



**ATIS-0600028.2021**

**DC Power Wire and Cable for  
Telecommunications Power Systems – for  
XHHW, XHHW-2 and DLO/Halogenated  
RHH-RHW Cable Types**

**AMERICAN NATIONAL STANDARD FOR TELECOMMUNICATIONS**



As a leading technology and solutions development organization, the Alliance for Telecommunications Industry Solutions (ATIS) brings together the top global ICT companies to advance the industry's most pressing business priorities. ATIS' nearly 200 member companies are currently working to address the All-IP transition, 5G, network functions virtualization, big data analytics, cloud services, device solutions, emergency services, M2M, cyber security, network evolution, quality of service, billing support, operations, and much more. These priorities follow a fast-track development lifecycle — from design and innovation through standards, specifications, requirements, business use cases, software toolkits, open source solutions, and interoperability testing.

ATIS is accredited by the American National Standards Institute (ANSI). The organization is the North American Organizational Partner for the 3rd Generation Partnership Project (3GPP), a founding Partner of the oneM2M global initiative, a member of the International Telecommunication Union (ITU), as well as a member of the Inter-American Telecommunication Commission (CITEL). For more information, visit [www.atis.org](http://www.atis.org).

## AMERICAN NATIONAL STANDARD

Approval of an American National Standard requires review by ANSI that the requirements for due process, consensus, and other criteria for approval have been met by the standards developer.

Consensus is established when, in the judgment of the ANSI Board of Standards Review, substantial agreement has been reached by direct and materially affected interests. Substantial agreement means much more than a simple majority, but not necessarily unanimity. Consensus requires that all views and objections be considered, and that a concerted effort be made towards their resolution.

The use of American National Standards is completely voluntary; their existence does not in any respect preclude anyone, whether he has approved the standards or not, from manufacturing, marketing, purchasing, or using products, processes, or procedures not conforming to the standards.

The American National Standards Institute does not develop standards and will in no circumstances give an interpretation of any American National Standard. Moreover, no person shall have the right or authority to issue an interpretation of an American National Standard in the name of the American National Standards Institute. Requests for interpretations should be addressed to the secretariat or sponsor whose name appears on the title page of this standard.

**CAUTION NOTICE:** This American National Standard may be revised or withdrawn at any time. The procedures of the American National Standards Institute require that action be taken periodically to reaffirm, revise, or withdraw this standard. Purchasers of American National Standards may receive current information on all standards by calling or writing the American National Standards Institute.

## Notice of Disclaimer & Limitation of Liability

The information provided in this document is directed solely to professionals who have the appropriate degree of experience to understand and interpret its contents in accordance with generally accepted engineering or other professional standards and applicable regulations. No recommendation as to products or vendors is made or should be implied.

NO REPRESENTATION OR WARRANTY IS MADE THAT THE INFORMATION IS TECHNICALLY ACCURATE OR SUFFICIENT OR CONFORMS TO ANY STATUTE, GOVERNMENTAL RULE OR REGULATION. AND FURTHER, NO REPRESENTATION OR WARRANTY IS MADE OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE, OR AGAINST INFRINGEMENT OF INTELLECTUAL PROPERTY RIGHTS. ATIS SHALL NOT BE LIABLE, BEYOND THE AMOUNT OF ANY SUM RECEIVED IN PAYMENT BY ATIS FOR THIS DOCUMENT, AND IN NO EVENT SHALL ATIS BE LIABLE FOR LOST PROFITS OR OTHER INCIDENTAL OR CONSEQUENTIAL DAMAGES. ATIS EXPRESSLY ADVISES THAT ANY AND ALL USE OF OR RELIANCE UPON THE INFORMATION PROVIDED IN THIS DOCUMENT IS AT THE RISK OF THE USER.

NOTE - The user's attention is called to the possibility that compliance with this standard may require use of an invention covered by patent rights. By publication of this standard, no position is taken with respect to whether use of an invention covered by patent rights will be required, and if any such use is required no position is taken regarding the validity of this claim or any patent rights in connection therewith. Please refer to [<http://www.atis.org/legal/patentinfo.asp>] to determine if any statement has been filed by a patent holder indicating a willingness to grant a license either without compensation or on reasonable and non-discriminatory terms and conditions to applicants desiring to obtain a license.

## ATIS-0600028.2021, NDC Power Wire and Cable for Telecommunications Power Systems – for XHHW / XHHW-2 and DLO/Hardened RHH-RHW Cable Types

Is an American National Standard developed by the ATIS Network Power Systems (NPS) Subcommittee under the ATIS Sustainability in Telecom: Energy and Protection Committee (STEP).

Published by  
**Alliance for Telecommunications Industry Solutions**  
1200 G Street, NW, Suite 500  
Washington, DC 20005

Copyright © 2021 by Alliance for Telecommunications Industry Solutions  
All rights reserved.

No part of this publication may be reproduced in any form, in an electronic retrieval system or otherwise, without the prior written permission of the publisher. For information contact ATIS at 202.628.6380. ATIS is online at < <http://www.atis.org> >.

**ATIS-0600028.2021**

[Revision of ATIS-0600028.2016]

American National Standard on

**DC Power Wire and Cable for Telecommunications Power  
Systems – for XHHW / XHHW-2 and DLO/Halogenated RHH-  
RHW Cable Types**

Alliance for Telecommunications Industry Solutions

Approved July 30, 2021

**Abstract**

This document describes standard dimensions and testing for XHHW and DLO type wires to be used for telecommunications power and grounding as an alternative to the RHH-RHW cable described in ATIS-0600017.

## Foreword

---

The information contained in this Foreword is not part of this American National Standard (ANS) and has not been processed in accordance with ANSI's requirements for an ANS. As such, this Foreword may contain material that has not been subjected to public review or a consensus process. In addition, it does not contain requirements necessary for conformance to the Standard.

The Alliance for Telecommunication Industry Solutions (ATIS) serves the public through improved understanding between providers, customers, and manufacturers. The Sustainability in Telecom: Energy and Protection (STEP) Committee – formerly the Network Interface, Power, and Protection Committee (NIPP) – engages industry expertise to develop standards and technical reports for telecommunications equipment and environments in the areas of energy efficiency, environmental impacts, power, and protection. The work products of STEP enable vendors, operators, and their customers to deploy and operate reliable, environmentally sustainable, energy efficient communications technologies. STEP is committed to proactive engagement with national, regional, and international standards development organizations and forums that share its scope of work.

Suggestions for improvement of this document are welcome. They should be sent to the Alliance for Telecommunications Industry Solutions, STEP, 1200 G Street NW, Suite 500, Washington, DC 20005.

At the time it approved this document, STEP, which is responsible for the development of this Standard, had the following leadership:

J. Fuller, STEP Chair and NPS Vice-Chair (AT&T)

E. Gallo, STEP Vice-Chair and NPS Chair (Ericsson)

M. Levitre, STEP NPS Technical Editor (Southwire)

The Network Power Systems (NPS) Subcommittee was responsible for the development of this document.

# Table of Contents

1	Scope, Purpose, & Application .....	1
1.1	Scope.....	1
1.2	Purpose .....	1
1.3	Application .....	1
2	Normative References .....	1
3	Definitions, Acronyms, & Abbreviations .....	2
3.1	Definitions .....	2
3.2	Acronyms & Abbreviations.....	3
4	Requirements .....	4
4.1	General .....	4
4.2	Electrical .....	6
4.2.1	Cable Ampacity.....	6
4.2.2	Voltage Rating .....	7
4.3	Life Expectancy .....	7
5	Physical Characteristics.....	7
5.1	Conductor Material .....	7
5.2	Conductor Stranding.....	7
5.3	Conductor Size & Dimensions .....	8
5.4	Separators .....	10
5.5	Insulation .....	10
5.5.1	XHHW Type Insulation.....	10
5.5.2	DLO Insulation .....	10
5.5.3	Location Definitions.....	10
5.6	Jacket .....	11
5.7	Cable Properties & Testing Procedures .....	11
5.7.1	Flexibility (Cable Bend Resistance, & Spring Back).....	11
5.7.2	Resistance to Algae & Fungus Growth.....	13
5.7.3	Sunlight/UV Resistance .....	13
5.7.4	Abrasion & Pull Resistance .....	14
5.7.4.1.4	Test Objective #2 .....	15
5.7.4.1.5	Test Objective #3 .....	15
5.7.5	Coefficient of Friction .....	15
5.7.6	Creep or Deformation Resistance .....	15
5.7.7	Insulation Tensile Strength .....	15
5.7.8	Dielectric Voltage Withstand Test.....	15
6	Marking.....	16
6.1	Jacket or Outer Insulation Colors .....	16
6.2	Marking Colors.....	16
6.3	Trace.....	16
7	Packaging .....	16
7.1	Protection.....	16
7.2	Lengths on Reel.....	16
8	Quality System Requirement.....	17
A	Force to Bend Measurement Test.....	18

B Spring Back Test.....	20
C Cable Securing .....	21
D Fiber Protection for Cable insulation .....	27
D.1 Introduction .....	27
D.2 Protection Methods .....	27

## Table of Figures

Figure 5.1 – Typical Cable Abrasion Test Setup .....	14
Figure A.1 – Force to Bend Measurement Test Setup .....	18
Figure B.1 – Spring Back Test Fixture .....	20
Figure C.1 – Kansas City Stitch .....	21
Figure C.2 – Ending Stitches .....	22
Figure C.3 – Sewing Cable to Supports at Turns (Chicago Stitch) .....	23
Figure C.4 – Cables from Miscellaneous Run Secured Together Between Rack and First Support with a Modified Chicago Stitch .....	24
Figure C.5 – Securing Power Cables Through a Bend .....	25
Figure C.6 – Securing Cable with Correct Application of a Transitional Device (Splice) .....	26
Figure D.1 – Fiber Over Threaded Rods and Cable Rack Rung .....	29
Figure D.2 – Typical Threaded Rod Protective Sleeve .....	29
Figure D.3 – Protection on the Flanged Side of Cable-Rack Cross-Straps .....	30
Figure D.4 – Cable Rack Level Change Cross Strap Protection .....	31
Figure D.5 – Fiber Wrapping of Soft Rubber Insulation .....	32
Figure D.6 – Various Examples of DC Power and Grounding Cable Insulation Protection .....	33
Figure D.7 – More Examples of DC Power and Grounding Cable Insulation Protection .....	34

## Table of Tables

Table 4.1 – Cable Types .....	4
Table 4.2 – Cable Dimensions for XHHW and XHHW-2 Type Cables .....	5
Table 4.3 – DLO Soft-Rubber and RHH-RHW Cable Dimensions .....	6
Table 4.4 – Maximum Allowable Ampacity .....	7
Table 5.1 – Conductor – Class B Cable .....	9
Table 5.2 – Conductor – Class I Cable .....	9
Table 5.3 – Typical Bend Resistance .....	12
Table 5.4 – Typical Spring Back .....	12
Table 5.5 – Minimum Cable Bending Radius for Insulation Failure and Spring Back Tests .....	13
Table A.1 – Bend Radius and Roller Spacing .....	19