CAN/ULC 316:14 (R2024)

Standard for Performance of Video Surveillance Systems

ULC Standards
Normes ULC

SCC CCN

Underwriters Laboratories of Canada (ULC) was established in 1920 by letters patent issued by the Canadian Government. It maintains and operates laboratories and certification services for the examination, testing and certification of appliances, equipment, materials, constructions and systems to determine their relation to life, fire and property hazards as well as providing inspection services.

ULC Standards develops and publishes standards and other related publications for building construction, security and burglar protection, environmental safety, electrical equipment, fire protection equipment, gas and oil equipment, thermal insulation products, materials and systems, energy use in the built environment and electrical utility safety.

ULC Standards is a not-for-profit organization and is accredited by the Standards Council of Canada as a Standards Development Organization.

National Standards of Canada developed by ULC Standards conform to the criteria and procedures established by the Standards Council of Canada. Such standards are prepared using the consensus principle by individuals who provide a balanced representation of interests relevant to the subject area on a national basis.

National Standard of Canada

A National Standard of Canada is a standard developed by a Standards Council of Canada (SCC) accredited Standards Development Organization, in compliance with requirements and guidance set out by SCC. More information on National Standards of Canada can be found at www.scc.ca.

SCC is a Crown corporation within the portfolio of Innovation, Science and Economic Development (ISED) Canada. With the goal of enhancing Canada's economic competitiveness and social well-being, SCC leads and facilitates the development and use of national and international standards. SCC also coordinates Canadian participation in standards development, and identifies strategies to advance Canadian standardization efforts.

Accreditation services are provided by SCC to various customers, including product certifiers, testing laboratories, and standards development organizations. A list of SCC programs and accredited bodies is publicly available at www.scc.ca.

For further information on ULC standards, please contact:

ULC STANDARDS
Telephone: 1-888-853-3503
E-mail: ClientService@shopULStandards.com

To purchase ULC Standards, visit: https://www.shopulstandards.com

The intended primary application of this standard is stated in its scope. It is important to note that it remains the responsibility of the user of the standard to judge its suitability for the particular application.

Copies of this National Standard of Canada may be ordered from ULC Standards.

CETTE NORME NATIONALE DU CANADA EST DISPONIBLE EN VERSIONS FRANÇAISE ET ANGLAISE

Standard For Performance Of Video Surveillance Systems, CAN/ULC 316

First Edition, Dated December 1, 2014

Summary of Topics

This reaffirmation of CAN/ULC 316 dated October 31, 2024 is being issued to update the title page to reflect the reaffirmation of this First Edition National Standard of Canada. No changes in requirements are involved.

Text that has been changed in any manner or impacted by ULSE's electronic publishing system is marked with a vertical line in the margin.

The requirements are substantially in accordance with Proposal(s) on this subject dated June 14, 2024.

PLEASE NOTE THAT CERTAIN CODES MAY REFER TO A SUPERSEDED VERSION OF THIS STANDARD. IN THOSE INSTANCES, THE RELEVANT VERSIONS ARE AVAILABLE FOR PURCHASE.

ULSE INC. COPYRIGHTED MATERIAL – NOT AUTHORIZED FOR FURTHER REPRODUCTION OR DISTRIBUTION WITHOUT PERMISSION FROM ULSE INC.

CAN/ULC 316:14 (R2024)

Standard for Performance of Video Surveillance Systems

ICS 13.310; 13.320; 33.160.40

FIRST EDITION . . . . . **DECEMBER 2014**
Reaffirmed . . . . . October 15, 2019
REAFFIRMED . . . . . OCTOBER 31, 2024

© 2024

ULC Standards

All rights reserved. No part of this publication may be reproduced in any form, in an electronic retrieval system or otherwise, without prior permission.

ULSE INC. COPYRIGHTED MATERIAL – NOT AUTHORIZED FOR FURTHER REPRODUCTION OR DISTRIBUTION WITHOUT PERMISSION FROM ULSE INC.

CONTENTS

ULC STANDARDS COMMITTEE ON SECURITY AND BURGLAR ALARM EQUIPMENT AND SYSTEMS 7

PREFACE 9

1 SCOPE 11
2 REFERENCE PUBLICATIONS 11
3 GLOSSARY 13
4 LEGAL AND LOCAL COMPLIANCE REQUIREMENTS RELATING TO PRIVACY 21
5 TYPES OF VIDEO SURVEILLANCE SYSTEMS (VSS) 21
6 VIDEO SURVEILLANCE SYSTEMS (VSS) APPLICATION CATEGORIES 22
6.1 GENERAL 22
6.2 VSS CLASS DESCRIPTIONS 22
6.3 RISK MODEL APPROACH 22
7 IMAGE PERFORMANCE REQUIREMENTS 23
7.1 GENERAL 23
7.2 DETECTION MINIMUM RELATIVE TARGET SIZE 24
7.3 CLASSIFICATION MINIMUM TARGET SIZE 25
7.4 ASSESSMENT MINIMUM TARGET SIZE 26
7.5 VISUAL IDENTIFICATION MINIMUM TARGET SIZE 27
7.6 DETECTION CATEGORY REQUIREMENTS 28
7.7 CLASSIFICATION CATEGORY REQUIREMENTS 28
7.8 ASSESSMENT CATEGORY REQUIREMENTS 29
7.9 VISUAL IDENTIFICATION CATEGORY REQUIREMENTS 29
7.10 BIOMETRIC / MACHINE IDENTIFICATION CATEGORY REQUIREMENTS 30
8 SYSTEM OPERATIONAL PERFORMANCE REQUIREMENTS 30
8.1 SYSTEM OPERATIONAL REQUIREMENTS 31
8.2 SYSTEM INTEGRITY AND TAMPER DETECTION 32
8.3 SYSTEM SECURITY (SOFT) 33
8.4 SYSTEM LOGS AND AUDITING REQUIREMENTS 35
8.5 SYSTEM SECURITY (PHYSICAL) 35
8.6 ENVIRONMENTAL 36
8.7 STORAGE REQUIREMENTS 37
9 CAMERA AND VIEWING INSTALLATION AND EQUIPMENT SELECTION 37
9.1 VSS PERFORMANCE IMPACT 37
9.2 IMAGE CAPTURE 42
9.3 CAMERA HOUSINGS 46
9.4 TAMPER PROTECTION 47
9.5 VIEWING 47
10 CABLE AND CONNECTOR INSTALLATION AND EQUIPMENT SELECTION 48
10.1 GENERAL 48
10.2 POWER WIRING AND POWER SUPPLIES 48
10.3 CONTROL, VIDEO AND DATA TRANSMISSION CABLING 49
10.4 WIRELESS VIDEO TRANSMISSION 50
10.5 FIBRE OPTIC CABLING 50
11 STORAGE / REDUNDANCY 50
12 INSPECTIONS AND PREVENTATIVE MAINTENANCE 50
13 RECORD KEEPING 51
14 INSTALLATION 52
14.1 CABLE AND RACEWAYS 52
14.2 HARDWARE AND POWER SUPPLY INSTALLATION 53
14.3 CONTROL EQUIPMENT 53
14.4 APPLICATION SPECIFIC INSTALLATION 54

ULSE INC. COPYRIGHTED MATERIAL – NOT AUTHORIZED FOR FURTHER REPRODUCTION OR DISTRIBUTION WITHOUT PERMISSION FROM ULSE INC.

14.5 ENVIRONMENTAL CONDITIONS FOR VSS SURVEILLANCE ROOMS OR SERVER ROOMS....54
14.6 PHYSICAL SECURITY....54
15 SYSTEM CONFIGURATION FOR ACCESS PRIVILEGES....55
15.1 ACCESS PRIVILEGES FOR VIDEO SURVEILLANCE SYSTEM....55
16 LEGAL CONSIDERATIONS....55
16.1 PRIVACY COMPLIANCE....55
TABLES....55
FIGURES....60

APPENDIX A (INFORMATIVE) – REQUIREMENT MATRIX EXAMPLE FOR VSS APPLICATIONS

A1 REQUIREMENT MATRIX EXAMPLE FOR VSS APPLICATIONS....62

APPENDIX B (INFORMATIVE) – VIDEO SYSTEM TOPOLOGIES

APPENDIX C (INFORMATIVE) – PERFORMANCE IMPACT CHECKLIST

C1 CONSIDER THE FOLLOWING DURING THE ORIGINAL ASSESSMENT....66

APPENDIX D (INFORMATIVE) – ACQUIRING QUALITY VIDEO IMAGES

D1 BACKGROUND....68
D2 IMAGE QUALITY MEASUREMENT DIFFICULTIES....68
D3 IMAGE QUALITY FACTORS....68
D4 LIMITING VISUAL RESOLUTION....69
D5 DYNAMIC RANGE....69
D6 COMPRESSION TYPE....69
D7 COMPRESSION LEVEL....69
D8 EXPOSURE TIME....69
D9 FOCUS....70
D10 DEPTH OF FIELD....70
D11 IMAGE CAPTURE RATE....70
D12 LIGHTING TYPE....70
D13 LIGHTING VARIANCE....70

APPENDIX E (INFORMATIVE) – BEST PRACTICES

E1 GENERAL....71
E2 RECOMMENDATIONS FOR MONITOR VIEWING ANGLES AND DISTANCES....71
E2.1 OPERATOR DISTANCE TO DESK OR CONSOLE MOUNTED MONITORS....71
E2.2 VIEWING ANGLES FOR MONITORS....72
E3 DATA TRANSMISSION (COMMUNICATIONS)....73
E3.1 GENERAL....73
E4 DATA AUTHENTICATION....74
E5 CAMERA INSTALLATION PERFORMANCE CRITERIA....74
E6 RECORDING MODES....75
E7 STORAGE / RETENTION AND REDUNDANCY REQUIREMENTS....75
E8 CABLING REQUIREMENTS....75
E9 APPENDIX E TABLES....75

APPENDIX F (INFORMATIVE) – ANNUAL INSPECTION CHECKLIST

ULSE INC. COPYRIGHTED MATERIAL – NOT AUTHORIZED FOR FURTHER REPRODUCTION OR DISTRIBUTION WITHOUT PERMISSION FROM ULSE INC.

ULC STANDARDS COMMITTEE ON SECURITY AND BURGLAR ALARM EQUIPMENT AND SYSTEMS

NAME	AFFILIATION	CATEGORY	REGION
K. Allison	Fire Monitoring Of Canada Inc.	Commercial / Industrial User	Ontario
B. Barnable	BMO Financial Group	Commercial / Industrial User	Ontario
D. Currie	Damar Security Systems, Div of Lambton Communication Ltd.	Commercial / Industrial User	Canada
L. Dischert	Johnson Controls, Inc / Building Solutions North America	Commercial / Industrial User	USA
K. Eltherington	Brink's Canada	Commercial / Industrial User	Ontario
E. Flamand	Siemens Canada	General Interest	Quebec
A. Gilders (Project Manager)	UL Standards & Engagement	Non-Voting	Ontario
R. Jagmohan	Honeywell Security & Communications	Producer	Ontario
R. Krzak	Chubb Security Systems, Div of Chubb Security Canada Inc	Producer	Ontario
F. Leber	AML Encore Corp	General Interest	Ontario
F. Luz (TC Chair)	UL Standards & Engagement	Non-Voting	Ontario
G. MacPherson	CAPSYS Integrated Technology Consultants	General Interest	Ontario
B. Neufeld	ADT Security Services Canada Inc. / TELUS	Supply Chain	Alberta
D. Nita	Digital Security Controls, Div of Tyco Safety Products Canada Ltd	Producer	Ontario
M. Roper	Standards Individuals	General Interest	Ontario
J. Wilson	Digital Monitoring Products	Producer	USA
D. Winikoff	David Winikoff Security Consultants	General Interest	USA
I. Yavari	SenezCo - Fire Science & Engineering	General Interest	Ontario
R. Yeole	HID Global	Producer	USA
T. Zhong	UL Solutions	Non-Voting	Canada

This list represents the membership at the time the Committee balloted on the final text of this edition. Since that time, changes in the membership may have occurred.

ULSE INC. COPYRIGHTED MATERIAL – NOT AUTHORIZED FOR FURTHER REPRODUCTION OR DISTRIBUTION WITHOUT PERMISSION FROM ULSE INC.

PREFACE

This is the First Edition of CAN/ULC 316, Standard for Performance of Video Surveillance Systems.

This Edition of the Standard was developed by the ULC Standards Subcommittee on Surveillance Equipment, and was formally approved by the ULC Standards Committee on Security and Burglar Alarm Equipment and Systems.

This Standard has been developed in compliance with the requirements of SCC for accreditation of a Standards Development Organization.

Only metric SI units of measurement are used in this Standard. If a value for measurement is followed by a value in other units in parentheses, the second value may be approximate. The first stated value is the requirement.

Annexes A through F, identified as informative, are for informational purposes only.

In Canada, there are two official languages, English and French. All safety warnings must be in French and English. Attention is drawn to the possibility that some Canadian authorities may require additional markings and/or installation instructions to be in both official languages.

This First Edition National Standard of Canada is based on, and now supersedes, the first edition of ULC-S317, Standard for Installation and Classification of Closed Circuit Video Equipment (CCVE) Systems for Institutional and Commercial Security Applications.

Attention is drawn to the possibility that some of the elements of this Canadian standard may be the subject of patent rights. ULC Standards shall not be held responsible for identifying any or all such patent rights.

Requests for interpretation of this Standard should be sent to ULC Standards. The requests should be worded in such a manner as to permit a “yes” or “no” answer based on the literal text of the requirement concerned.

This CAN/ULC 316 Standard is under continuous maintenance, whereby each revision is approved in compliance with the requirements of SCC for accreditation of a Standards Development Organization. In the event that no revisions are issued for a period of four years from the date of publication, action to revise, reaffirm, or withdraw the standard shall be initiated.

Comments or proposals for revisions on any part of the Standard may be submitted at any time. Proposals should be submitted via a Proposal Request in the Collaborative Standards Development System (CSDS) at https://csds.ul.com.

This Standard is intended to be used for conformity assessment.

ULSE INC. COPYRIGHTED MATERIAL – NOT AUTHORIZED FOR FURTHER REPRODUCTION OR DISTRIBUTION WITHOUT PERMISSION FROM ULSE INC.

1 SCOPE

1.1 This standard provides minimum acceptable performance parameters for *video* surveillance systems. The system stakeholder determines the *video* surveillance system operational requirements. Refer to Section 8, System Operational Performance Requirements.

1.2 The purpose of this Standard is to provide guidance to ensure that security *video* system functions and performance are achieved, to assist end users, integrators, consultants and authorities with a means to objectively define, verify, and maintain compliance to performance standards.

1.3 This Standard is structured:

A To accommodate a broad range of applications;

B To reflect widely used current and emerging technologies;

C To avoid specific technological requirements that may restrict the application of advanced innovative solutions and new technology; and

D Is based on a *Risk – Application* method. Application of the Standard requires the practitioner to determine associated *risk* level based on a *risk assessment* of each area to be covered and determination of the primary objective for each camera associated with that area. The results may then be used to select the system *class* requirements for each area within the system. A set of specific functional parameters required for compliance is provided for each *class* or category.

1.4 The purpose of the Video Surveillance System (VSS) is to capture images of the scene, process the images, record and display them to the system operator. In some applications, *video* images and metadata may be transmitted to remote locations or retrieved when required by off-site operators.

1.5 A Video Surveillance System is comprised of many components and the performance of any one of the individual components of the system can have a significant impact on the overall operational design performance. This Standard reflects the desired system performance for each identified category (*Detection*, *Classification*, *Assessment*, *Visual Identification* and *Biometric/Machine Identification* as defined in Section 7, Image Performance Requirements). In practical deployments, this Standard does not address critical elements of a Video Surveillance System (such as network infrastructure). Elements of the system which may impact compliance with this standard shall be considered during the design phase.

1.6 This Standard is applicable to the source image and recorded / viewed image and defines compliance requirements for overall performance. This document does not specify the type of technology or the required *image quality* for a certain *video* surveillance task.

2 REFERENCE PUBLICATIONS

The documents shown below are referenced in the text of this Standard. Unless otherwise stated elsewhere in this Standard, such reference shall be considered to indicate the edition and/or revisions of the document available at the date on which the Committee approved this ULC Standard. All undated references shall be interpreted as referring to the latest edition of that document.

Document Published by the National Fire Protection Association (NFPA)
1 Batterymarch Park, Quincy, Massachusetts USA 02169-7471
Telephone: 1-617-770-3000 or 1-800-344-3555

• ANSI/NFPA 262-1985, Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces

ULSE INC. COPYRIGHTED MATERIAL – NOT AUTHORIZED FOR FURTHER REPRODUCTION OR DISTRIBUTION WITHOUT PERMISSION FROM ULSE INC.

Document Published by CSA Group
5060 Spectrum Way, Suite 100, Mississauga, Ontario L4W 5N6 Canada
Telephone: 1-800-463-6727, Fax: (416) 747-2473
www.csa.ca

• CSA C22.1-12, Canadian Electrical Code, Part I, Safety Standard for Electrical Installations
• CSA C22.2 No.0.3-09, Test Methods for Electrical Wires and Cables

---

Document Published by IEEE
3 Park Avenue, 17th Floor, New York, NY 10016-5997 USA
Telephone: 1-800-701-IEEE, Fax: +1 732 981 9667
onlinesupport@ieee.org

• IEEE 802.11-2012, Information technology – Telecommunications and information exchange between systems Local and metropolitan area networks – Specific requirements Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications

---

Document Published by the International Telecommunication Union (ITU)
Place des Nations, 1211 Geneva 20, Switzerland
Telephone: +41 22 730 5111

• ITU H.261-1993, Video Codec for Audiovisual Services at p x 64 kbit/s

---

Document Published by the International Organization for Standardization (ISO)
1, ch. de la Voie-Creuse, CP 56, CH-1211 Geneva 20, Switzerland
Telephone: +41 22 749 01 11

• ISO/IEC 19794-5:2011, Information Technology – Biometric Data Interchange Formats – Part 5: Face Image Data

---

Codes published by the National Research Council of Canada
Publication Sales M20, National Research Council of Canada, Institute for Research in Construction, Ottawa, ON K1A 0R6
Telephone: (613) 993-2463 or 1-800-672-7990
www.nrc-cnrc.gc.ca

• National Building Code of Canada 2010
• National Fire Code of Canada 2010

Document Published by the Underwriters Laboratories Inc.
333 Pfingsten Road, Northbrook, IL 60062-2096 U.S.A.
Telephone: (847) 272-8800
www.ul.com

• UL 1581-2013, Reference Standard for Electrical Wires, Cables, and Flexible Cords
• UL 1685-2010, Vertical-Tray Fire-Propagation and Smoke-Release Test for Electrical and Optical-Fiber Cables

ULSE INC. COPYRIGHTED MATERIAL – NOT AUTHORIZED FOR FURTHER REPRODUCTION OR DISTRIBUTION WITHOUT PERMISSION FROM ULSE INC.

Documents Published by ULC Standards
171 Nepean Street, Suite 400, Ottawa, ON K2P 0B4 Canada
Telephone: (416) 757-3611, ext. 61744; Fax (613) 231-5977, “ATTN: Publications”
E-mail: publications@ulc.ca
www.ulc.ca

• CAN/ULC-S302, Standard for the Installation, Inspection and Testing of Intrusion Alarm Systems

3 GLOSSARY

Note: Terms used in this Standard that are in *italic print* are defined as follows:

3.1 *ACCESS LEVEL HIERARCHY* – Permission levels (as through the use of *logons* and *passwords*) that can be assigned to a specific user or group for users to restrict certain tasks and functions. The Hierarchy will vary by application. Examples may include Installer Level, Master Level, Supervisor Level, Auditor Level, User Level, etc.

3.2 *ANALOGUE* – Information carried over an analogue signal is a representation of data by continuously varying quantities. An analogue electrical signal has a different value of volts or amperes for electrical representation of the original excitement (light, sound, etc.) within a *dynamic range* specific to the analogue device.

3.3 *APERTURE* – The opening of a *lens* that controls the amount of light reaching the surface of the pickup device. The size of the *aperture* is controlled by the *iris* adjustment. By increasing the *F-stop* number (F/1.4, F/1.8, F/2.8, etc.) less light is permitted to pass to the pickup device. Also affects *depth of field*.

3.4 *ASPECT RATIO* – The ratio between the width and height of an image or frame. The present *aspect ratio* of the normal television screen is 4:3, which means four units wide by three units high. The *aspect ratio* was elected in the early days of television, when the majority of movies were of the same format. The new, high definition television format has a 16:9 *aspect ratio*.

3.5 *ASSESSMENT* – A *video* application category that enables the operator or reviewer to positively determine the type of target (image) including characteristics which may distinguish the target (image) from similar targets (images) and determine unique characteristics of a particular target of interest.

3.6 *AUTHENTICATION* – The process whereby devices or users are identified to the network and the remote end by providing identities to the network/system, such as usernames / *passwords* and network certificates.

3.7 *AUTHORITY LEVEL* – User access levels can be controlled by user authorities for the system *log on*. These may vary but generally fall into the categories of Administrator, Investigator, Operator and Viewer.

3.8 *AUTO-IRIS LENS* – A *lens* that automatically varies the size of a *lens aperture* in response to changes in scene illumination and under diverse and changing lighting conditions.

3.9 *BACK FOCUS* – A procedure of adjusting the physical position of the CCD-chip/*lens* to achieve the correct *focus* for all *focal length* settings (especially critical with *zoom lenses*). *Back focus* is a term used to describe the relationship of the distance of the *lens* to the image device.

ULSE INC. COPYRIGHTED MATERIAL – NOT AUTHORIZED FOR FURTHER REPRODUCTION OR DISTRIBUTION WITHOUT PERMISSION FROM ULSE INC.