



ATIS-0600010.01.2017

Temperature, Humidity, Altitude, and Salt Fog
Requirements for Network Telecommunications
Equipment Utilized in Outside Plant Environments

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 and major U.S. contributor to the International Telecommunication Union (ITU), as well as a member of the Inter-American Telecommunication Commission (CITEL). For more information, visit 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 directly 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 [\[http://www.atis.org/legal/patentinfo.pdf\]](http://www.atis.org/legal/patentinfo.pdf) 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-0600010.01.2017 Temperature, Humidity, Altitude, and Salt Fog Requirements for Network Telecommunications Equipment Utilized in Outside Plant Environments

Is an American National Standard developed by the **Network Physical Protection (NPP)** Subcommittee under the ATIS Sustainable **Telecom: Energy and Protection Committee (STEP)**.

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

Copyright © 2017 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-0600010.01.2017

[Revision of ATIS-0600010.01.2008]

American National Standard on

**Temperature, Humidity, Altitude, and Salt Fog
Requirements for Network Telecommunications
Equipment Utilized in Outside Plant Environments**

Alliance for Telecommunications Industry Solutions

Approved January 4, 2017

Abstract

This standard covers the minimum temperature, humidity, altitude, and salt fog criteria for telecommunications network equipment to be installed and utilized by service providers in Outside Plant (OSP) environments. These environments include those in OSP cabinet enclosure, pedestals, etc.

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 (NIPP) Committee – engages industry expertise to develop standards and technical reports for telecommunications equipment and environments in the areas of energy efficiency, environmental impact, 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.

ANSI guidelines specify two categories of requirements: mandatory and recommendation. The mandatory requirements are designated by the word *shall* and recommendations by the word *should*. Where both a mandatory requirement and a recommendation are specified for the same criterion, the recommendation represents a goal currently identifiable as having distinct compatibility or performance advantages.

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 of consensus on this document, STEP, which was responsible for its development, had the following roster:

- K. Biholar, STEP Chair (Alcatel-Lucent)
- J. Krahnert, STEP Vice Chair (Cisco)
- C. Forbes, STEP NPP Chair (NTS)
- C. Von Hagel, STEP NPP Vice Chair (Intertek)

The Network Physical Protection (NPP) 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	2
3	Definitions, Acronyms, & Abbreviations	2
3.1	Definitions	2
3.2	Acronyms & Abbreviations.....	3
4	Environment Classification	3
4.1	Operating Temperature Humidity Environment	4
4.2	Operating Altitude Environment.....	5
4.3	Storage & Transportation Environment	5
5	Equipment Cooling Classification	6
6	Environmental Conditions.....	7
6.1	Operating Temperatures & Humidity	7
6.2	Operating Altitude	7
6.3	Storage & Transportation Temperature & Humidity.....	8
6.4	Solar Loading.....	8
6.4.1	<i>Test Conditions</i>	9
6.4.2	<i>Methodology</i>	9
6.4.3	<i>Set up</i>	10
6.4.4	<i>Category 1 Application of Solar Load by Strip Heaters</i>	11
7	Operating Temperature Humidity Test Methods.....	13
7.1	Description.....	13
7.2	Test Apparatus & Support Equipment	14
7.2.1	<i>Test Apparatus</i>	14
7.2.2	<i>Support Equipment</i>	14
7.3	Sample Requirements	14
7.4	Preconditioning	15
7.5	Testing.....	15
7.5.1	<i>Equipment Operation</i>	15
7.5.2	<i>Equipment Failures</i>	15
7.5.3	<i>Functional Requirements & Verification</i>	15
7.5.4	<i>Temperature & Humidity Procedure for OSP Class 2, 3 & 4 Environments</i>	16
7.5.5	<i>Temperature & Humidity Procedure for Class 3 Environments</i>	18
7.5.6	<i>Fan Failure</i>	22
8	Altitude Test Method.....	22
8.1	Description.....	22
8.2	Test Apparatus & Support Equipment	23
8.3	Sample Requirements	23
8.4	Preconditioning	23
8.5	Testing.....	23
8.5.1	<i>Equipment Operation</i>	23
8.5.2	<i>Equipment Failures</i>	23
8.5.3	<i>Hypobaric Chamber Test Method</i>	23

9	Storage & Transportation Environmental Test Methods	23
9.1	Low Temperature.....	24
9.2	High Temperature.....	24
9.3	High Humidity	24
10	Salt Fog Test Methods.....	24
10.1	Salt Fog	24
10.2	Test Method (Non-Sealed)	25
10.3	Test Method (Sealed)	25
11	Test Report Requirements.....	25
A	Additional Information on Environment Classification	27
A.1	Class 1, Controlled – Protected Environment – Network Equipment Facilities.....	27
A.2	Class 2, Harsh Protected Environment.....	27
A.3	Class 3, Extreme Protected Environment.....	27
A.4	Class 4, Unprotected Environment	28
B	Equipment Cooling Classification	29
B.1	Natural or Free Convection	29
B.2	Forced Convection	29
B.3	Liquid-cooled.....	29
C	100 Cycle Accelerated Life Test	30
C.1	Test Conditions & Pass/Fail Criteria	30
C.2	Reporting Conditions	31

Table of Tables

Table 4.1	– Operating Environment Classification.....	4
Table 4.2	– High Altitude Environment.....	5
Table 4.3	– Temperature and Humidity Range for Storage and Transportation Environment ...	5
Table 6.1	– Test Environment - Temperature and Humidity	7
Table 6.2	– Operating Environment Tests – Altitude Temperature, and Pressure Levels	7
Table 6.3	– Storage & Transportation - Temperature/Humidity Levels.....	8
Table 6.4	– Solar Load Categories	8
Table 6.5	– Spectral Distribution of Solar Simulator	13
Table 7.1	– Temperature and Humidity for Class 2 Environment	18
Table 7.2	– Temperature and Humidity for Class 3 Environment	19
Table 7.3	– Temperature and Humidity for Class 4 Environment	21

ATIS Standard on –

Temperature, Humidity, Altitude, and Salt Fog Requirements for Network Telecommunications Equipment Utilized in Outside Plant Environments

1 Scope, Purpose, & Application

1.1 Scope

This standard covers the minimum temperature, humidity, altitude, and salt fog criteria for telecommunications network equipment to be installed and utilized by service providers in Outside Plant (OSP) environments. These environments include those found in OSP cabinets, enclosures, pedestals, etc., as well as those outside of protective enclosures. Test methodologies and test report criteria necessary for proper evaluation by interested parties and those intending to deploy equipment in such environments are also provided.

This document defines Environmental Classifications based on the temperature, humidity, altitude, and salt fog ranges in which the equipment must operate, and provides test methodologies to evaluate equipment operation in those environments. Based on the intended usage, network equipment could be placed in one or more of the "Environment Classifications".

The expectation is that equipment will continue to function properly and without any unexpected degradation of performance when placed in these environments. Regardless of the operational environmental classification, equipment is expected to function properly after exposure to the environmental stresses, such as operational altitude and storage/transportation temperature-humidity. The test criteria defined in this document apply to all equipment.

1.2 Purpose

The purpose of this document is to provide the end users, manufacturers, test labs, etc., a means of testing OSP equipment to the expected environmental conditions encountered in normal deployment.

1.3 Application

This document applies to network equipment intended to be installed and utilized by service providers in OSP locations.

Equipment originally designed for Class 1 Environments shall not be deployed in Class 2, Class 3, or Class 4 Environments unless they are re-evaluated to the criteria applicable to that Class of environment as outlined in this document.

Environmental Classes 1, 2, and 3 as defined in this standard are in an ascending hierarchy. Therefore, equipment evaluated to a higher Class is acceptable for deployment in lower Class environments – e.g., equipment evaluated for a Class 3 Environment is acceptable in a Class 2 environment. Engineering judgment and analysis may be used to determine if subassemblies in a product tested in a Class 4 Environment meet the requirements of the Class in which it is to be installed.

Specific test methods may deviate from the general procedures set forth in each of the testing clauses. In the case where the specific test methods deviate from those general procedures, the specific test methods take precedence.

Ramp rates can exceed those specified at the discretion of the manufacturer.