicular to the grain in pounds per linear inch of penetration into the main member based on a specific gravity of approximately 0.545.

⁷ Loads for threaded nails (Ring and Screw Shank) are the same as common nails.

TABLE NO. II
DIAGONAL SHEATHING HORIZONTAL OR VERTICAL DIAPHRAGM VALUES⁵
(1 x 6¹ or 1 x 8²)

Item No.	FASTENER ¹ DESCRIPTION ²⁻⁴	WIRE DIA.	WIRE GA.	REQUIRED LEG LENGTH	MAXIMUM ALLOWABLE SHEAR - VALUE (Lbs. Per Ft.)
1	STAPLES ³	.0625	16	1 3/4	195
2		.072	15		245
3		.080	14		285
4		.0915	13		300
5	T-NAILS	.097	12 1/2	1 3/4	195
6		.113	11 1/2	2	240
7		.131	10 1/4	2 1/4	300
8	SPECIAL Length Nails	.131	10 1/4	2 1/4	300
9	8 d Common Nails	.131	10 1/4	2 1/2	300
10	8 d Ring Shank Nails	.120	11		
11	8 d Screw Shank Nails				
12	6 d Box Nails	.099	12 1/2	1 3/4	195
13	6 d Common Nails	.113	11 1/2	2	240

¹ 1 x 6 Sheathing shall be connected to each intermediate bearing with not less than 2 staples or nails. Three staples or nails are required at diaphragm boundaries.

² 1 x 8 Sheathing shall be connected to each intermediate bearing with not less than 3 staples or nails. Four staples or nails are required at diaphragm boundaries.

³ Staples shall have a minimum crown width of 7/16-inch O.D.

⁴ Staples and nails shall be driven flush with the top surface of the sheathing.

⁵ The tabulated values are for fasteners installed in Douglas Fir, Larch or Southern Pine (Group II species). To determine the allowable values for Groups I, III & IV species, as shown in the appendix, multiply the value tabulated for the Group II species by the following factors: I - 1.24, III - .81, IV - .65.

TABLE NO. III
ALLOWABLE SHEAR FOR WIND OR SEISMIC FORCES
IN POUNDS PER FOOT FOR HORIZONTAL PLYWOOD DIAPHRAGMS¹⁻⁵

Item No.	T-Nail, ³ Standard Round Head or Clipped Round Head Nail Diameter (In Inches) or Staple Gauge ⁴	Minimum Length of Fastener Required (Inches)	Minimum Nominal Width of Framing Member (Inches)	BLOCKED DIAPHRAGMS				UNBLOCKED DIAPHRAGMS	
				Nail Spacing at Diaphragm Boundaries (All Cases) and Continuous Panel Edges Parallel to Load (Cases 3 & 4)				Nails Spaced 6" Maximum at Supported End	
				6-in.	4-in.	2½-in.	2-in.	Load Perpendicular to Unblocked Edges and Continuous Panel Joints (Case 1)	All Other Configurations (Cases 2, 3, 4)
				Nail Spacing at other Panel Edges					
6-in.	6-in.	4-in.	3-in.						
PLYWOOD GRADE STRUCTURAL 1 – 5/16" NOMINAL THICKNESS²									
1	6d Common	1½	2	185	250	375	420	165	125
2	6d Ring Shank Nail								
3	6d Screw Shank Nail								
4	8d Cooler								
5	8d Box	3	210	280	420	475	185	140	
6	.113 T-Nail								
7	No.14 Ga. Staple	1½	2	155	205	310	345	135	105
8	No.15 Ga. Staple								
9	.097-.099 T-Nail	1½	3	175	230	345	390	155	115
10	No.16 Ga. Staple	1½	2	135	180	275	305	120	90
11	6d Cooler	1½	3	155	205	305	345	135	100
12	.0915 T-Nail								
PLYWOOD GRADE STRUCTURAL 1 – 3/8" NOMINAL THICKNESS²									
13	8d Common	1½	2	270	360	530	600	240	180
14	.131 T-Nail								
15	8d Ring Shank Nail								
16	8d Screw Shank Nail	3	300	400	600	675	265	200	
17	No.13 Ga. Staple								
18	10 d-Box	1½	2	265	355	520	590	235	180
19	.128 T-Nail								
20	No.14 Ga. Staple	1½	3	295	395	590	655	260	200
21	10d Cooler	1¾	2	240	320	470	530	210	160
22	.1205 T-Nail								
23	6d Common	1½	2	220	290	430	485	195	145
24	6d Ring Shank Nail								
25	6d Screw Shank Nail								
26	8d Cooler								
27	8d Box								
28	.113 T-Nail								
29	No.15 Ga. Staple	1½	3	240	325	485	545	215	160
30	6d Box	1½	2	180	240	350	400	160	120
31	.097-.099 T-Nail								
32	No.16 Ga. Staple	1½	3	200	265	400	450	175	135

¹ These values are for short time loads due to wind or earthquake and must be reduced 25 percent for normal loading. Space fasteners 10 inches on center for floors and 12 inches on center for roofs along intermediate framing members.

² Plywood not exceeding 1½ inches in thickness may be connected with T-Nails, round head nails, modified round head nails, or staples, provided the fastener penetration complies with Table I.

³ "Nail" is general description and may be T-nail, round head nail or modified round head nail. Casing nails and finish T-Nails are excluded.

⁴ See Table No. I for round head nail, modified round head nail, required penetration into the receiving member, other than listed above.

⁵ The tabulated values are for fasteners installed in Douglas Fir, Larch or Southern Pine (Group II species). To determine the allowable values for Groups I, III & IV species, as shown in the appendix, multiply the value tabulated for the Group II species by the following factors: I – 1.24, III – .81, IV – .65.

TABLE NO. IV
ALLOWABLE SHEAR FOR WIND OR SEISMIC FORCES
IN POUNDS PER FOOT FOR HORIZONTAL PLYWOOD DIAPHRAGMS¹⁻⁶

Item No.	T-Nail, ³ Standard Round Head or Clipped Round Head Nail Diameter (In Inches) or Staple Gauge ⁴	Minimum Length of Fastener Required (Inches)	Minimum Nominal Width of Framing Member (Inches)	BLOCKED DIAPHRAGMS				UNBLOCKED DIAPHRAGMS	
				Nail Spacing at Diaphragm Boundaries (All Cases) and Continuous Panel Edges Parallel to Load (Cases 3 & 4)				Nails Spaced 6" Maximum at Supported End	
				6-in.	4-in.	2½-in.	2-in.	Load Perpendicular to Unblocked Edges and Continuous Panel Joints (Case 1)	All Other Configurations (Cases 2, 3, 4)
				Nail Spacing at Other Panel Edges					
6-in.	6-in.	4-in.	3-in.						
PLYWOOD GRADE STRUCTURAL 1 – 1/2" NOMINAL THICKNESS²									
1	10 d Common	2 ½	2	320	425	640 ⁵	730 ⁵	285	215
2	10 d Short Com								
3	10 d Ring Shank Nail								
4	10 d Screw Shank Nail								
5	.148 T-Nail	3	360	480	720	820	320	240	
6	No. 12 Ga. Staple								
7	No. 13 Ga. Staple	1 ½	2	315	415	625 ⁵	715 ⁵	280	210
			3	350	270	705	800	315	235
8	8 d Common	2	2	270	360	530	600	240	180
9	8 d Short Com.								
10	8 d Ring Shank Nail								
11	8 d Screw Shank Nail								
12	.131 T-Nail	3	300	400	600	675	265	200	
13	10 d Box								
14	.128 T-Nail	2	2	260	340	510	585	230	170
15	No. 14 Ga. Staple	1 ½	3	290	380	575	655	255	190
16	10 d Cooler	1 ¾	2	235	310	470	535	210	160
17	.1205 T-Nail								
			3	265	350	530	600	235	175
18	6 d Common	1 ¾	2	215	285	430	490	190	140
19	6 d Ring Shank Nail								
20	6 d Screw Shank Nail								
21	8 d Box								
22	.113 T-Nail	3	240	320	480	550	215	160	
23	No. 15 Ga. Staple								
24	6 d Box	1 ½	2	175	235	355	405	155	120
25	.097-.099 T-Nail	1 ½	3	200	265	400	455	175	135
26	No. 16 Ga. Staple								

¹ These values are for short time loads due to wind or earthquake and must be reduced 25 percent for normal loading. Space fasteners 10 inches on center for floors and 12 inches on center for roofs along intermediate framing members.

² Plywood not exceeding 1 ½ inches in thickness may be connected with T-nails, round head nails, modified round head nails, or staples, provided the fastener penetration complies with Table I.

³ "Nail" is general description and may be T-nail, round head nail or modified round head nail. Casing nails and finish T-nails are excluded.

⁴ See Table No. I for round head nail, modified round head nail, required penetration into the receiving member, other than listed above.

⁵ Reduce tabulated allowable shears 10 percent when boundary members provide less than 3-inch nominal nailing surface.

⁶ The tabulated values are for fasteners installed in Douglas Fir, Larch or Southern Pine (Group II Species). To determine the allowable values for Groups I, III & IV species, as shown in the appendix, multiply the value tabulated for Group II species by the following factors: I – 1.24, III – .81, IV – .65.

TABLE NO. V
ALLOWABLE SHEAR FOR WIND OR SEISMIC FORCES
IN POUNDS PER FOOT FOR HORIZONTAL PLYWOOD DIAPHRAGMS¹⁻⁵

Item No.	T-Nail, Standard Round ³ Head or Clipped Round Head Nail Diameter (In Inches) or Staple Gauge ⁴	Minimum Length of Fastener Required (Inches)	Minimum Nominal Width of Framing Member (Inches)	BLOCKED DIAPHRAGMS				UNBLOCKED DIAPHRAGMS	
				Nail Spacing at Diaphragm Boundaries (All Cases) and Continuous Panel Edges Parallel to Load (Cases 3 & 4)				Nails Spaced 6" Maximum at Supported End	
				6-in.	4-in.	2½-in.	2-in.	Load Perpendicular to Unblocked Edges and Continuous Panel Joints (Case 1)	All Other Configurations (Cases 2, 3, 4)
				Nail Spacing at Other Panel Edges					
6-in.	6-in.	4-in.	3-in.						
PLYWOOD GRADE – STRUCTURAL II, CC									
EXTERIOR, STANDARD SHEATHING – 5/16" NOMINAL THICKNESS²									
1	6d Common	1½	2	170	225	335	380	150	110
2	6d Ring Shank Nail								
3	6d Screw Shank Nail								
4	8d Cooler								
5	8d Box								
6	.113 T-Nail								
7	No. 14 Ga. Staple	1¾	2	140	185	275	315	125	90
8	No. 15 Ga. Staple								
9	.097-.099 T-Nail	1¾	3	155	205	315	355	140	105
10	No. 16 Ga. Staple								
11	6d Cooler	1¾	2	125	165	245	290	110	80
12	.0915 T-Nail								
12	.0915 T-Nail	1¾	3	140	180	275	315	125	90
PLYWOOD GRADE – STRUCTURAL II, CC									
EXTERIOR, STANDARD SHEATHING – 3/8" NOMINAL THICKNESS²									
13	8d Common	1¾	2	240	320	480	545	215	160
14	8d Ring Shank Nail								
15	8d Screw Shank Nail								
16	.131 T-Nail								
17	No. 13 Ga. Staple	1¾	2	235	315	470	530	210	155
18	10d Box								
19	.128 T-Nail	1¾	3	265	355	530	600	235	175
20	No. 14 Ga. Staple								
21	10d Cooler	1¾	2	215	290	425	475	190	145
22	.1205 T-Nail								
22	.1205 T-Nail	1¾	3	240	320	475	540	210	160
23	6d Common								
24	6d Ring Shank Nail	1¾	2	185	250	375	420	165	125
25	6d Screw Shank Nail								
26	8d Cooler								
27	8d Box								
28	.113 T-Nail								
29	No. 15 Ga. Staple								
30	6d Box	1½	2	160	215	315	360	145	110
31	.097-.099 T-Nail								
32	No. 16 Ga. Staple	1¾	3	180	240	360	405	155	120
33	6d Cooler								
33	6d Cooler	1¾	2	135	180	275	305	120	90
34	.0915 T-Nail								
34	.0915 T-Nail	1¾	3	155	205	305	345	135	100

¹ These values are for short time loads due to wind or earthquake and must be reduced 25 percent for normal loading. Space fasteners 10 inches on center for floors and 12 inches on center for roofs along intermediate framing members.

² Plywood not exceeding 1½ inches in thickness may be connected with T-nails, round head nails, modified round head nails, or staples, provided the fastener penetration complies with Table I.

³ "Nail" is general description and may be T-nail, round head nail or modified round head nail. Casing nails and finish T-nails are excluded.

⁴ See Table No. I for round head nail, modified round head nail, required penetration into the receiving member, other than listed above.

⁵ The tabulated values are for fasteners installed in Douglas Fir, Larch or Southern Pine (Group II species). To determine the allowable values for Groups I, III & IV species, as shown in the appendix, multiply the value tabulated for the Group II species by the following factors: I – 1.24, III – .81, IV – .65.

TABLE NO. VI
ALLOWABLE SHEAR FOR WIND OR SEISMIC FORCES
IN POUNDS PER FOOT FOR HORIZONTAL PLYWOOD DIAPHRAGMS¹⁻⁶

Item No.	T-Nail, Standard Round ³ Head or Clipped Round Head Nail Diameter (In Inches) or Staple Gauge ⁴	Minimum Length of Fastener Required (Inches)	Minimum Nominal Width of Framing Member (Inches)	BLOCKED DIAPHRAGMS				UNBLOCKED DIAPHRAGMS	
				Nail Spacing at Diaphragm Boundaries (All Cases) and Continuous Panel Edges Parallel to Load (Cases 3 & 4)				Nails Spaced 6" Maximum at Supported End	
				6-in.	4-in.	2½-in.	2-in.	Load Perpendicular to Unblocked Edges and Continuous Panel Joints (Case 1)	All Other Configurations (Cases 2, 3, 4)
				Nail Spacing at Other Panel Edges					
6-in.	6-in.	4-in.	3-in.						
PLYWOOD GRADE – STRUCTURAL II, CC EXTERIOR, STANDARD SHEATHING – 1/2" NOMINAL THICKNESS²									
1	8 d Common	2	2	270	360	530	600	240	180
2	8 d-Short Com.								
3	8 d Ring Shank Nail								
4	8 d Screw Shank Nail								
5	.131 T-Nail	3	300	400	600	675	265	200	
6	No. 13 Ga. Staple								
7	10 d Box								
8	.128 T-Nail	2	235	315	470	530	210	155	
9	No. 14 Ga. Staple								
10	10 d Cooler	3	265	355	530	600	235	175	
11	.1205 T-Nail								
12	6 d Common	1½	2	215	290	425	475	190	145
13	6 d Ring Shank Nail								
14	6 d Screw Shank Nail								
15	8 d Box								
16	.113 T-Nail	3	210	280	420	475	185	140	
17	No. 15 Ga. Staple								
18	6 d Box								
19	.097-.099 T-Nail	2	160	215	315	360	145	110	
20	No. 16 Ga. Staple								
21	10 d Common	1½	3	180	240	360	405	155	120
22	10 d Short Com.								
23	10 d Ring Shank Nail								
24	10 d Screw Shank Nail								
25	.148 T-Nail	2½	2	290	385	575 ⁵	655 ⁵	255	190
26	No. 12 Ga. Staple								

¹ These values are for short time loads due to wind or earthquake and must be reduced 25 percent for normal loading. Space fasteners 10 inches on center for floors and 12 inches on center for roofs along intermediate framing members.

² Plywood not exceeding 1½ inches in thickness may be connected with T-nails, round head nails, modified round head nails, or staples, provided the fastener penetration complies with Table I.

³ "Nail" is general description and may be T-nail, round head nail or modified round head nail. Casing nails and finish T-nails are excluded.

⁴ See Table No. I for round head nail, modified round head nail, required penetration into the receiving member, other than listed above.

⁵ Reduce tabulated allowable shears 10 percent when boundary members provide less than 3-inch nominal nailing surface.

⁶ The tabulated values are for fasteners installed in Douglas Fir, Larch or Southern Pine (Group II species). To determine the allowable values for Groups I, III & IV species, as shown in the appendix, multiply the value tabulated for Group II species by the following factors: I – 1.24, III – .81, IV – .65.

TABLE NO. VII
ALLOWABLE SHEAR FOR WIND OR SEISMIC FORCES
IN POUNDS PER FOOT FOR HORIZONTAL PLYWOOD DIAPHRAGMS¹⁻⁶

Item No.	T-Nail Standard Round ³ Head or Clipped Round Head Nail Diameter (In Inches) or Staple Gauge ⁴	Minimum Length of Fastener Required (Inches)	Minimum Nominal Width of Framing Member (Inches)	Blocked Diaphragms				Unblocked Diaphragms	
				Nail Spacing at Diaphragm Boundaries (All Cases) and Continuous Panel Edges Parallel to Load (Cases 3 & 4)				Nails Spaced 6" Maximum at Supported End	
				6-in.	4-in.	2½-in.	2-in.	Load Perpendicular to Unblocked Edges and Continuous Panel Joints (Case 1)	All Other Configurations (Cases 2, 3, 4)
				Nail Spacing at Other Panel Edges					
6-in.	6-in.	4-in.	3-in.						
PLYWOOD GRADE – STRUCTURAL II, CC									
EXTERIOR, STANDARD SHEATHING – 5/8" NOMINAL THICKNESS²									
1	10d Common	2¼	2	320	425	640 ⁵	730 ⁵	285	215
2	10d Short Com								
3	10d Ring Shank Nail								
4	10d Screw Shank Nail	3	3	360	480	720	820	320	240
5	.148 T-Nail								
6	No.12 Ga. Staple								
7	No.13 Ga. Staple	1¾	2	315	415	625 ⁵	715 ⁵	280	210
		1½	3	350	470	705	800	315	235
8	8d Common	2½	2	270	360	530	600	240	180
9	8d Short Com								
10	8d Ring Shank Nail								
11	8d Screw Shank Nail	3	3	300	400	600	675	265	200
12	.131 T-Nail								
13	10d Box								
14	.128 T-Nail	2½	2	260	340	510	585	230	170
15	No.14 Ga. Staple	1½	3	290	380	575	655	255	190
16	10d Cooler	2	2	235	310	470	535	210	160
17	.1205 T-Nail		3	265	350	530	600	235	175
18	6d Common	1¾	2	185	250	375	420	165	125
19	6d Ring Shank Nail								
20	6d Screw Shank Nail								
21	8d Box	3	3	210	280	420	475	185	140
22	.113 T-Nail								
23	No.15 Ga. Staple								
24	6d Box	1¾	2	160	215	315	360	145	110
25	.097-.099 T-Nail	1½	3	180	240	360	405	155	120
26	No.16 Ga. Staple								

¹ These values are for short time loads due to wind or earthquake and must be reduced 25 percent for normal loading. Space fasteners 10 inches on center for floors and 12 inches on center for roofs along intermediate framing members.

² Plywood not exceeding 1½ inches in thickness may be connected with T-nails, round head nails, modified round head nails, or staples, provided the fastener penetration complies with Table I.

³ "Nail" is general description and may be T-nail, round head nail or modified round head nail. Casing nails and finish T-nails are excluded.

⁴ See Table No. I for round head nail, modified round head nail, required penetration into the receiving member, other than listed above.

⁵ Reduce tabulated allowable shears 10 percent when boundary members provide less than 3-inch nominal nailing surface.

⁶ The tabulated values are for fasteners installed in Douglas Fir, Larch or Southern Pine (Group II species). To determine the allowable values for Groups I, III & IV species, as shown in the appendix, multiply the value tabulated for Group II species by the following factors: I – 1.24, III – .81, IV – .65.

**TABLE NO. VIII
ALLOWABLE SHEAR FOR WIND OR SEISMIC FORCES
IN POUNDS PER FOOT FOR PLYWOOD SHEAR WALLS¹⁻⁴**

Item No.	T-NAIL, STANDARD ROUNDHEAD, CLIPPED ROUND HEAD NAIL, IN WIRE DIAMETER OR STAPLE WIRE GAUGE ³	MINIMUM LENGTH OF FASTENER REQUIRED IN INCHES ²		ALLOWABLE WALL SHEAR VALUES			
		Plywood Applied Direct to Framing	Plywood Applied Over ½ In. Gypsum Sheathing	Nail Spacing at Plywood Edges (In Inches)			
				6	4	2½	2
PLYWOOD GRADE – STRUCTURAL I MINIMUM NOMINAL PLYWOOD THICKNESS (5/16")							
1	6 d Common	1 ½	—	200	300	450	510
2	6 d Ring Shank Nail		—				
3	6 d Screw Shank Nail		—				
4	.097-.099 Galv. T-Nail	1 ½	—				
5	8 d Common	—	—				
6	8 d Ring Shank Nail	—	2 ½				
7	8 d Screw Shank Nail	—	—				
8	.131 T-Nail	—	—				
9	8 d Galv. Cooler	—	2 ½				
10	.113 Galv. T-Nail	—	—				
11	No. 13 Gauge Staple	1 ¾	—	200	300	450	510
12	No. 14 Gauge Staple		—				
13	No. 15 Gauge Staple		—				
14	No. 16 Gauge Staple		—				
15	.0915 Galv. T-Nail		—				
16	No. 13 Gauge Staple	—	—	165	250	370	420
17	No. 14 Gauge Staple	—	—	145	220	330	370
18	No. 15 Gauge Staple	—	1 ¾	200	300	450	510
19	No. 16 Gauge Staple	—		190	290	430	490
20	.0915 Galv. T-Nail	—		165	245	370	420
21	.097-.099 Galv. T-Nail	—		135	200	300	340
22	.0915 Galv. T-Nail	—		120	180	265	300
23	.097-.099 Galv. T-Nail	—	2	130	200	300	340

¹ All panel edges backed with 2-inch nominal or wider framing. Plywood installed horizontally or vertically. Space fasteners at 6 inches on center along intermediate framing members for 3/8-inch plywood installed with face grain parallel to studs spaced 24 inches on center, and 12 inches on center for other conditions and plywood thicknesses. These values are for short time loads due to wind or earthquake and must be reduced 25 percent for normal loading.

² Where fastener lengths are not tabulated, the allowable wall shear values do not apply to that wall construction.

³ Fasteners exposed to weather shall be zinc coated by Hot-Dip Galvanized zinc, Mechanically Deposited zinc or Electrodeposited zinc.

⁴ The tabulated values are for fasteners installed in Douglas Fir, Larch or Southern Pine (Group II species). To determine the allowable values for Groups I, III & IV species, as shown in the appendix, multiply the value tabulated for the Group II species by the following factors: I – 1.24, III – .81, IV – .65.

TABLE NO. IX
ALLOWABLE SHEAR FOR WIND OR SEISMIC FORCES
IN POUNDS PER FOOT FOR PLYWOOD SHEAR WALLS¹⁻⁶

Item No.	T-NAIL, STANDARD ⁷ ROUNDHEAD, CLIPPED ROUND HEAD NAIL, IN WIRE DIAMETER OR STAPLE WIRE GAUGE ⁴	MINIMUM LENGTH OF FASTENER REQUIRED IN INCHES ²		ALLOWABLE WALL SHEAR VALUES							
		Plywood Applied Direct to Framing	Plywood Applied Over ½ In. Gypsum Sheathing	Nail Spacing at Plywood Edges (In Inches)							
				6	4	2½	2				
PLYWOOD GRADE – STRUCTURAL I											
MINIMUM NOMINAL PLYWOOD THICKNESS (3/8")											
1	8 d Common	1 ¾	—	230 ⁵	360 ⁵	530 ⁵	610 ⁵				
2	8 d Ring Shank Nail		—								
3	8 d Screw Shank Nail		—								
4	.131 T-Nail		—								
5	6 d Galv. Common	1 ½	—	280	430	640 ³	730 ³				
6	Galvanized 6 d Ring Shank Nail		—								
7	6 d Screw Shank Nail		—								
8	.113 Galv. T-Nail		—								
9	No.14 Gauge Staple	1 ¾	—	190 ⁵	295 ⁵	440 ⁵	500 ⁵				
10	10 d Common	—									
11	10 d Ring Shank Nail	—									
12	10 d Screw Shank Nail	—									
13	.148 T-Nail	—	2 ½	160 ⁵	240 ⁵	350 ⁵	400 ⁵				
14	.128 Galv. T-Nail	—									
15	No.15 Gauge Staple	1 ¾	—					270	420	630 ³	715 ³
16	No.16 Gauge Staple	1 ¾	—								
17	.097-.099 Galv. T-Nail	1 ½	—								
18	No.13 Gauge Staple	—	1 ¾	225	345	510	580				
19	No.14 Gauge Staple	—		190	285	430	490				
20	No.15 Gauge Staple	—		155	240	355	405				
21	No.16 Gauge Staple	—	2	205	315	470	535				
22	.097-.099 Galv. T-Nail	—	2 ¼								
23	10 d Cooler	—	2 ¼								
24	.1205 T-Nail	—									

¹ All panel edges backed with 2-inch nominal or wider framing. Plywood installed horizontally or vertically. Space fasteners at 6 inches on center along intermediate framing members for ¾-inch plywood installed with face grain parallel to studs spaced 24 inches on center, and 12 inches on center for other conditions and plywood thicknesses. These values are for short time loads due to wind or earthquake and must be reduced 25 percent for normal loading.

² Where fastener lengths are not tabulated, the allowable wall shear values do not apply to that wall construction.

³ Reduce tabulated allowable shears 10 percent when boundary members provide less than 3-inch nominal nailing surface.

⁴ Fasteners exposed to weather shall be zinc coated by Hot-Dip Galvanized zinc, Mechanically Deposited zinc or Electrodeposited zinc.

⁵ The values for ¾-inch thick plywood applied direct to framing may be increased by 20 percent provided studs are spaced a maximum of 16 inches on center or plywood is applied with face grain across studs.

⁶ The tabulated values are for fasteners installed in Douglas Fir, Larch or Southern Pine (Group II species). To determine the allowable values for Groups I, III & IV species, as shown in the appendix, multiply the value tabulated for the Group II species by the following factors: I – 1.24, III – .81, IV – .65.

⁷ "Nail" is general description and may be round head nail or modified round head nail.

TABLE NO. X
ALLOWABLE SHEAR FOR WIND OR SEISMIC FORCES
IN POUNDS PER FOOT FOR PLYWOOD SHEAR WALLS¹⁻⁶

Item No.	T-NAIL, STANDARD ROUND HEAD, CLIPPED ⁷ ROUND HEAD NAIL, IN WIRE DIAMETER OR STAPLE WIRE GAUGE ⁴	MINIMUM LENGTH OF FASTENER REQUIRED IN INCHES ²		ALLOWABLE WALL SHEAR VALUES			
		Plywood Applied Direct to Framing	Plywood Applied Over 1/2 In. Gypsum Sheathing	Nail Spacing at Plywood Edges (In Inches)			
				6	4	2 1/2	2
PLYWOOD GRADE – STRUCTURAL I							
MINIMUM NOMINAL PLYWOOD THICKNESS (1/2")							
1	10d Common	2 1/2	—	340	510	770 ³	870 ³
2	10d Short Common		—				
3	10d Ring Shank Nail		—				
4	10d Screw Shank Nail		—				
5	.148 T-Nail		—				
6	10d Galv. Box	2	—	270	405	615	690
7	.128 Galv. T-Nail		—				
8	No. 13 Gauge Staple	1 1/2	—	230	345	520	590
9	No. 14 Gauge Staple		—				
10	No. 15 Gauge Staple		—				
11	No. 16 Gauge Staple	2	—	280	420	640	720
12	8d Common		—				
13	8d Ring Shank Nail		—				
14	8d Screw Shank Nail		—				
15	.131 T-Nail		—				
16	10d Cooler	1 3/4	—	250	375	565	640
17	.1205 T-Nail		—				
18	6d Common	1 3/4	—	230	340	515	580
19	6d Ring Shank Nail		—				
20	6d Screw Shank Nail		—				
21	.113 T-Nail		—				
22	6d Box	1 5/8	—	190	280	425	480
23	.097-.099 T-Nail		—				
PLYWOOD GRADE – STRUCTURAL II CC – EXTERIOR, STANDARD SHEATHING,							
PANEL SIDING MINIMUM NOMINAL PLYWOOD THICKNESS (5/16")							
24	6d Common	1 5/8	—	180	270	400	450
25	6d Ring Shank Nail		—				
26	6d Screw Shank Nail		—				
27	.113 T-Nail		—				
28	.097-.099 Galv. T-Nail	1 1/2	—	180	270	400	450
29	8d Common		—				
30	8d Ring Shank Nail	—	2 3/4	180	270	400	450
31	8d Screw Shank Nail						
32	.131 T-Nail						
33	8d Galv. Cooler	—	2 1/2	145	220	330	370
34	.113 Galv. T-Nail						
35	No. 13 Gauge Staple	1 3/4	—	180	270	400	450
36	No. 14 Gauge Staple						
37	No. 15 Gauge Staple	1 3/4	—	130	195	290	330
38	No. 16 Gauge Staple						
39	.0915 T-Nail						
40	No. 13 Gauge Staple	—	1 3/4	180	270	400	450
41	No. 14 Gauge Staple						
42	No. 15 Gauge Staple						
43	No. 16 Gauge Staple						
44	.0915 Galv. T-Nail						
45	.097-.099 Galv. T-Nail						
		2	—	120	180	270	300

For Footnotes – see Table No. XII

**TABLE NO. XI
ALLOWABLE SHEAR FOR WIND OR SEISMIC FORCES
IN POUNDS PER FOOT FOR PLYWOOD SHEAR WALLS¹⁻⁶**

Item No.	T-NAIL, STANDARD ROUND HEAD, CLIPPED ⁷ ROUND HEAD NAIL, IN WIRE DIAMETER OR STAPLE WIRE GAUGE ⁴	MINIMUM LENGTH OF FASTENER REQUIRED IN INCHES ²		ALLOWABLE WALL SHEAR VALUES			
		Plywood Applied Direct to Framing	Plywood Applied Over ½ In. Gypsum Sheathing	Nail Spacing at Plywood Edges (In Inches)			
				6	4	2½	2
PLYWOOD GRADE – STRUCTURAL II CC – EXTERIOR, STANDARD SHEATHING, PANEL SIDING MINIMUM NOMINAL PLYWOOD THICKNESS (3/8")							
1	8 d Common	1 ¾	—	220 ⁵	320 ⁵	470 ⁵	530 ⁵
2	8 d Ring Shank Nail		—				
3	8 d Screw Shank Nail		—				
4	.131 T-Nail		—				
5	6 d Galv. Common	1 ¾	—	260	380	570 ³	640 ³
6	Galvanized		—				
7	6 d Screw Shank Nail		—				
8	.113 Galv. T-Nail		—				
9	No. 14 Gauge Staple	1 ¾	—	180 ⁵	260 ⁵	390 ⁵	440 ⁵
10	.148 T-Nail	—	2 ½				
11	.128 Galv. T-Nail	—	2 ¾	140 ⁵	210 ⁵	315 ⁵	350 ⁵
12	No. 15 Gauge Staple	1 ¾	—				
13	No. 16 Gauge Staple	1 ¾	—	260	380	570 ³	640 ³
14	.097-.099 Galv. T-Nail	1 ½	—				
15	No. 13 Gauge Staple	—	1 ¾				
16	No. 14 Gauge Staple	—					
17	No. 15 Gauge Staple	—					
18	No. 16 Gauge Staple	—	1 ¾	145	210	315	355
19	.097-.099 Galv. T-Nail	—	2				
20	.1205 T-Nail	—	2 ½	190	280	420	470
PLYWOOD GRADE – STRUCTURAL II CC – EXTERIOR, STANDARD SHEATHING, PANEL SIDING – MINIMUM NOMINAL PLYWOOD THICKNESS (1/2")							
21	10 d Common	2 ¼	—	310	460	690 ³	770 ³
22	10 d Short Common		—				
23	10 d Ring Shank Nail		—				
24	10 d Screw Shank Nail		—				
25	.148 T-Nail	2	—	250	370	550	615
26	10 d Galv Box		—				
27	.128 Galv. T-Nail		—				
28	No. 13 Gauge Staple		1 ½				
29	No. 14 Gauge Staple	1 ½	—	210	310	470	525
30	No. 15 Gauge Staple		—				
31	No. 16 Gauge Staple		—				
32	8 d Common	2	—	255	385	570	640
33	8 d Ring Shank Nail		—				
34	8 d Screw Shank Nail		—				
35	.131 T-Nail		—				
36	10 d Cooler	1 ¾	—	230	340	505	565
37	.1205 T-Nail		—				
38	6 d Common	1 ¾	—	210	310	460	515
39	.113 T-Nail		—				
40	.097-.099 T-Nail	1 ¾	—	170	255	380	425

For Footnotes – see Table No. XII

TABLE NO. XII
ALLOWABLE SHEAR FOR WIND OR SEISMIC FORCES
IN POUNDS PER FOOT FOR PLYWOOD SHEAR WALLS¹⁻⁶

Item No.	T-NAIL, STANDARD ⁷ ROUNDHEAD, CLIPPED ROUND HEAD NAIL, IN WIRE DIAMETER OR STAPLE WIRE GAUGE ⁴	MINIMUM LENGTH OF FASTENER REQUIRED IN INCHES ²		ALLOWABLE WALL SHEAR VALUES			
		Plywood Applied Direct to Framing	Plywood Applied Over ½ In. Gypsum Sheathing	Nail Spacing at Plywood Edges (In Inches)			
				6	4	2½	2
FINISH – PLYWOOD							
PANEL SIDING MINIMUM NOMINAL PLYWOOD THICKNESS (5/16")							
1	6 d Galv. Casing Nail	1 ½	—	140	210	320	360
2	.097-.099 Galv. Finish T-Nail						
3	8 d Galv. Casing Nail	—	2 ½				
4	.113 Galv. Finish T-Nail						
FINISH – PLYWOOD							
PANEL SIDING MINIMUM NOMINAL PLYWOOD THICKNESS (3/8")							
5	8 d Galv. Casing Nail	1 ¾	—	130 ⁵	200 ⁵	300 ⁵	340 ⁵
6	.113 Galv. Finish T-Nail						
7	10 d Galv. Casing Nail	—	2 ¾				
8	.128 Galv. Finish T-Nail						

¹ All panel edges backed with 2-inch nominal or wider framing. Plywood installed horizontally or vertically. Space fasteners at 6 inches on center along intermediate framing members for 3/8-inch plywood installed with face grain parallel to studs spaced 24 inches on center, and 12 inches on center for other conditions and plywood thicknesses. These values are for short time loads due to wind or earthquake and must be reduced 25 percent for normal loading.

² Where fastener lengths are not tabulated, the allowable wall shear values do not apply to that wall construction.

³ Reduce tabulated allowable shears 10 percent when boundary members provide less than 3-inch nominal nailing surface.

⁴ Fasteners exposed to weather shall be zinc coated by Hot-Dip Galvanized zinc, Mechanically Deposited Zinc or Electrodeposited zinc.

⁵ The values for 3/8-inch thick plywood applied direct to framing may be increased by 20 percent provided studs are spaced a maximum of 16 inches on center or plywood is applied with face grain across studs.

⁶ The tabulated values are for fasteners installed in Douglas Fir, Larch or Southern Pine (Group II species). To determine the allowable values for Groups I, III & IV species, as shown in the appendix, multiply the value tabulated for Group II species by the following factors: I – 1.24, III – .81, IV – .65.

⁷ "Nail" is general description and may be round head nail or modified round head nail.

TABLE NO. XIII
ALLOWABLE SHEAR FOR WIND OR SEISMIC FORCES IN POUNDS PER FOOT
FOR VERTICAL DIAPHRAGMS OF WALL SHEATHING, GYPSUM LATH-PLASTER,
WALLBOARD, & EXTERIOR PLASTER ATTACHED TO WOOD FRAMED WALL ASSEMBLIES¹

Description Attached Material	Thickness of Material	Wall Construction	SPACING ² SPECIFICATIONS (In Inches)		SHEAR VALUE	FASTENER SPECIFICATIONS		Item No.
			Edges	Intermediate		Leg Length (In In.)	FASTENER STYLE ⁶⁻⁷	
4 Fiber- ³ board Sheathing	7/16"		3	6	125	1 1/2	11 Ga. Galv. Roofing Nail	1
					115	1 1/2	No.14 Ga. Galv. Staple	2
					95		No.15 Ga. Galv. Staple	3
	25/32"		3	6	175	1 1/2	11 Ga. Galv. Roofing Nail	5
					160	1 3/4	No.14 Ga. Galv. Staple	6
							No.15 Ga. Galv. Staple	7
No.16 Ga. Galv. Staple	8							
Gypsum ⁵ Lath, Plain or Perforated	3/8" Lath & 1/2" Plaster	Unblocked	5" On Center		100	1 1/2	No.16 Ga. Galv Staple	9
Gypsum ³ Sheathing Board	1/2" x 2' x 8'	Unblocked	4" On Center		75	1 3/4	No.16 Ga. Galv. Staple	10
	1/2" x 4' x 8'	Blocked			175			
Gypsum ³ Wall-board ⁸	1/2"	Unblocked	7" On Center		100	1 5/8	5 d Cooler Nail	11
			4" On Center		125			
		Blocked	7" On Center		125	1 1/2	No. 16 Gauge Staple	12
			4" On Center		150			
	5/8"	Blocked	4" On Center		175	1 7/8	6 d Cooler Nail	13
						1 5/8	No.16 Ga. Staple	14
		Blocked Two-Ply	Base Ply—9"—Center		250	1 7/8	6 d Cooler Nail	15
			Face Ply—7"—Center			1 5/8	No.16 Ga. Staple	16
					2 3/8	8 d Cooler Nail	17	
					2 1/4	No.15 Ga. Staple	18	
Self-Furred ⁵ Woven Wire Lath		2" x 4" Studs spaced 24" maximum on center. Lath stapled 6" o.c. to all studs, top and bottom plate. Wall finished with 3/8" thick exterior plaster.			180 ⁹	3/4	No.16 Ga. Galv. Staple	19

¹ These vertical diaphragms shall not be used to resist loads imposed by masonry or concrete walls. Values are for short-time loading due to wind or earthquake and must be reduced 25 percent for normal loading.

² Applied to nailing at all studs, top and bottom plates and blocking.

³ Staples shall have a minimum crown width of 7/16-inch O.D.

⁴ The shear value may be 175 pounds for 1/2" x 4 foot x 8-foot fiberboard nail base sheathing.

⁵ Staples for the attachment of gypsum lath and woven-wire lath shall have a minimum crown width of 3/4 inch O.D.

⁶ Material attached to Redwood and Group III species of wood add minimum of 3/8 inch to fastener leg lengths.

⁷ Fasteners required to be galvanized shall be zinc coated by Hot-Dip Galvanized zinc, Mechanically Deposited zinc or Electrodeposited zinc.

⁸ Wallboard requiring a smooth finish for appearance's sake shall be attached with an approved stapling tool that simultaneously drives the staple and dimples the surface area of the wallboard without cutting the paper.

⁹ The tabulated values are for fasteners installed in Douglas Fir, Larch or Southern Pine (Group II species). To determine the allowable values for Groups I, III & IV species, as shown in the appendix, multiply the value tabulated for the Group II species by the following factors: I - 1.24, III - .81, IV - .65.

**TABLE NO. XIV
NAILING SCHEDULE FOR FRAMING**

Item No.	NAIL ³ DESCRIPTION	CONNECTION DESCRIPTION	Fasteners Required	Minimum Fastener Length \n Inches	
1	.113 T-Nail	Joist to sill or girder, toe nail	3	2 3/8	
2	8 d Cooler	Bridging to joist, toe nail each end	2		
		1" x 6" subfloor or less to each joist, face nail	2		
3	8 d Sinker	Wider than 1" x 6" subfloor to each joist, face nail	3		
		Stud to sole plate, toe nail	4		
4	8 d Box	Ceiling joists to plate, toe nail	3		
		Continuous header to stud, toe nail	4		
5	8 d Common	Rafter to plate, toe nail	3	3 1/4	
		1" brace to each stud and plate, face nail	2		
6	8 d Screw Nail	1" x 8" sheathing or less to each bearing, face nail	2		
		Wider than 1" x 8" sheathing to each bearing, face nail	3		
7	8 d Ring Nail				
8	.131 T-Nail	2" subfloor to joist or girder, blind and face nail	2		3 1/4
9	.131 to .135 Nail	Sole plate to joist or blocking, face nail	16" o.c.		
		Top plate to stud, end nail	2		
10	16 d Sinker	Doubled studs, face nail	24" o.c.		
		Doubled top plates, face nail	16" o.c.		
11	16 d Box	Top plates, laps and intersections, face nail	2		
		Continuous header, two pieces	16" o.c. ⁴		
12	16 d Common	Ceiling joists, laps over partitions, face nail	3		
		Ceiling joists, to parallel rafters, face nail	3	See Foot Notes 1 & 2	
13	16 d Screw Nail	Built-up corner studs	24" o.c.		
		2" planks	2		
14	16 d Ring Nail				
Combination Subfloor-underlayment (to framing):					
15	6 d Screw Nail	3/4" and less	See	2	
16	6 d Ring Nail				
17	8 d Screw Nail	5/8" to 1"	Foot	2 1/2	
18	8 d Ring Nail				
19	10 d Common	1 1/8" to 1 1/4"	Notes	3	
20	.148 T-Nail				
21	8 d Screw Nail				
22	8 d Ring Nail				

¹ Nails spaced 6 inches on center at edges, 10 inches at intermediate supports for floors and 12 inches on center for roofs.

² Nails spaced 6 inches on center at all supports where spans are 48 inches or more.

³ Nail is a general description and may have round heads or modified round heads.

⁴ Along each edge.

TABLE NO. XV
STAPLE AND NAIL NON-DESIGNED USES FOR MATERIALS
ATTACHED TO WOOD RECEIVING MEMBERS

SUBFLOORING, WALL SHEATHING, ROOF SHEATHING (SOLID OR SPACED)				
NOMINAL THICKNESS (in.)	SPACING SPECIFICATIONS FASTENER COUNT PER BOARD Attached to Receiving Member and Other Arrangements	MINIMUM LENGTH OF FASTENER REQUIRED (in.)	Staple Crown Width 7/16" Min. T-Nail, Standard Round Head, Clipped Round Head Nail, in Wire Diameter or Staple Wire Gauge	Item No.
1 x 4 or 1 x 6	2 Staples per Board per Bearing	1 ¾	No. 16 Gauge Staple	1
			No. 15 Gauge Staple	2
			No. 14 Gauge Staple	3
	2 Nails per Board per Bearing	2	6 d Common Nail	4
			6 d Ring Shank Nail	5
			6 d Screw Shank Nail	6
			.113 T-Nail	7
	2 Nails per Board per Bearing	1 ½	.097-.099 T-Nail	8
1 x 8	4 Staples per Board per Bearing	1 ¾	No. 16 Gauge Staple	9
			No. 15 Gauge Staple	10
	3 Staples per Board per Bearing	1 ¾	No. 14 Gauge Staple	11
	3 Nails per Board per Bearing	2	6 d Common Nail	12
			6 d Ring Shank Nail	13
			6 d Screw Shank Nail	14
			.113 T-Nail	15
	4 Nails per Board per Bearing	1 ½	.097-.099 T-Nail	16

TABLE NO. XVI
STAPLE & NAIL NON-DESIGNED USES FOR
SUBFLOOR & ROOF SHEATHING ATTACHED TO WOOD MEMBERS

DESCRIPTION ATTACHED MATERIAL	ATTACHED MATERIAL NOMINAL THICKNESS	SPACING SPECIFICATIONS (In Inches)			FASTENER SPECIFICATIONS ¹⁻²		Item No.	
		Edges	Intermediate		Leg Length (In Inches)	Fastener Style ³		
			Roof	Floor				
PLYWOOD	5/16 - 1/4 - 3/8	6	12	10	1 3/8	No. 14 Gauge Staple	1	
						No. 15 Gauge Staple	2	
					1 5/8	No. 16 Gauge Staple	3	
						6 d Common Nail	4	
						6 d Ring Shank Nail	5	
						6 d Screw Shank Nail	6	
						.113 T-Nail	7	
SUBFLOOR	1/2	6	12	10	1 1/2	No. 14 Gauge Staple	8	
						No. 15 Gauge Staple	9	
					1 3/4	No. 16 Gauge Staple	10	
						6 d Common Nail	11	
						6 d Ring Shank Nail	12	
						6 d Screw Shank Nail	13	
						.113 T-Nail	14	
& ROOF	5/8	6	12	10	1 7/8	No. 14 Gauge Staple	15	
						No. 15 Gauge Staple	16	
					2 1/4	No. 16 Gauge Staple	17	
						8 d Common Nail	18	
						1 7/8	6 d Ring Shank Nail	19
							6 d Screw Shank Nail	20
						2 1/8	.131 T-Nail	21
SHEATHING ⁴	3/4	6	12	10	2	No. 14 Gauge Staple	22	
						6	10	8
		2 3/8	No. 16 Gauge Staple	24				
		6	12	10	2 1/4		8 d Common Nail	25
					2	6 d Ring Shank Nail	26	
						6 d Screw Shank Nail	27	
					2 1/4	.131 T-Nail	28	

¹ Staples shall have a 7/16" minimum O.D. Crown Width.

² Fasteners exposed to weather shall be zinc coated by Hot-Dip Galvanized zinc, Mechanically Deposited zinc or Electrodeposited zinc.

³ Nails may have T-heads, modified round heads or standard round heads.

⁴ Where subfloor spans 48 inches or more, fasteners shall be spaced six inches on center at all supports except where a closer spacing is indicated.

TABLE NO. XVII
STAPLE & NAIL NON-DESIGNED USES FOR
SUBFLOOR & ROOF SHEATHING ATTACHED TO WOOD MEMBERS

DESCRIPTION ATTACHED MATERIAL	ATTACHED MATERIAL NOMINAL THICKNESS	SPACING SPECIFICATIONS (In Inches)			FASTENER SPECIFICATIONS ¹⁻²		Item No.	
		Edges	Intermediate		Leg Length (In Inches)	Fastener Style ³		
			Roof	Floor				
PLYWOOD SUBFLOOR & ROOF SHEATHING ⁴	7/8	6	12	10	2 3/8	8 d Common	1	
						8 d Ring Shank Nail	2	
						8 d Screw Shank Nail	3	
						.131 T-Nail	4	
					2	No. 13 Gauge Staple	5	
					2 1/2	No. 14 Gauge Staple	6	
	SUBFLOOR & ROOF SHEATHING ⁴	1	4	10	8	2 1/2	No. 15 Gauge Staple	7
						2 1/2	No. 16 Gauge Staple	8
						2 1/2	No. 13 Gauge Staple	9
						2 1/2	8 d Common Nail	10
8 d Ring Shank Nail							11	
8 d Screw Shank Nail							12	
1 1/2 - 1 1/4		6	12	10	2 1/4	.131 T-Nail	13	
						No. 14 Gauge Staple	14	
					2 3/8	No. 15 Gauge Staple	15	
						No. 13 Gauge Staple	16	
1 1/2 - 1 1/4	6	12	10	2 3/8	10 d Common Nail	17		
					.148 T-Nail	18		
					No. 14 Gauge Staple	19		
				2 1/2	8 d Ring Shank Nail	20		
					8 d Screw Shank Nail	21		
					3	No. 15 Gauge Staple	22	

¹ Staples shall have a 7/16" minimum O.D. Crown Width.

² Fasteners exposed to weather shall be zinc coated by Hot-Dip Galvanized zinc, Mechanically Deposited zinc or Electrodeposited zinc.

³ Nails may have T-heads, modified round heads or standard round heads.

⁴ Where subfloor spans 48 inches or more, fasteners shall be spaced six inches on center at all supports except where a closer spacing is indicated.

TABLE NO. XVIII
STAPLE & NAIL NON-DESIGNED USES FOR
WALL SHEATHING ATTACHED TO WOOD MEMBERS

DESCRIPTION ATTACHED MATERIAL	ATTACHED MATERIAL NOMINAL THICKNESS	SPACING SPECIFICATIONS (In Inches)		FASTENER SPECIFICATIONS ¹⁻²		Item No.
		Edges	Intermediate	Leg Length (In Inches)	Fastener Style ³	
PLYWOOD	1/4 & 5/16	6	12	1 3/8	No. 14 Gauge Staple	1
					No. 15 Gauge Staple	2
					No. 16 Gauge Staple	3
				1 1/2	6 d Box Nail	4
					.097-.099 T-Nail	5
					No. 14 Gauge Staple	6
	3/8	6	12	1 3/8	No. 15 Gauge Staple	7
					No. 16 Gauge Staple	8
					6 d Common Nail	9
				1 5/8	6 d Ring Shank Nail	10
					6 d Screw Shank Nail	11
					.113 T-Nail	12
				1 1/2	6 d Box Nail	13
					.097-.099 T-Nail	14
WALL SHEATHING	1/2	6	12	1 1/2	No. 14 Gauge Staple	15
					No. 15 Gauge Staple	16
					No. 16 Gauge Staple	17
				1 3/8	6 d Common Nail	18
					6 d Ring Shank Nail	19
					6 d Screw Shank Nail	20
	1 5/8	.113 T-Nail	21			
		6 d Box Nail	22			
		.097-.099 T-Nail	23			
		No. 14 Gauge Staple	24			
		No. 15 Gauge Staple	25			
	5/8	6	12	1 3/8	No. 16 Gauge Staple	26
					6 d Common Nail	27
					6 d Ring Shank Nail	28
1 1/2				6 d Screw Shank Nail	29	
				8 d Cooler Nail	30	
				.113 Finish T-Nail	31	
				8 d Box Nail	32	
				.113 T-Nail	33	

¹Staples shall have a 7/16" minimum O.D. Crown Width.

²Fasteners exposed to weather shall be zinc coated by Hot-Dip Galvanized zinc, Mechanically Deposited zinc or Electrodeposited zinc.

³Nails may have T-heads, modified round heads or standard round heads.

TABLE NO. XIX
WALL SHEATHING, PANEL SIDING AND FLOOR UNDERLAYMENT
ATTACHED TO WOOD MEMBERS

DESCRIPTION ATTACHED MATERIAL	ATTACHED MATERIAL NOMINAL THICKNESS	SPACING SPECIFICATIONS (In Inches)		FASTENER SPECIFICATIONS ¹		Item No.
		Edges	Intermediate	Leg Length (In Inches)	Fastener Style ³	
PLYWOOD	3/8	6	12	1 1/2	6 d Galv. Casing Nail	1
					6 d Galv. Siding Nail	2
					.097-.099 Galv. Finish T-Nail	3
PANEL	1/2	6	12	1 3/4	6 d Galv. Casing Nail	4
					6 d Galv. Siding Nail	5
					.097-.099 Galv. Finish T-Nail	6
SIDING ²	5/8	6	12	1 3/4	8 d Galv. Casing Nail	7
					8 d Galv. Siding Nail	8
					.113 Galv. Finish T-Nail	9
FIBERBOARD WALL SHEATHING	1/2	6	12	1 1/2	No. 14 Gauge Staple	10
		4	10		No. 15 Gauge Staple	11
					No. 16 Gauge Staple	12
	25/32	6	12	1 3/4	No. 14 Gauge Staple	13
		4	10		No. 15 Gauge Staple	14
					No. 16 Gauge Staple	15
GYPSUM WALL SHEATHING	1/2	6	12	1 1/2	No. 14 Gauge Staple	16
		4	10		No. 15 Gauge Staple	17
					No. 16 Gauge Staple	18
FLOOR UNDERLAYMENT PLYWOOD HARDBOARD FLAKEBOARD PARTICLE BOARD	1/4 & 5/16	Edges	Intermediate Areas	1 1/4	3 d Ring Shank Nail	19
		6	8-Grid		.080 T-Nail	20
		4	6-Grid		No. 18 Gauge Staple 3/16" Crown	21
	3/8	6	8-Grid	1 1/4	.080 T-Nail	22
		4	6-Grid		3 d Ring Shank Nail	23
	1/2	6	8-Grid	1 1/4	No. 16 Gauge Staple	24
		4	8-Grid		6 d Box Nail	25
		6	8-Grid		.097-.099 T-Nail	26
	5/8	6	8-Grid	1 1/4	3 d Ring Shank Nail	27
		4	8-Grid		No. 16 Gauge Staple	28
		6	8-Grid		6 d Box Nail	29
		4	6-Grid		.097-.099 T-Nail	30
	6	8-Grid		4 d Ring Shank Nail	31	
	4	6-Grid		No. 16 Gauge Staple	32	

¹ Except as noted above, all staples shall have a minimum O.D. crown width of 7/16 inch.

² Fasteners manufactured from steel wire exposed to the weather shall be zinc coated by Hot-Dip Galvanized zinc, Mechanically Deposited zinc or Electrodeposited zinc. Fasteners manufactured from aluminum alloy wire or other non-ferrous alloys exposed to the weather do not require protective coatings.

³ Nails may have T-heads, modified round heads or standard round heads; .080 T-nails and No. 18 gauge staples are not listed in Table No. I, and are for nonstructural use only as tabulated above.

**TABLE NO. XX
FASTENERS FOR ATTACHING ROOF AND WALL COVERING MATERIALS**

SPACING SPECIFICATIONS ⁵⁻⁶	FASTENER SPECIFICATIONS ¹⁻²			Item No.
	FASTENER STYLE ³	MIN. O.D. CROWN WIDTH (In Inches)	LEG LENGTHS ⁴ O.D. (In Inches)	
ASPHALT – COMPOSITION, ROOF SHINGLES AND WALL SHINGLES				
A Minimum of (4) Staples Per Each 36" Section of Shingle	16 Ga. Staples	3/4	3/4	1
A Minimum of (6) Staples Per Each 36" Section of Shingle		7/16	3/4	2
ASPHALT – COMPOSITION, RIDGE, HIP, CAPS				
A Minimum of (4) Staples are required for Ridge Cap	16 Ga. Staples	3/4	1	3
		7/16	1 1/4	4
ROOF AND WALL WOOD SHINGLES⁸⁻⁹				
A Minimum of (2) Staples or Nails Per Shingle	16 Ga. Staples	7/16	1 1/4	5
	.080 T-Nails	—	1 1/4	6
WOOD SHAKES⁸⁻⁹				
A Minimum of (2) Staples or Nails Per Shake	16 Ga. Staples	7/16	1 3/4	7
	.080 T-Nails	—	1 3/4	8
TIN CAPPING – ROOF FELTS				
All tin caps placed and stapled 12" on center	16 Ga. Staples	7/16	3/8	9
Tin Cap Roofing Felts to Gypsum Decks	16 Ga. Staples	3/4	1 5/8	10
		7/16		11
ALUMINUM SIDING⁷				
Staple Spacing Maximum of 32" on Center	16 Ga. Staples	7/16	3/4	12

¹ Shingles and shakes attached to roof sheathing having the underside of the sheathing exposed to visual view may be attached in these locations with staples or nails having shorter lengths than specified so as not to penetrate the exposed side of the sheathing.

² All fasteners are manufactured from steel wire zinc coated by Hot-Dip Galvanized zinc, Mechanically Deposited zinc or Electrodeposited zinc. Fasteners manufactured from aluminum alloy wire or other non-ferrous alloys do not require coatings.

³ Nails may have T-heads, clipped round heads or standard heads.

⁴ For reroofing or recover applications, the staples or nail leg length shall be long enough to penetrate the opposite side of sheathing 1/8-inch or penetrate the sheathing 3/4-inch; all other provisions of this table will prevail.

⁵ Asphalt-Composition shingles attached with staples are driven so that the staple crown bears tightly against the shingle but does not cut the shingle surface. The crown is parallel to the long dimension of the shingle course.

⁶ Wood shingles and shakes attached with staples or T-nails are driven so that the staple crown and the nail head are parallel to the butt-edge compressing the wood surface no more than the total thickness of the staple crown wire or T-nail head.

⁷ Staples shall be aluminum and have a minimum penetration of 3/4" into the wood supporting member. One leg of the staple shall be driven through the prepunched hole in the sealing rib with the crown perpendicular to the width of the siding.

⁸ Nails for wood shingles and shakes shall be long enough to penetrate into the sheathing 3/4 inch, or through the thickness of the sheathing whichever is less. Exception is set forth in Footnote 1.

⁹ 18 Gauge staples with 7/16-inch crown may be used to attach roof and wall shingles provided the butt ends do not exceed 3/4 inch. The staple leg lengths shall be long enough to penetrate into the sheathing 3/4 inch or through the thickness of the sheathing whichever is less. Two staples shall be used to attach each shingle or shake.

TABLE NO. XXI
STAPLES¹ FOR ATTACHING WALL, CEILING AND
SOFFIT COVERING MATERIALS TO WOOD RECEIVING MEMBERS ONLY

Item No.	LEG LENGTH (O.D., In Inches)	DESCRIPTION OF COVERING MATERIALS ²⁻³	STAPLE SPACING (In Inches)
1	¾	¾-Inch Gypsum Lath, — Plain, Perforated, Type X	5
2			
3			
4	1	¾-Inch Gypsum Lath & Metal or Wire Stripping (For One Hour Fire-Rated Ceilings)	4
5	1 ½	½-Inch Gypsum Lath Plain or Type-X	
6		½-Inch Fiber Insulation Lath	
7	1 ¾	1-Inch Fiber Insulation Lath	5
8		Laminating ¾-Inch Gypsum Lath & ½-Inch Gypsum Wallboard (For Two Hour Fire-Rated Wall)	
9	¾	¾-Inch Gypsum Lath Panels, Wallboard & Backer Board	7
10			
11	1 ½	½-Inch Gypsum Lath Panels, Wallboard & Backer Board	
12			
13	1 ¼	¾-Inch Gypsum Wallboard & Backer Board	
14			
15	1 ¾	Laminating ½-Inch & ½-Inch Type-X Wallboard (For One Hour Fire-Rating)	
16		Laminating ¾-Inch & ¾-Inch Type-X Wallboard (For Two Hour Fire-Rated Wall)	
17	2	Laminating ¾-Inch & ¾-Inch Type-X Wallboard (For Two Hour Fire-Rated Wall)	6
18			
19	¾	Exterior Self-furred Stucco Mesh ²	
		Expanded Metal Lath — Furred and Non-Furred	
		Welded or Woven Wire Netting	
20		Welded Wire Fabric	
		Flat Rib Metal Lath	
		Masonry Veneer Wire Mesh (Stucco Mesh)	
21	1 ½	Exterior Self-furred Stucco Mesh ² (Attached on top of sheathing)	
22			
23	¾	Gun Lath, Stucco-Rite & Aqua-K-Lath, Heavy	
24			
25	1 ¼	¾-Inch High Rib Metal Lath	At Ribs
26			
27	1 ¾	¾-Inch High Rib Metal Lath	
28			

¹ Staples manufactured from 16 gauge round, semi-round or flattened wire, and shall have a minimum 7/16-inch O.D. crown.

² Fasteners manufactured from steel wire exposed to the weather shall be zinc coated by hot-dip galvanized zinc, mechanically deposited zinc or electrodeposited zinc. Fasteners manufactured from aluminum alloy wire or other non-ferrous alloys exposed to the weather do not require protective coatings.

³ Wallboard requiring a smooth finish for appearance's sake shall be attached with an approved tool that simultaneously drives the staple and dimples the surface area of the wallboard without cutting the paper.

TABLE NO. XXII
STAPLES FOR ATTACHING WALL, CEILING,
SOFFIT COVERING MATERIALS TO METAL RECEIVING MEMBERS ONLY

Item No.	WIRE GAUGE NO.	LEG LENGTH (O.D.) (In In.)	DESCRIPTION OF COVERING MATERIALS ¹	STAPLE ² SPACES (In Inches)	RECEIVING MEMBER			
1	16	1 ½	¾-Inch Gypsum Lath	5	Approved Load and Nonloadbearing Nailable Studs "Only" Designed for Receiving Round Wire Staples or Conventional Nails			
2				8				
3	16					½-Inch Gypsum Lath; Panels & Wallboard	5	
4				8				
5	14	⅝-Inch Gypsum Lath, Panels & Wallboard	5					
6			8					
7	16			Metal Lath & Welded or Woven Wire Lath & Masonry Veneer Wire Mesh, Gun Lath, Stucco-Rite & Aqua K-Lath Heavy Duty Furred, Non-Furred		6		
8			At Ribs					
9	16	¾-Inch High Rib Metal Lath				6		
10								
11	14		¾-Inch High Rib Metal Lath	At Ribs				
12								
13	16	1 ¼		Metal Lath & Welded or Woven Wire Lath & Masonry Veneer Wire Mesh, Gun Lath, Stucco-Rite & Aqua K-Lath Heavy Duty Furred, Non-Furred		6		
14								
15	16		1 ½				¾-Inch High Rib Metal Lath	At Ribs
16								
17	16	1 ¼		¾-Inch High Rib Metal Lath		At Ribs		
18								

¹ Staples manufactured from round, semi-round or flat wire and shall have a minimum 7/16-inch O. D. crown.

² Staples required to be galvanized shall be zinc coated by hot-dip galvanizing, mechanically deposited zinc or electrodeposited zinc.

³ Wallboard requiring a smooth finish for appearance's sake shall be attached with an approved stapling tool that simultaneously drives the staple and dimples the surface of the wallboard without cutting the paper.

TABLE NO. XXIII
TYING FASTENER GUIDE FOR ATTACHING METAL LATH
TO METAL RECEIVING MEMBERS

Item No.	FASTENER SIZE (In Inches)	WIRE GAUGE NO.	ATTACHMENT MATERIAL	RECEIVING MEMBER	Tying Fastener Spacing (In In.)
1	¾ x ¾ x ¾	14	3.4 Expanded Metal Lath (K-Lath) Gun Lath, Stucco-Rite, and Aqua K-Lath Heavy Duty	¼-Inch Diameter Pencil Rod Welded Wire Studs	6
2	¾ x 1 ¼ x ¾	14	Welded Wire Fabric (K-Lath, etc.), Gun Lath, Stucco-Rite and K-Lath Heavy Duty	Double ¼-Inch Diameter Pencil Rod Welded Wire Studs	6
3	1 ¾ x ½ x 1 ¾	13	Welded Wire Fabric (K-Lath, etc.), Gun Lath, Stucco-Rite and K-Lath Heavy Duty	¾-Inch Channel Iron ¾-Inch Flanged Pressed Steel (Prefab) Studs	6

Staples, nails and tying fasteners used for the attachment of wall, ceiling and soffit covering materials to wood and metal receiving members of bearing and non-bearing assemblies for fire-resistive or non-fire-resistive construction shall be installed as set forth in Table Nos. XXI through XXIII.

APPENDIX

WOOD SPECIES AND FORMULAS FOR CALCULATING LATERAL AND WITHDRAWAL LOAD VALUES FOR NAILS, T-NAILS, AND STAPLES

Reference: 1973 National Design Specifications for Stress Grade Lumber and its Fastenings.

Lateral Resistance: The allowable loads in lateral resistance when driven in side grain of seasoned wood with load applied in any lateral direction, are given in Table No. I. These loads apply only where the depth of penetration into the member holding the point is not less than 10 diameters for Group I species; 11 diameters for Group II species; 13 diameters for Group III species; 14 diameters for Group IV species. When penetration is less than that specified, the allowable load may be determined by straight-line interpolation between zero and the tabulated load, except that penetration shall be not less than one-third of that specified. Staples shall have a minimum penetration of 1 inch unless otherwise specified in the tables.

See Footnote No. 4 of Table I for factors to determine allowable lateral strength values for species in Groups I, III and IV.

Withdrawal Resistance: The allowable withdrawal loads per inch of penetration of a nail or spike driven in side grain (perpendicular to the fiber) of seasoned wood, or unseasoned wood which will remain wet shall be calculated by the following formula:

$$\rho = 1380 G^{5/2} D.$$

WHERE:

ρ = the allowable load per lineal inch of penetration in the member holding the nail point.

G = the specific gravity of the wood (see Table No. C).

D = the diameter of the nail in inches (see Table No. A).

METHOD OF CALCULATING DIAPHRAGM VALUES FOR STAPLES

Diaphragm values assigned to staples are based upon the lateral load-carrying capacity of the staple as determined by the criteria set forth in Handbook 72 of the U.S. Dept. of Agriculture for wire nails.

Handbook 72 provides that the lateral load-carrying capacity of wire nails is a function of the species of the wood and the diameter of the wire nail raised to the 3/2 power. As a staple has two legs the value for a single leg is doubled. Thus a No. 14 gauge staple is manufactured from wire having a diameter of .080 inch. This diameter raised to the 3/2 power and doubled produces a value of .0454. "EXAMPLE" in 3/8" plywood, diaphragm values have been determined by using a ratio of this value to the diameter raised to the 3/2 power on an 8 penny common nail (.0474).

**TABLE NO. A
MINIMUM WIRE DIAMETER SIZES FOR
COMMON, RING OR SCREW SHANK NAILS**

PENNY-WEIGHT	WIRE DIAMETER (In Inches)	WIRE DIAMETER (In Inches)
	COMMON NAILS	RING OR SCREW SHANK NAILS
6d	0.113	0.120
8d	.131	.120
10d	.148	.135
12d	.148	.135
16d	.162	.148
20d	.192	.177

APPENDIX

TABLE NO. B
COMMON NAILS – ALLOWABLE
LATERAL LOADS – NORMAL DURATION
(For Species in Each Group, See Table No. C)

GROUP	SIZE OF NAIL*					
	d = 6	8	10	12	16	20
I	78	97	116	116	132	171
II	63	78	94	94	107	139
III	51	64	77	77	88	113
IV	41	51	62	62	70	91

*Loads for Ring or Screw Shank Nails are the same as for Common Nails.

TABLE NO. C
GROUPING OF SPECIES FOR DETERMINING
ALLOWABLE LOADS FOR NAILS, AND STAPLES

GROUP	SPECIES OF WOOD	Specific Gravity* (G)
I	Ash, Commercial White .....	.62
	Beech .....	.68
	Birch, Sweet & Yellow .....	.66
	Hickory & Pecan .....	.75
	Maple, Black & Sugar .....	.66
	Oak, Red & White .....	.67
II	Douglas Fir – Larch .....	.51
	Southern Pine .....	.55
	Sweetgum & Tupelo .....	.54
III	Aspen, Northern .....	.42
	California Redwood (Close grain) .....	.42
	Douglas Fir, South .....	.48
	Eastern Hemlock – Tamarack .....	.45
	Eastern Spruce .....	.43
	Hem – Fir .....	.44
	Idaho White Pine .....	.42
	Lodgepole Pine .....	.44
	Mountain Hemlock .....	.47
	Northern Pine .....	.46
	Ponderosa Pine – Sugar Pine .....	.42
	Red Pine .....	.42
	Sitka Spruce .....	.43
	Southern Cypress .....	.48
Spruce – Pine – Fir .....	.42	
Western Hemlock .....	.48	
Yellow Poplar .....	.46	
IV	Aspen .....	.40
	Balsam Fir .....	.38
	California Redwood (Open grain) .....	.37
	Coast Sitka Spruce and Coast Species .....	.39
	Cottonwood, Black .....	.33
	Cottonwood, Eastern .....	.41
	Eastern White Pine .....	.38
	Engelman Spruce .....	.37
	Northern Species .....	.36
	Northern White Cedar .....	.31
	Subalpine Fir .....	.34
	Western Cedars36
Western White Pine40	

*Based on weight and volume when oven-dry.

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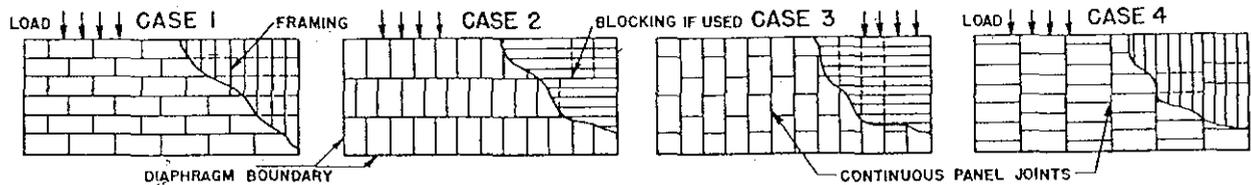
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I-SANTA MANUAL No. 2-19-73 HUD-FHA

The drawing illustrated on this sheet was inadvertently omitted from the Manual No. 2-19-73 HUD - FHA section of this document.

When using Tables III through VII "Horizontal Plywood Diaphragms" located on pages 6 through 10, refer to the drawing below for Cases 1 through 4 for blocked and unblocked diaphragms.



NOTE: Framing may be located in either direction for blocked diaphragms.