

Table of Contents

Generic Requirements Notice of Disclaimer	iii
Preface	xiii
1 Introduction	
1.1 Purpose and Scope	1-1
1.1.1 Background	1-1
1.1.2 Pole Choice and Design Criteria	1-2
1.1.3 GR-60 Scope	1-3
1.2 Relationship With Other Industry Standards	1-4
1.3 Organization	1-6
1.4 Reasons for GR-60-CORE, Issue 1	1-7
1.4.1 Reasons for TR-NWT-000060, Issue 3 (1993)	1-8
1.5 Target Audience	1-8
1.6 Requirements Terminology	1-9
1.7 Requirement Labeling Conventions	1-9
1.7.1 Numbering of Requirement and Related Objects	1-9
1.7.2 Requirement, Conditional Requirement, and Objective Identification	1-10
1.8 Testing Information	1-10
1.8.1 Laboratory Conditions	1-11
1.8.2 Measurements	1-11
1.8.3 Sample Selection and Size	1-11
1.8.4 Product Re-Testing	1-12
1.8.5 Report Documentation	1-13
1.9 Navigating the GR-60 Portable Document Format (PDF) File	1-14
2 General Information	
2.1 General Product Description	2-1
2.2 Special Identification of Poles	2-2
2.3 Selection of Wood Species and Preservatives	2-4
2.4 Ordering Information	2-11
2.5 Framing Information	2-11
3 Wooden Pole Requirements	
3.1 Material Requirements for Wooden Utility Poles Prior to Preservative Treatment	3-1
3.1.1 Pole Classes	3-1
3.1.2 Wood Species	3-1
3.1.3 Wood Pole Source - Sustainable Forestry	3-2
3.2 Physical Characteristics for Wood Utility Poles Prior to Preservative Treatment	3-2
3.2.1 Prohibited Defects - Decay	3-3
3.2.1.1 Permitted Defects	3-5
3.2.2 Knots	3-5
3.2.3 Straightness and Shape of Pole	3-6
3.2.3.1 Gain	3-8
3.2.4 Length	3-8

3.2.5 Circumference	3-9
3.2.6 Shaving	3-10
3.2.7 Moisture Content	3-11
3.3 Marking	3-11
3.3.1 Marking and Code Letters (Reference ANSI O5.1, Paragraph 7.5)	3-11
3.4 Incising	3-12
3.4.1 Framing	3-13
3.5 Material Requirements for Preservatives and Preservative Systems	3-13
3.5.1 Preservation	3-14

4 Specific Requirements - Preservatives and Pole Treatment

4.1 Commentary on Preservative and Treatment Criteria	4-1
4.1.1 Treatment Choices and Methods	4-1
4.1.2 Retention Levels	4-2
4.2 Dimensions, Species, and Wood Quality	4-3
4.3 Oil-Borne Preservative Treatment of Poles	4-3
4.3.1 Oil Carrier	4-3
4.3.2 Conditioning and Seasoning	4-4
4.3.2.1 Air Seasoning	4-5
4.3.2.2 Steam Conditioning	4-5
4.3.2.3 Kiln Drying	4-6
4.3.2.4 Boulton Drying	4-6
4.3.3 Treatment Levels	4-6
4.3.4 Treatment Conditions	4-7
4.3.5 Results of Treatment - Penetration of Preservative	4-8
4.3.6 Results of Treatment - Net Retention of Preservative	4-9
4.3.6.1 Pentachlorophenol/Petroleum	4-9
4.3.6.2 Copper Naphthenate/Petroleum	4-11
4.3.7 Results of Treatment - Cleanliness, Appearance, Odor, and Color	4-14
4.4 Waterborne Oxide Preservative Treatment of Poles	4-14
4.4.1 Chromated Copper Arsenate (CCA) -Type C	4-14
4.4.2 Ammoniacal Copper Zinc Arsenate (ACZA)	4-16
4.4.3 Conditioning or Seasoning Prior to Treatment With Waterborne Preservatives (CCA-C, ACZA)	4-18
4.4.4 Pre-Steamng Prior to ACZA Treatment	4-18
4.4.5 Treatment Process	4-19
4.4.6 Results of Treatment - Penetration of Preservative	4-20
4.4.7 Results of Treatment - Retention of Preservative	4-21
4.4.8 Cleanliness, Appearance, and Post-Treatment Operations	4-23
4.5 Coal Tar Creosote Treatment of Poles	4-23
4.5.1 Conditioning and/or Seasoning Prior to Treatment	4-24
4.5.2 Treatment	4-25
4.5.3 Results of Treatment - Penetration of Creosote Preservative	4-26
4.5.4 Results of Treatment - Retention of Preservative	4-27
4.6 Miscellaneous Requirements (Common to Section 4.3 , Section 4.4 , and Section 4.5)	4-28
4.6.1 Treatment Charge Identification	4-28
4.6.2 Plugging Increment Borer Holes	4-28
4.6.3 Treatment Damage	4-29
4.6.4 Re-Treatment	4-29

4.6.5	Re-Treatment of Stored Poles	4-29
4.6.6	Re-Treatment of Poles Cut Back After Original Treatment	4-29
4.6.7	Post Treatment Cleaning	4-30
4.6.8	Cleanliness, Appearance, Odor, and Color	4-30
4.6.9	Storage and Shipping	4-31
4.7	New or Other Poles/Preservative Systems	4-32
4.7.1	Functional Performance Data	4-32
4.7.2	Materials Specification Methods and Criteria	4-34
4.7.3	Quality Management System (QMS)	4-34
4.7.4	Qualification of New Pole/Preservative Systems	4-35
4.7.4.1	New Wood Preservative	4-35
4.7.4.2	Wooden Pole Product	4-36
4.7.4.3	Naturally Durable Wood Pole Species	4-37
4.7.5	General Requirements	4-38

5 Performance Verification and Test Procedures

5.1	Material Requirements for Wooden Poles	5-1
5.2	Oil-Borne Preservative Treatment of Poles	5-1
5.3	Waterborne Preservative Treatment of Poles	5-2
5.4	Coal Tar Creosote - Treatment of Poles	5-3
5.5	Other Pole-Preservative Systems	5-3
5.6	Individual Test Methods and Procedures	5-6
5.6.1	Moisture Tests on Wood	5-6
5.6.1.1	Sample Criteria	5-6
5.6.1.2	Moisture Meter	5-6
5.6.1.3	Oven-Dry Method	5-7
5.6.1.4	Toluene Extraction Method	5-7
5.6.2	Specific Gravity of Wood	5-9
5.6.3	Preservative Analysis of Wood	5-9
5.6.3.1	General Laboratory Requirements	5-9
5.6.3.2	Lime Ignition Determination of Pentachlorophenol	5-10
5.6.3.2.1	Test Procedure	5-10
5.6.3.2.2	Calculations	5-12
5.6.3.3	Photometric Determination of Pentachlorophenol	5-12
5.6.3.4	Analysis of CCA Solutions and Treated Wood Samples by Colorimetry	5-13
5.6.3.5	Analysis by X-Ray Emission Spectroscopy	5-13
5.6.3.5.1	Sample Selection and Preparation	5-15
5.6.3.5.2	Instrument Preparation and Measurements	5-15
5.6.3.5.3	Analysis	5-16
5.6.3.5.4	Lime-Ignition Analysis (Post-ASOMA Analysis)	5-16
5.6.3.5.5	Report	5-17
5.6.3.6	Oil Analysis	5-17

6 Documentation and Packaging

6.1	Ordering Information	6-1
6.2	Marking, Packaging, and Shipping	6-1
6.3	Documentation and Instructions	6-2
6.4	Quality Assurance and Pole Test Documentation	6-3

7 Quality and Reliability

7.1	General Information	7-1
7.1.1	Definitions	7-1
7.2	General Quality Management System (QMS) Criteria	7-2
7.2.1	Product Change Notification (PCN)	7-3
7.2.2	Pole Treatment Facility	7-4
7.3	General Quality Program Specification (QPS) Criteria	7-4
7.3.1	Pole Supplier Requirements	7-5
7.3.2	User Responsibilities and Activities	7-5
7.4	Inspection Requirements and Guidance	7-7
7.4.1	Visual Inspection Decision Class M1 Criteria	7-8
7.4.2	Visual Inspection Decision Class M2 Criteria	7-8
7.4.3	Quantitative Measurements - Decision Class C Criteria	7-9
7.4.4	Process Audit and Document-Record Review - Decision Class R Criteria	7-10
7.5	Defect Categorization, Detection, and Counting	7-11
7.5.1	Defect Categories	7-11
7.5.2	Defect Detection	7-12
7.5.3	Defect Counting	7-13
7.5.3.1	Untreated Poles - Criteria	7-13
7.6	Sampling Inspection Requirements	7-14
7.6.1	Treatment Materials and Solutions	7-14
7.6.1.1	General	7-14
7.6.1.2	Waterborne Salt Solutions	7-15
7.6.1.3	Petroleum Co-Solvent (Oil-Based Systems)	7-15
7.6.2	Preservative Penetration	7-16
7.6.3	Preservative Retention	7-16
7.6.4	Procedure and Calculations for Retention Calculations	7-17
7.6.4.1	Volume of Increment Boring	7-17
7.6.4.2	The Increment Boring Diameter Factor (BDF)	7-17
7.6.4.3	Average Diameter	7-18
7.6.5	Gauges, Meters, and Other Recording Instruments	7-18
7.6.6	Treated Stock And Loading/Handling Practices	7-18
7.6.6.1	General	7-18
7.6.6.2	Inspection Evidence and Imprinted Mark	7-19
7.6.6.3	Charge (Lot) Make-Up	7-20
7.7	Reporting	7-20

Appendix A: References

A.1	Telcordia Documents	A-1
A.2	Non-Telcordia Documents	A-1
A.3	Telcordia Reference Notes	A-5
A.3.1	Contact Telcordia Customer Service	A-5
A.3.2	Order Documents Online From the Telcordia Information SuperStore	A-5
A.3.3	Web Sites for Generic Requirements Information	A-6
A.3.4	Licensing Agreements for Telcordia Documents	A-6

Appendix B: Acronyms and Glossary

B.1 Acronyms B-1
B.2 Definitions of Terms B-2

Appendix C: Defects and Decay in Wood Poles

C.1 General C-1
C.2 Causes of Decay C-1
C.3 Growth and Spread of Decay C-2
C.4 Developmental Stages of Decay C-2
C.5 Factors Governing the Growth of Wood-Inhabiting Fungi C-3
C.6 Detection of Decay C-4
C.7 More Important Fungi C-5
C.8 Molds and Stains C-6

Requirement-Object Index

List of Figures

Figure 2-1	Marking on Face of New Poles	2-2
Figure 2-2	Standard Framing of Poles	2-12
Figure 3-1	Crook Measurements	3-7
Figure 3-2	Sweep Measurements	3-8
Figure 4-1	Susceptibility Map for Wood Decay in Contact With the Ground . .	4-7

List of Tables

Table 2-1	Standard Codes for Species and Preservative Treatment	2-3
Table 2-2	Pole Surface Characteristics	2-4
Table 2-3	Wooden Utility Poles - Species	2-6
Table 2-4	Dimensions - Southern Yellow Pine and Douglas Fir Poles	2-7
Table 2-5	Dimensions - Western Red Cedar and Ponderosa Pine Poles	2-8
Table 2-6	Dimensions - Lodgepole Pine, Jack Pine, and Red Pine Poles	2-9
Table 2-7	Dimensions - Western Larch Poles	2-10
Table 3-1	General Classification of Defects	3-3
Table 3-2	Maximum Knot Sizes Permitted (ANSI)	3-6
Table 3-3	Preservative Treatment, Species, and Corresponding Codes	3-14
Table 4-1	Maximum Impregnation Pressure	4-8
Table 4-2	Preservative Penetration Depth in Poles with Sapwood < 0.75-Inch Thick	4-9
Table 4-3	Preservative Penetration Depth in Poles with Sapwood > 0.75-Inch Thick	4-9
Table 4-4	Minimum Retention Levels of Pentachlorophenol Preservative	4-11
Table 4-5	Minimum Retention Levels of Copper Naphthenate	4-13
Table 4-6	Active Component Composition of Copper Arsenate Preservative	4-15
Table 4-7	Compositional Tolerances for Preservative CCA - Type C Solutions	4-15
Table 4-8	Preservative Component Sources	4-15
Table 4-9	Component Composition of ACZA Preservative	4-16
Table 4-10	Compositional Tolerances of Components in Preservative ACZA Solution	4-17
Table 4-11	ACZA Preservative Component Sources	4-17
Table 4-12	Maximum Pre-Steamng Conditions for ACZA Poles	4-18
Table 4-13	CCA and ACZA Penetration Depth in Poles with Sapwood < 0.75-Inch Thick	4-20
Table 4-14	CA and ACZA Penetration Depth in Poles with Sapwood > 0.75-Inch Thick	4-21
Table 4-15	Minimum Retention Levels of Preservative (CCA and ACZA)	4-21
Table 4-16	Component Minimum Retention Levels (CCA and ACZA)	4-22
Table 4-17	Density of Creosote - Whole and Fractions	4-24
Table 4-18	Distillate Fractions as Function of Temperature	4-24
Table 4-19	Maximum Treatment Pressures - Creosote Preservatives	4-25
Table 4-20	Creosote Preservative Minimum Penetration Depth in Poles with Sapwood < 0.75-Inch Thick	4-26
Table 4-21	Creosote Preservative Minimum Penetration Depth in Poles with Sapwood > 0.75 Inch Thick	4-27
Table 4-22	Minimum Retention Levels of Creosote Preservative	4-28
Table 4-23	Pole Surface Characteristics	4-30
Table 4-24	Pole Class Strength Definition	4-38
Table 7-1	Inspection Guidelines and Principles	7-7
Table B-1	Glossary Definitions	B-3

