

Designation: D 1760 - 01

Standard Specification for Pressure Treatment of Timber Products¹

This standard is issued under the fixed designation D 1760; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

1. Scope

- 1.1 This specification covers treatment of timber products by pressure processes in closed vessels with preservative materials and solutions.
- 1.2 This specification is divided into two general sections. Sections 1-9 cover requirements relating to all species and commodities, while Tables 1-7 show requirements relating to specific species and commodities. The purchaser should note that these individual requirements vary widely and, consequently, great care must be used in applying them in specific instances.
- 1.3 The values stated in inch-pound units are to be considered as standard.

2. Referenced Documents

- 2.1 ASTM Standards:
- D 347 Tables for Volume and Specific Gravity Correction for Creosote and Coal Tar²
- D 390 Specification for Coal-Tar Creosote for the Preservative Treatment of Piles, Poles, and Timbers for Marine, Land, and Fresh Water Use²
- D 391 Specification for Creosote-Coal Tar Solution²
- D 1272 Specification for Pentachlorophenol²
- D 1325 Specification for Ammoniacal Copper Arsenate and Ammoniacal Copper Zinc Arsenate²
- D 1326 Methods for Chemical Analysis of Ammoniacal Copper Arsenate and Ammoniacal Copper Zinc Arsenate²
- D 1624 Specification for Acid Copper Chromate²
- D 1625 Specification for Chromated Copper Arsenate²
- D 1627 Methods for Chemical Analysis of Acid Copper Chromate²
- D 1628 Test Methods for Chemical Analysis of Chromated Copper Arsenate²
- D 1858 Specification for Creosote-Petroleum Solution²
- ¹ This specification is under the jurisdiction of ASTM Committee D07 on Wood and is the direct responsibility of Subcommittee D07.06 on Treatments for Wood Products.
- Current edition approved April 10, 2001. Published June 2001. Originally published as D 1760 60. Last previous edition D 1760 96.
- Some requirements in this specification are similar to those in the Commodities Standards of the American Wood-Preservers' Association for treatment of timber products by pressure processes in closed vessels with preservative materials and solutions. Acknowledgment is made to the American Wood-Preservers' Association for its development of subject matter used in this specification.
 - ² Annual Book of ASTM Standards, Vol 04.10.

- D 1860 Test Method for Moisture and Creosote-Type Preservative in Wood²
- D 2085 Test Method for Determining Chloride Used in Calculating Pentachlorophenol in Solutions or Wood (Lime Ignition Method)²
- D 2604 Specification for High-Boiling Hydrocarbon Solvent for Preparing Oil-Borne Preservative Solutions²
- D 2605 Specification for Volatile Petroleum Solvent (LPG) for Preparing Pentachlorophenol Solutions²
- D 3225 Specification for Low-Boiling Hydrocarbon Solvent for Oil-Borne Preservatives²
- D 5584 Test Methods for Chemical Analysis of Ammoniacal Copper Quat Type B (ACQ-B)²
- D 5653 Specification for Copper bis (Dimethyldithiocarbamate)²
- D 5654 Specification for Ammoniacal Copper Quat Type B (ACQ-B)²
- D 5655 Test Method for Analysis of Copper Dimethyldithiocarbamate (CDDC) Treated Wood by Colorimetry²

3. Terminology

- 3.1 Definitions of Terms Specific to This Standard:
- (3.1.1) preservative materials and solutions—materials that when injected into wood protect it from the destructive action of fungi, insects, and marine borers.
- 3.1.2 *timber products*—include round, sawn, and otherwise fabricated materials of various species. Examples are utility poles, piles, posts, crossties, lumber, timbers, glued laminated timbers, plywood, and so forth.

ALL TIMBER PRODUCTS

4. General Requirements

- 4.1 The following requirements, except as modified, or supplemented by Tables 1-7, for the various species and types of material, apply to each of the treating processes and to all species and types of material. If these requirements are to be otherwise modified to meet special conditions, complete detailed instructions shall be given by the purchaser or specifier.
- 4.1.1 Maximum time duration (total elapsed time of a treating phase), maximum temperature, and maximum pressure limits shall not be exceeded. A phase shall begin when a change in conditions within the cylinder is initiated and shall end when either new conditions are imposed, or the cylinder is emptied of preservative.



TABLE 1 Treatment of Lumber, Timbers, Bridge Ties, and Mine Ties by Pressure Processes

	Southern Pine and Ponderosa Pine			Hemfir, A Pacific Coast Douglas Fir, B Western Hemlock and Western Larch C			
Conditioning	air seasoning, kiln drying, Boulton drying, heating in preservative or a combination			air seasoning, kiln drying, Boulton drying, steaming (water- borne treatments only), heating in preservative or a combination			
Steaming: ^D							
Temperature, max, °F (°C)	245 (120)			240 (117	7)		
Duration, max, h Vacuum, min, in. (mm) at sea	17 22 (558.8)			6 22 (558.	0)		
level Heating in preservative:	22 (336.6)			22 (336.	0)		
Temperature, max, °F (°C)	220 (104)			210 (99))		
Duration, max, h	optional			, ,	soned, optional	if green	
Incising	not required			required			
Treatment:							
Pressure, psig (kPa)	()			,_ ,_ ,			
min	75 (517)			50 (345)			
max	200 (1379)			150 (103	34)		
Expansion bath: temperature, max, °F (°C) Final steaming:	220 (104)			220 (104	4)		
Temperature, max, °F (°C) Duration, max, h	240 (117) (not permitted 2	for service in coa	stal waters)	240 (117 2	7) (not permitted	for service in coasta	waters)
	Above Ground	Ground Contact	Coastal Wate	ers	Above Ground	Ground Contact	Coastal Waters
Results of treatment: Retention, min, lb/ft³ (kg/m³): (sampling zone for assay 0 to 0.60 in. (0 to 15.2 mm) from surface):	(https://	/stan	anuai dards	.ite	h.ai)		
Creosote and creosote							
solutions—by assay: Creosote	6 (96)	8 (128)	20 (320) full o		8 (128)	10 (160)	20 (320) full cell
Creosote-coal tar solution	6 (96)	8 (128)	20 (320) full (8 (128)	10 (160)	20 (320) full cell
Creosote-petroleum solution	6 (96)	8 (128)	not recommen		8 (128)	10 (160)	not recommended
27.1							
Pentachlorophenol using Specifi- cations D 2604, D 2605, or D 3225 solvents Water-borne preservatives—by as-	ai/catalo.30 (4.81) ard	8/8 0.40 (6.4) 4		ded-80(0.40 (6.4)	90f4 0.50 (8.0) hd	not recommended
Pentachlorophenol using Specifi- cations D 2604, D 2605, or D 3225 solvents Vater-borne preservatives—by as- say:		, ,	5 (not recommen		. ,	` ,	
Pentachlorophenol using Specifi- cations D 2604, D 2605, or D 3225 solvents Vater-borne preservatives—by as-	0.25 (4.0)	0.50 (8.0) 0.40 (6.4)	not recommen	ded	0.40 (6.4) 0.25 (4.0) 0.25 (4.0)	0.50 (8.0) - d 0.50 (8.0) 0.40 (6.4)	
Pentachlorophenol using Specifi- cations D 2604, D 2605, or D 3225 solvents Vater-borne preservatives—by as- say: ACC		0.50 (8.0)	5 (not recommen	ded	0.25 (4.0)	0.50 (8.0)	not recommende $2.50 (40.0)^{E}$
Pentachlorophenol using Specifi- cations D 2604, D 2605, or D 3225 solvents Vater-borne preservatives—by as- say: ACC ACA and ACZA ACQ-Type B CCA, Types A and C	0.25 (4.0) 0.25 (4.0)	0.50 (8.0) 0.40 (6.4)	not recommen not recommen 2.50 (40.0)	ded ded	0.25 (4.0) 0.25 (4.0)	0.50 (8.0) 0.40 (6.4)	not recommende $2.50 (40.0)^{E}$ not recommende
Pentachlorophenol using Specifi- cations D 2604, D 2605, or D 3225 solvents Water-borne preservatives—by as- say: ACC ACA and ACZA ACQ-Type B	0.25 (4.0) 0.25 (4.0) 0.25 (4.0)	0.50 (8.0) 0.40 (6.4) 0.40 (6.4)	not recommen 2.50 (40.0) not recommen	ded ded	0.25 (4.0) 0.25 (4.0) 0.25 (4.0)	0.50 (8.0) 0.40 (6.4) 0.40 (6.4)	not recommended 2.50 (40.0) ^E not recommended
cations D 2604, D 2605, or D 3225 solvents Water-borne preservatives—by as- say: ACC ACA and ACZA ACQ-Type B CCA, Types A and C	0.25 (4.0) 0.25 (4.0) 0.25 (4.0) 0.25 (4.0)	0.50 (8.0) 0.40 (6.4) 0.40 (6.4) 0.40 (6.4) 0.20 (3.2)	not recommen 2.50 (40.0) not recommen 2.50 (40.0) not recommen 0.40 ir thick in. a A bore each requ	ded ded n. (10.2 m rness, 0.5 rr core sha n charge.	0.25 (4.0) 0.25 (4.0) 0.25 (4.0) 0.25 (4.0) m) and 90 % of 0 in. (12.7 mm) astal waters ser all be taken fror If 80 % of the b	0.50 (8.0) 0.40 (6.4) 0.40 (6.4) 0.40 (6.4) sapwood less than 5 and 90 % of sapwoo	in. (127 mm) in d thicker than 5 20 pieces in tration s not meeting the
Pentachlorophenol using Specifications D 2604, D 2605, or D 3225 solvents Vater-borne preservatives—by assay: ACC ACA and ACZA ACQ-Type B CCA, Types A and C CDDCH (as copper metal)	0.25 (4.0) 0.25 (4.0) 0.25 (4.0) 0.25 (4.0) 0.10 (1.6) 2.5 in. (64 mm) unless 89	0.50 (8.0) 0.40 (6.4) 0.40 (6.4) 0.40 (6.4) 0.20 (3.2)	not recommen 2.50 (40.0) not recommen 2.50 (40.0) not recommen 0.40 ir thick in. a A bore each requ	ded ded n. (10.2 m rness, 0.5 rr core sha n charge.	0.25 (4.0) 0.25 (4.0) 0.25 (4.0) 0.25 (4.0) m) and 90 % of 0 in. (12.7 mm) astal waters ser all be taken fror If 80 % of the b	0.50 (8.0) 0.40 (6.4) 0.40 (6.4) 0.40 (6.4) sapwood less than 5 and 90 % of sapwoovice m the incised faces of sorings meet the pene ll be accepted. Boring	not recommended 2.50 (40.0) ^E not recommended not recommended in. (127 mm) in d thicker than 5 20 pieces in tration in the solution in the so
Pentachlorophenol using Specifications D 2604, D 2605, or D 3225 solvents Vater-borne preservatives—by assay: ACC ACA and ACZA ACQ-Type B CCA, Types A and C CDDCH (as copper metal) Penetration	0.25 (4.0) 0.25 (4.0) 0.25 (4.0) 0.25 (4.0) 0.10 (1.6) 2.5 in. (64 mm) unless 89	0.50 (8.0) 0.40 (6.4) 0.40 (6.4) 0.40 (6.4) 0.20 (3.2)	not recommen 2.50 (40.0) not recommen 2.50 (40.0) not recommen 0.40 ir thick in. a A bore each requ	ded ded n. (10.2 m kness, 0.5 ind for coa ir core sha n charge. iirements etration re	0.25 (4.0) 0.25 (4.0) 0.25 (4.0) 0.25 (4.0) m) and 90 % of 00 in. (12.7 mm) astal waters ser all be taken fror lf 80 % of the bethe charge shall equirements shall	0.50 (8.0) 0.40 (6.4) 0.40 (6.4) 0.40 (6.4) sapwood less than 5 and 90 % of sapwoovice m the incised faces of sorings meet the pene ll be accepted. Boring	not recommended 2.50 (40.0) for recommended not recommended in. (127 mm) in distriction that the commended in the commended i
Pentachlorophenol using Specifications D 2604, D 2605, or D 3225 solvents Jater-borne preservatives—by assay: ACC ACA and ACZA ACQ-Type B CCA, Types A and C CDDC ^H (as copper metal) Penetration Determination of penetration	0.25 (4.0) 0.25 (4.0) 0.25 (4.0) 0.25 (4.0) 0.10 (1.6) 2.5 in. (64 mm) unless 88	0.50 (8.0) 0.40 (6.4) 0.40 (6.4) 0.40 (6.4) 0.20 (3.2) 5 % of sapwood	not recommen 2.50 (40.0) not recommen 2.50 (40.0) not recommen 0.40 ir thick in. a A bore each requ pen pen Jack Pine, Lodge	ded ded ded n. (10.2 m kness, 0.5 knd for coe er core she n charge. kirements etration re etration. pole Pine, -borne tre	0.25 (4.0) 0.25 (4.0) 0.25 (4.0) 0.25 (4.0) m) and 90 % of 0 in. (12.7 mm) astal waters ser all be taken fror If 80 % of the bath charge shall equirements shall be a	0.50 (8.0) 0.40 (6.4) 0.40 (6.4) 0.40 (6.4) sapwood less than 5 and 90 % of sapwoovice in the incised faces of sorings meet the pene ll be accepted. Boring show evidence of p	not recommende 2.50 (40.0) ^E not recommende not recommende in. (127 mm) in d thicker than 5 20 pieces in tration s not meeting the reservative
Pentachlorophenol using Specifications D 2604, D 2605, or D 3225 solvents Vater-borne preservatives—by assay: ACC ACA and ACZA ACQ-Type B CCA, Types A and C CDDC ^H (as copper metal) Penetration Determination of penetration Conditioning	0.25 (4.0) 0.25 (4.0) 0.25 (4.0) 0.25 (4.0) 0.10 (1.6) 2.5 in. (64 mm) unless 88	0.50 (8.0) 0.40 (6.4) 0.40 (6.4) 0.40 (6.4) 0.20 (3.2) 5 % of sapwood	not recommen 2.50 (40.0) not recommen 2.50 (40.0) not recommen 0.40 ir thick in. a A bore each requ pen pen Jack Pine, Lodge	ded ded ded n. (10.2 m kness, 0.5 knd for coe er core she n charge. kirements etration re etration. pole Pine, -borne tre	0.25 (4.0) 0.25 (4.0) 0.25 (4.0) 0.25 (4.0) m) and 90 % of 0 in. (12.7 mm) astal waters ser all be taken fror If 80 % of the bath charge shall equirements shall be a	0.50 (8.0) 0.40 (6.4) 0.40 (6.4) 0.40 (6.4) sapwood less than 5 and 90 % of sapwoovice in the incised faces of sorings meet the pene ll be accepted. Boring show evidence of p	not recommende 2.50 (40.0) ^E not recommende not recommende in. (127 mm) in d thicker than 5 20 pieces in tration s not meeting the reservative
Pentachlorophenol using Specifications D 2604, D 2605, or D 3225 solvents // sater-borne preservatives—by assay: ACC ACA and ACZA ACQ-Type B CCA, Types A and C CDDCH (as copper metal) Penetration Determination of penetration Conditioning	0.25 (4.0) 0.25 (4.0) 0.25 (4.0) 0.25 (4.0) 0.10 (1.6) 2.5 in. (64 mm) unless 88	0.50 (8.0) 0.40 (6.4) 0.40 (6.4) 0.40 (6.4) 0.20 (3.2) 5 % of sapwood	not recommen 2.50 (40.0) not recommen 2.50 (40.0) not recommen 0.40 ir thick in. a A bore each requ pen pen Jack Pine, Lodge	ded ded ded n. (10.2 m kness, 0.5 knd for coe er core she n charge. kirements etration re etration. pole Pine, -borne tre	0.25 (4.0) 0.25 (4.0) 0.25 (4.0) 0.25 (4.0) m) and 90 % of 0 in. (12.7 mm) astal waters ser all be taken fror If 80 % of the bath charge shall equirements shall be a	0.50 (8.0) 0.40 (6.4) 0.40 (6.4) 0.40 (6.4) sapwood less than 5 and 90 % of sapwoovice in the incised faces of sorings meet the pene ll be accepted. Boring show evidence of p	not recommende 2.50 (40.0) ^E not recommende not recommende in. (127 mm) in d thicker than 5 20 pieces in tration s not meeting the reservative
Pentachlorophenol using Specifications D 2604, D 2605, or D 3225 solvents Vater-borne preservatives—by assay: ACC ACA and ACZA ACQ-Type B CCA, Types A and C CDDC ^H (as copper metal) Penetration Determination of penetration Conditioning Steaming: G Temperature, max, °F (°C) Duration, max, h Vacuum, min, in. (mm) at sea level	0.25 (4.0) 0.25 (4.0) 0.25 (4.0) 0.25 (4.0) 0.10 (1.6) 2.5 in. (64 mm) unless 89	0.50 (8.0) 0.40 (6.4) 0.40 (6.4) 0.40 (6.4) 0.20 (3.2) 5 % of sapwood	not recommen 2.50 (40.0) not recommen 2.50 (40.0) not recommen 0.40 ir thick in. a A bore each requ pen pen Jack Pine, Lodge	ded ded ded n. (10.2 m kness, 0.5 knd for coe er core she n charge. kirements etration re etration. pole Pine, -borne tre	0.25 (4.0) 0.25 (4.0) 0.25 (4.0) 0.25 (4.0) m) and 90 % of 0 in. (12.7 mm) astal waters ser all be taken fror If 80 % of the bath charge shall equirements shall be a	0.50 (8.0) 0.40 (6.4) 0.40 (6.4) 0.40 (6.4) sapwood less than 5 and 90 % of sapwoovice in the incised faces of sorings meet the pene ll be accepted. Boring show evidence of p	not recommende 2.50 (40.0) ^E not recommende not recommende in. (127 mm) in d thicker than 5 20 pieces in tration s not meeting the reservative
Pentachlorophenol using Specifications D 2604, D 2605, or D 3225 solvents Vater-borne preservatives—by assay: ACC ACA and ACZA ACQ-Type B CCA, Types A and C CDDC ^H (as copper metal) Penetration Determination of penetration Conditioning Steaming: ^G Temperature, max, °F (°C) Duration, max, h Vacuum, min, in. (mm) at sea level Heating in preservative:	0.25 (4.0) 0.25 (4.0) 0.25 (4.0) 0.25 (4.0) 0.25 (4.0) 0.10 (1.6) 2.5 in. (64 mm) unless 88 F air seasoning, kiln dryi treatments only), head the seasoning of the seasoning	0.50 (8.0) 0.40 (6.4) 0.40 (6.4) 0.40 (6.4) 0.20 (3.2) 5 % of sapwood	not recommen 2.50 (40.0) not recommen 2.50 (40.0) not recommen 0.40 ir thick in. a A bore each requ pen pen Jack Pine, Lodge	ded ded ded n. (10.2 m kness, 0.5 knd for coe er core she n charge. kirements etration re etration. pole Pine, -borne tre	0.25 (4.0) 0.25 (4.0) 0.25 (4.0) 0.25 (4.0) m) and 90 % of 0 in. (12.7 mm) astal waters ser all be taken fror If 80 % of the bath charge shall equirements shall be a	0.50 (8.0) 0.40 (6.4) 0.40 (6.4) 0.40 (6.4) sapwood less than 5 and 90 % of sapwoovice in the incised faces of sorings meet the pene ll be accepted. Boring show evidence of p	not recommende 2.50 (40.0) ^E not recommende not recommende in. (127 mm) in d thicker than 5 20 pieces in tration s not meeting the reservative
Pentachlorophenol using Specifications D 2604, D 2605, or D 3225 solvents Vater-borne preservatives—by assay: ACC ACA and ACZA ACQ-Type B CCA, Types A and C CDDC ^H (as copper metal) Penetration Determination of penetration Conditioning Steaming: ^G Temperature, max, °F (°C) Duration, max, h Vacuum, min, in. (mm) at sea level	0.25 (4.0) 0.25 (4.0) 0.25 (4.0) 0.25 (4.0) 0.25 (4.0) 0.10 (1.6) 2.5 in. (64 mm) unless 88	0.50 (8.0) 0.40 (6.4) 0.40 (6.4) 0.40 (6.4) 0.20 (3.2) 5 % of sapwood	not recommen 2.50 (40.0) not recommen 2.50 (40.0) not recommen 0.40 ir thick in. a A bore each requ pen pen Jack Pine, Lodge	ded ded ded n. (10.2 m kness, 0.5 knd for coe er core she n charge. kirements etration re etration. pole Pine, -borne tre	0.25 (4.0) 0.25 (4.0) 0.25 (4.0) 0.25 (4.0) m) and 90 % of 0 in. (12.7 mm) astal waters ser all be taken fror If 80 % of the bath charge shall equirements shall be a	0.50 (8.0) 0.40 (6.4) 0.40 (6.4) 0.40 (6.4) sapwood less than 5 and 90 % of sapwoovice in the incised faces of sorings meet the pene ll be accepted. Boring show evidence of p	not recommende 2.50 (40.0) ^E not recommende not recommende in. (127 mm) in d thicker than 5 20 pieces in tration s not meeting the reservative

TABLE 1 Continued

Jack Pine, Lodgepole Pine, and Red Pine

Treatment:

Pressure, psig (kPa):

75 (517) min max 175 (1207)

Expansion bath: temperature, max,

°F (°C)

220 (104)

Final steaming G :

Temperature, max, °F (°C) 240 (117) (not permitted for service in coastal waters)

Duration, max, h

	Jack Pine, Lodgepole Pine, and Red Pine			
	Above Ground	Ground Contact	Coastal Waters	
Results of treatment:				
Retention, min, lb/ft ³ (kg/m ³) (sampling zone for assay 0 to 0.60 in. (0 to 15.2 mm) from surface):				
Creosote and creosote solutions—by assay:				
Creosote	6 (96)	8 (128)	refusal	
Creosote-coal tar solution	6 (96)	8 (128)	refusal	
Creosote-petroleum solution	6 (96)	8 (128)	not recommended	
Dil-borne preservatives—by assay:				
Pentachlorophenol using Specifications D 2604, D 2605, or D 3225 solvents	0.30 (4.81)	0.40 (6.4)	not recommended	
Nater-borne preservatives—by assay:				
ACC	0.25 (4.0)	0.50 (8.0)	not recommended	
ACA and ACZA	0.25 (4.0)	0.40 (6.4)	not recommended	
CCA, Types A and C	0.25 (4.0)	0.40 (6.4)	not recommended	

Penetration

Determination of penetration

Less than 5 in. (127 mm) thick, 0.40 (10.2 mm), and 90 % of sapwood. 5 in. thick and thicker and coastal water service, 0.50 in. (12.7 mm) and 90 % of sapwood.

A borer core shall be taken from each of 20 pieces in each charge. If 80 % of

the borings meet the penetration requirement the charge shall be accepted.

Northern White Pine, Sugar Pine,

Redwood

	and Western White Pine	
Conditioning https://standards.iteh	air seasoning, kiln drying, Boulton drying, steaming (water- borne treatments and ice-coated or frozen material with oil treatments only), heating in preservative or a combination	air seasoning, kiln drying, Boulton drying, steaming (water- borne treatments or ice-coated or frozen material with oil-type treatments only), heating in preservative or a combination
Steaming: ^D	040 (447)	040 (447)
Temperature, max, °F (°C)	240 (117)	240 (117)
Duration, max, h	6	4.5
Vacuum, min, in. (mm) at sea level Heating in preservative:	22 (558.8)	22 (558.8)
Temperature, max, °F (°C)	210 (99)	210 (99)
Duration, max, h	6 h seasoned, green optional	6 h seasoned, green optional
Incising	required	required
Treatment:	·	•
Pressure, psig (kPa):		
min	EO (24E)	EO (24E)

50 (345) 50 (345) min 150 (1034) 125 (861) max

Expansion bath: temperature, max,° F (°C)

220 (104) 220 (104)

Final steaming: Temperature, max, °F (°C) 240 (117) (not permitted for service in coastal waters)

240 (117) (not permitted for service in coastal waters)

Above Above Ground Contact Coastal Waters Ground Contact Coastal Waters Ground Ground

Results of treatment:

Duration, max, h

Retention, min, lb/ft3 (kg.m3) (sampling zone for assay 0 to 0.60 in. (0 to 15.2 mm) from surface): Creosote and creosote solutions—by

assay:

TABLE 1 Continued

_	Above Ground	Ground Contact	Coastal Waters	Above Ground	Ground Contact	Coastal Waters
Creosote	6 (96)	8 (128)	refusal	8 (128)	10 (160)	20 (320) full cell
Creosote-coal tar solution Creosote-petroleum solution	6 (96) 6 (96)	8 (128) 8 (128)	refusal not recommended	8 (128) 8 (128)	10 (160) 10 (160)	20 (320) full cell not recommended
Oreosote petroleum solution		. , ,		0 (120)	, ,	not recommended
	Above	Pine, Sugar Pine, and \	Western White Pine	Above	Redwod	
	Ground	Ground Contact	Coastal Waters	Ground	Ground Contact	Coastal Waters
Oil-borne preservatives—by assay: Pentachlorophenol using Specifications D 2604, D 2605, or D 3225 solvents Water-borne preservatives—by as-	0.30 (4.81)	0.40 (6.4)	not recommended	0.60 (9.6)	0.50 (8.0)	not recommended
say: ACC	0.25 (4.0)	0.50 (8.0)	not recommended	0.25 (4.0)	0.50 (8.0)	not recommended
ACA and ACZA	0.25 (4.0)	0.40 (6.4)	not recommended	0.25 (4.0)	0.40 (6.4)	not recommended
CCA, Types A and C	0.25 (4.0)	0.40 (6.4)	not recommended	0.25 (4.0)	0.40 (6.4)	not recommended
	90 % of sapwood	7 mm) thick, 0.40 (6.4 r . 5 in. and thicker and .50 in. (8.0 mm) and 90	for service in 5 in. and 90 % of 90 % of	nd thicker and coa f sapwood	hick, 0.40 (6.4 mm), astal waters service, (0.50 (8.0 mm) and
	•	Teh Sta	charg	e shall be accept	meet the penetration ed. Borings not meet w evidence of preser	ing the penetration
		Black G	Gum and Red Gum		Oak	
Conditioning	(https		ing, Boulton drying, stealive or a combination	-	oning, kiln drying, Bo servative or a combin	
Steaming: ^D				.,		
Temperature, max, °F (°C)		240 (117)		not perr	nitted	
Duration, max, h Vacuum, min, in. (mm) at sea level Heating in preservative:		22 (558.8)				
Temperature, max, °F (°C) Duration, max, h Incising				220 (10 optional	,	
Treatment: PS://standards.iteh.ai/						
Pressure, psig (kPa): min max		125 (861) 200 (1379)		125 (86 250 (17	,	
Expansion bath: temperature, max, °F (°C)		200 (10.0)				
		220 (104)		220 (10	,	
		, ,	ed for service in coastal	220 (10	4)	service in coastal
Final steaming: Temperature, max, °F (°C) Duration, max, h		, ,	ed for service in coastal	220 (10	4) 7) (not permitted for s	service in coastal
Temperature, max, °F (°C)		240 (117) (not permitte		220 (10 waters) 240 (11 water	4) 7) (not permitted for s	
Temperature, max, °F (°C) Duration, max, h Results of treatment: Retention, min, lb/ft³ (kg/m³) (by gage):	Above Ground	240 (117) (not permitte		220 (10 waters) 240 (11 water 1	4) 7) (not permitted for s	
Temperature, max, °F (°C) Duration, max, h Results of treatment:	Above Ground	240 (117) (not permitte		220 (10 waters) 240 (11 water 1	4) 7) (not permitted for s	Coastal Waters E refusal min 10
Temperature, max, °F (°C) Duration, max, h Results of treatment: Retention, min, lb/ft³ (kg/m³) (by gage): Creosote and creosote solutions:	Above Ground	240 (117) (not permitte 1 Ground Conta	act Coastal Waters	220 (10 waters) 240 (11 water 1 1 Above Ground 6 (96)	4) 7) (not permitted for sis) Ground Contact	t Coastal Waters E refusal min 10 (160) refusal min 10
Temperature, max, °F (°C) Duration, max, h Results of treatment: Retention, min, lb/ft³ (kg/m³) (by gage): Creosote and creosote solutions: Creosote Creosote-coal tar solution Creosote-petroleum solution	Above Ground :	240 (117) (not permitted 1 Ground Conta	refusal	220 (10 waters) 240 (11 water 1 Above Ground 6 (96) 6 (96)	4) 7) (not permitted for sis) Ground Contact 7 (112)	refusal min 10 (160) refusal min 10 (160)
Temperature, max, °F (°C) Duration, max, h Results of treatment: Retention, min, lb/ft³ (kg/m³) (by gage): Creosote and creosote solutions: Creosote Creosote-coal tar solution Creosote-petroleum solution	Above Ground: 6 (96) 6 (96)	240 (117) (not permitted 1 Ground Conta 8 (128) 8 (128) 8 (128)	refusal 12 (192) minimum	220 (10 waters) 240 (11 water 1 Above Ground 6 (96) 6 (96) 6 (96)	4) 7) (not permitted for sis) Ground Contact 7 (112) 7 (112)	refusal min 10 (160) refusal min 10 (160) not recommended
Temperature, max, °F (°C) Duration, max, h Results of treatment: Retention, min, lb/ft³ (kg/m³) (by gage): Creosote and creosote solutions: Creosote Creosote-coal tar solution Creosote-petroleum solution Oil-borne preservatives: Pentachlorophenol using Specifications D 2604, D 2605, or D 3225 solvents Water-borne preservatives:	Above Ground : 6 (96) 6 (96) 6 (96) 0.30 (4.81)	240 (117) (not permitted 1 Ground Conta 8 (128) 8 (128) 8 (128) 0.40 (6.4)	refusal 12 (192) minimum not recommended not recommended	220 (10 waters) 240 (11 water 1 Above Ground 6 (96) 6 (96) 6 (96) 1 0.30 (4.81)	7 (112) 7 (112) 7 (112) 0.40 (6.4)	refusal min 10 (160) refusal min 10 (160) not recommended not recommended
Temperature, max, °F (°C) Duration, max, h Results of treatment: Retention, min, lb/ft³ (kg/m³) (by gage): Creosote and creosote solutions: Creosote Creosote-coal tar solution Creosote-petroleum solution Oil-borne preservatives: Pentachlorophenol using Specifications D 2604, D 2605, or	Above Ground: 6 (96) 6 (96) 6 (96)	240 (117) (not permitted 1 Ground Conta 8 (128) 8 (128) 8 (128) 0.40 (6.4)	refusal 12 (192) minimum not recommended	220 (10 waters) 240 (11 water 1 Above Ground 6 (96) 6 (96) 6 (96) 0 .30 (4.81) 0 .25 (4.0)	7 (112) 7 (112) 7 (112)	* Coastal Waters E refusal min 10 (160) refusal min 10

TABLE 1 Continued

Penetration	1.5 in. (38 mm) unless 85 % of sapwood	White oaks, 90 % of sapwood. Red oaks, 65 % of annual rings to center of cross section. Charges of recalcitrant wood with less penetration may be accepted if the wood is properly conditioned before treatment and if treatment is continued to
Determination of penetration	A,B,C,D,E,F,G,H,I	refusal. F

^A The species grouping, Hemfir, includes Western hemlock (*Tsuga heterophylla*), California red fir (*Abies magnifica*), grand fir (*Abies grandis*), noble fir (*Abies procera*), Pacific silver fir (*Abies amalilis*), and white fir (*Abies concolor*).

TABLE 2 Treatment of Land and Fresh-Water Piles and Foundation Piles by Pressure Processes

	Southern Pine and Ponderosa Pine	Pacific Coast Douglas Fir ^{B,C}	Oak	Lodgepole Pine
Conditioning	air seasoning, kiln drying, steaming, heating in preservative, or a combination thereof	air seasoning, kiln drying, Boulton drying, heating in preservative, or a combination thereof	air seasoning, kiln drying, heating in preservative, or a combination thereof	air seasoning, kiln drying, steaming (for ice-coated or frozen piles only) Boulton drying, heating in preservative, or a combination thereof
Steaming: Temperature, max, °F (°C) Duration, max, h	southern pine: 15 ^A	not permitted	not permitted	240 (117) 6
Vacuum, min, in. (mm) at sea level	ponderosa pine: 6 22 (558.8)			22 (558.8)
Heating in preservative: Temperature, max, °F (°C)	220 (104)	seasoned 210°F (99 °C) and	220 (104)	220 (104)
Duration, max, h	optional	6 h green or partially seasoned 220°F (104° C) and optional	optional	optional
Treatment:				
	s.iteh.ai/catalog/standar		4bc6-8000-a21a109cf	
min	125 (861)	75 (517)	150 (1034)	100 (689)
max	200 (1379)	150 (1034)	200 (1379)	150 (1034)
Expansion bath: tempera- ture, max, °F (°C) Final steaming:	220 (104)	220 (104)	not permitted	220 (104)
Temperature, max, °F (°C) Duration, max, h	245 (120) 3	240 (117) 3	not permitted	24 (117) 3
Results of treatment:				
Number of borings per charge	20	20	20	20
Retention, min, lb/ft ³ (kg/ m³) (sampling zone for assay, in. (mm) from surface) Creosote and creosote	0 to 3.0 (0 to 76.2)	0 to 1.00 (0 to 25.4)	0 to 2.00 (0 to 50.8)	0 to 1.00 (0 to 25.4)
solutions:	10 (100)	17 (070)	6 (06)	17 (070)
Creosote Creosote-coal tar solution	12 (192)	17 (272) 17 (272)	6 (96) 6 (96)	17 (272) 17 (272)
Creosote-petroleum solution	12 (192)	17 (272)	6 (96)	17 (272)
Oil-borne preservatives: Pentachlorophenol using Specification D 2604	0.60 (9.6)	0.85 (13.6)	0.30 (4.81)	0.85 (13.6)
solvent Water-borne preservatives:				
ACA and ACZA	0.80 (12.8)	1.00 (16.0)	not recommended	1.00 (16.0)
CCA, Types A and C	0.80 (12.8)	1.00 (16.0)	not recommended	1.00 (16.0)
Penetration	3.5 in. (89 mm) unless 90 % of sapwood ^D	,	100 % of sapwood	0.75 (19 mm) and 85 % of sapwood unless 1.60 in. (41 mm)

^B Pacific Coast Douglas fir includes Douglas fir from west of the crest of the Cascade Mountains in Oregon, Washington, and Northern California and west of the crest of the Sierra Nevada Mountains in the rest of California. Interior Douglas fir is Douglas fir grown anywhere else.

^C Interior Douglas fir and Western larch are not suitable species to be used for lumber or timbers in coastal waters.

^D Steam-conditioning southern pine, ponderosa pine, red pine, or black or red gum lumber before treatment with ACC or CCA preservatives is prohibited except when the lumber is ice-coated or frozen.

 $^{^{\}it E}$ Retentions apply to red oak only. White oak of all sizes shall be treated to refusal.

F A borer core shall be taken from each of 20 pieces in the charge. If 80 % of the cores meet the penetration requirements, the charge shall be accepted. Borings not meeting the penetration requirements shall show evidence of preservative penetration.

^G This retention applies to Pacific Coast Douglas Fir and is not recommended for Hemfir, Western Hemlock, or Western Larch.

H Treatment of Pacific Coast Douglas fir and Western larch with CCA, Type A or C, shall only be valid when the material is chosen from permeable wood selected by treatment trials.

¹Southern pine only.



TABLE 2 Continued

	Southern F	Pine and Ponderosa Pine	Pacific Coast Dou	glas Fir ^{B,C}	Oak		Lodgepole Pine
Determination of penetration	midway be the top of charge. O meet the p	shall be taken etween the butt and each pile in the nly the piles that penetration nts shall be	A borer core shall midway betwee the top of each charge. Only th- meet the peneti requirement sha	n the butt and pile in the e piles that ration	A borer core shall be tak midway between the to the top of each pile in charge. Only the piles meet the penetration requirement shall be a	outt and the that	A borer core shall be taken midway between the butt and the top of each pile in the charge. Only the piles that meet the penetration requirement shall be accepted.
		Red	Pine	\	Western Larch		Jack Pine
Conditioning		air seasoning, kiln (ice-coated or from heating in prese combination ther	ozen piles only), rvative, or a		, kiln drying, Boulton tting in preservative, or a n thereof	coated	ning, kiln drying, steaming (ice- or frozen piles only), heating in ative, or a combination thereof
Steaming: Temperature, max, °F (°C) Duration, max, h		240 (117) 6		not permitted		240 (117) 6	
Vacuum: min, in. (mm) at sea Heating in preservative:	level	22 (558.8)				22 (558.8	3)
Temperature, max, °F (°C) Duration, max, h		220 (104) optional		partially seas	0°F (99 °C) and 6 h oned or green 220°F and optional	220 (104) optional	
Treatment: Pressure, psig (kPa)				,	апо ориопал		
min max Expansion bath: temperature °F (°C)	e, max,	100 (689) 150 (1034) 220 (104)		75 (517) 150 (1034) 220 (104)		100 (689) 150 (103- 220 (104)	4)
Final steaming: Temperature, max, °F (°C) Duration, max, h Results of treatment:		240 (117) 3		240 (117) 0.5		240 (117) 3)
Number of borings per charge. Retention, min, lb/ft ³ (kg/m ³)		20 0 to 2.00 (0 to 50.8	s//stan	20 0 to 1.00 (0 to	o 25.4) teh ai	20 0 to 2.00	(0 to 50.8)
(sampling zone for assay, from surface) Creosote and creosote soluby assay:	in. (mm)						
Creosote Creosote-coal tar solution Creosote-petroleum soluti		12 (192) 12 (192) 12 (192)		17 (272) 17 (272) 17 (272)		12 (192) 12 (192) 12 (192)	
Oil-borne preservatives—by as Pentachlorophenol using Sp D 2604 solvent	ssay: ai/c	atalog/standar 0.60 (9.6)				0.60 (9.6)	8/astm-d1760-01
Water-borne preservatives—by ACA and ACZA CCA, Types A and C	y assay:	0.80 (12.8) 0.80 (12.8)		1.00 (16.0) 1.00 (16.0)		0.80 (12.8 0.80 (12.8	,
Penetration		2.5 (64 mm) in. un sapwood	less 85 % of	unless 1.60	and 85 % of sapwood in. (41 mm)	sapwoo	mm) in. unless 85 % of od
Determination of penetration		A borer core shall	t and top of each e. Only the piles netration	A,B,C,D,E	, ,	E	

^A Piles shall be steamed at 240 to 245°F for not more than 1 h/in. of the average midpoint diameter of the piles in the charge. Total steam conditioning time shall include all steaming time during which the temperature exceeds 200°F.

^B Pacific Coast Douglas fir is Douglas fir grown west of the crest of the Cascade Mountains in Oregon, Washington, and Northern California and west of the crest of the Sierra Nevada Mountains in the rest of California. Interior Douglas fir is Douglas fir grown elsewhere.

^C Treatment of Pacific Coast Douglas fir and Western larch with CCA, Type A or C, shall only be valid when the material is chosen from permeable wood selected by treatment trials

^D Effective penetration must be continuous with both earlywood and latewood in each ring penetrated. Certain grain configurations or defects may make it difficult to determine actual depth of penetration in a core and shall be excluded from constituting a skip. These defects include but are not limited to pitch, pitch pockets, ingrown bark, and knots. A core of this type shall be disregarded and a new core taken from another location on the same member.

^E A borer core shall be taken midway between the butt and the top from each pile in the charge. Only the piles that meet the penetration requirement shall be accepted.