

American Nuclear Society

REAFFIRMED

June 16, 2015

**ANSI/ANS-59.52-1998
(R2015)**

**lubricating oil systems for safety-related
emergency diesel generators**

an American National Standard

REAFFIRMED

October 4, 2007

**ANSI/ANS-59.52-1998
(R2007)**

This standard has been reviewed and reaffirmed with the recognition that it may reference other standards and documents that may have been superseded or withdrawn. The requirements of this document will be met by using the version of the standards and documents referenced herein. It is the responsibility of the user to review each of the references and to determine whether the use of the original references or more recent versions is appropriate for the facility. Variations from the standards and documents referenced in this standard should be evaluated and documented.

This standard does not necessarily reflect recent industry initiatives for risk informed decision-making or a graded approach to quality assurance. Users should consider the use of these industry initiatives in the application of this standard.



published by the
American Nuclear Society
555 North Kensington Avenue
La Grange Park, Illinois 60525 USA

ANSI/ANS-59.52-1998

**American National Standard
Lubricating Oil Systems for Safety-Related
Emergency Diesel Generators**

Secretariat
American Nuclear Society

Prepared by the
**American Nuclear Society
Standards Committee
Working Group ANS-59.5x**

Published by the
**American Nuclear Society
555 North Kensington Avenue
La Grange Park, Illinois 60526 USA**

Approved October 23, 1998
by the
American National Standards Institute, Inc.

American National Standard

Designation of this document as an American National Standard attests that the principles of openness and due process have been followed in the approval procedure and that a consensus of those directly and materially affected by the standard has been achieved.

This standard was developed under procedures of the Standards Committee of the American Nuclear Society; these procedures are accredited by the American National Standards Institute, Inc., as meeting the criteria for American National Standards. The consensus committee that approved the standard was balanced to ensure that competent, concerned, and varied interests have had an opportunity to participate.

An American National Standard is intended to aid industry, consumers, governmental agencies, and general interest groups. Its use is entirely voluntary. The existence of an American National Standard, in and of itself, does not preclude anyone from manufacturing, marketing, purchasing, or using products, processes, or procedures not conforming to the standard.

By publication of this standard, the American Nuclear Society does not insure anyone utilizing the standard against liability allegedly arising from or after its use. The content of this standard reflects acceptable practice at the time of its approval and publication. Changes, if any, occurring through developments in the state of the art, may be considered at the time that the standard is subjected to periodic review. It may be reaffirmed, revised, or withdrawn at any time in accordance with established procedures. Users of this standard are cautioned to determine the validity of copies in their possession and to establish that they are of the latest issue.

The American Nuclear Society accepts no responsibility for interpretations of this standard made by any individual or by any ad hoc group of individuals. Requests for interpretation should be sent to the Standards Department at Society Headquarters. Action will be taken to provide appropriate response in accordance with established procedures that ensure consensus on the interpretation.

Comments on this standard are encouraged and should be sent to Society Headquarters.

Published by

**American Nuclear Society
555 North Kensington Avenue
La Grange Park, Illinois 60526 USA**

Copyright © 2000 by American Nuclear Society. All rights reserved.

Any part of this standard may be quoted. Credit lines should read "Extracted from American National Standard ANSI/ANS-59.52-1998 with permission of the publisher, the American Nuclear Society." Reproduction prohibited under copyright convention unless written permission is granted by the American Nuclear Society.

Printed in the United States of America

Foreword

(This Foreword is not a part of American National Standard for Lubricating Oil Systems for Safety-Related Emergency Diesel Generators, ANSI/ANS-59.52-1998.)

This standard is applicable to light water reactor nuclear power plants and is one of a series of standards, sponsored by the LWR Criteria Management Subcommittee (MC-1), intended to cover the design of auxiliary systems that support the operation of emergency diesel generator units. Other standards in this series that have been or are being developed by this working group are listed below:

Proposed Standard	Subject
ANS-59.51	Fuel Oil Systems
ANS-59.53	Starting Air Systems
ANS-59.54	Combustion Air Systems
ANS-59.55	Coolant Systems

This standard interfaces with American National Standard Criteria for Diesel-Generator Units Applied as Standby Power Supplies for Nuclear Power Generating Stations, ANSI/IEEE 387-1995. That standard does not address fluid system or component performance or design criteria. To address these fluid system requirements, this standard includes in its scope the pumps, tanks, piping and piping components, and instrumentation and control functions, as described herein. Based on discussions with the working group chairman for ANSI/IEEE 387, it was agreed that the intent of that standard is to address only the overall qualifications and boundaries of the diesel generator auxiliary systems and not the specific performance or design criteria, which are addressed in ANS-59.52.

The purpose of this standard, and the related standards under development, is to provide guidance to nuclear plant owners, designers, manufacturers, regulatory authorities, and operators, in the design of reliable, safety-related, onsite power systems for light water reactors. The reliability of lubricating oil systems must be considered when satisfying the overall reliability requirements of the diesel generator units. This is particularly important if lubricating oil systems have components that are shared between reactor units, and if the single failure criterion is applied.

This standard can also be used for non-safety-related onsite power systems, with several changes to eliminate those requirements which would not normally apply to such equipment. For example, non-safety-related equipment would not normally have to meet American National Standard Single Failure Criteria for Light Water Reactor Safety-Related Fluid Systems, ANSI/ANS-58.9-1981 (R1987), the Class 1E Power Systems requirements of American National Standard Criteria for Class 1E Power Systems for Nuclear Power Generating Stations, ANSI/IEEE 308-1992, and several of the requirements described in American National Standard Nuclear Safety Criteria for Design of Stationary Pressurized Water Reactor Plants, ANSI/ANS-51.1-1983 (R1988) and American National Standard Nuclear Safety Criteria for Design of Stationary Boiling Water Reactor Plants, ANSI/ANS-52.1-1983 (R1988), for safety-related equipment, such as Seismic Category I. Other requirements, such as American National Standard ASME Boiler and Pressure Vessel Code-1995, Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components," and American National Standard Quality Assurance Program Requirements for Nuclear Facilities, ANSI/ASME NQA-1-1994, which normally apply to safety-related equipment but which are considered to enhance reliability, could be optional or modified to suit a particular application.

This revision to the standard has been prepared by Working Group ANS-59.5x of the Standards Committee of the American Nuclear Society, which had the following membership.

S. A. Shuman, Chairman, *Individual*
J. M. Horne, *Cooper Cameron Corporation*
W. J. McFarland, *PECO Energy Company*
T. O'Brien, *Commonwealth Edison Company*
E. B. Tomlinson, *U.S. Nuclear Regulatory Commission*
N. A. Traeger, *Coltec Industries*

MC-1, LWR Criteria Management Committee, had the following membership at the time of its approval of the standard:

S. B. Bargerstock, *CYGNA Group, Inc.*
J. C. Dempsey, Jr., *Pacific Nuclear*
L. A. Ettliger, *Defense Nuclear Facilities Safety Board*
J. C. Glynn, *U.S. Nuclear Regulatory Commission*
P. H. Hepner, *ABB / Combustion Engineering Nuclear Power*
R. A. Hill, *GE Nuclear Energy*
M. P. Horrell, *Ebasco Services*
L. A. Klosowski, *Niagara Mohawk Power Corporation*
G. B. Locklear, *Carolina Power & Light Company*
J. T. Luke, *Florida Power & Light Company*
C. G. Morrell, *Stone & Webster Engineering Corporation*
S. A. Nass, *Duquesne Light Company*
N. Prillaman, *Babcock & Wilcox*
H. C. Shaffer, *Yankee Atomic Electric Company*
S. A. Shuman, *Individual*
M. D. Smith, *Bechtel Corporation*
R. C. Surman, *Westinghouse Electric Corporation*

The American Nuclear Society's Nuclear Power Plant Standards Committee (NUPPSCO) had the following membership at the time of its approval of the standard.

W. H. D'Ardenne, Chairman

M. D. Weber, Secretary

R. E. Allen UE&C Nuclear
(for the Institute of Electrical and Electronics Engineers, Inc.)
P. L. Ballinger Nebraska Public Power District
F. Boorboor Nuclear Placement Services, Inc.
J. C. Bradford Bechtel Power Corporation
R. H. Bryan, Jr. Tennessee Valley Authority
T. W. T. Burnett Westinghouse Electric Corporation
J. D. Cohen Westinghouse Savannah River Company
J. B. Cotton Philadelphia Electric Corporation
W. H. D'Ardenne DAE Enterprises
(for the American Nuclear Society)
L. E. Davis Commonwealth Edison Company
M. Drouin U.S. Nuclear Regulatory Commission
P. H. Hepner ABB/Combustion Engineering, Inc.
R. A. Hill G.E. Nuclear Energy
C. E. Johnson, Jr. U.S. Nuclear Regulatory Commission
J. T. Luke Florida Power & Light Company
J. F. Mallay Liberty Consulting Group
C. H. Moseley, Jr. Performance Development Corporation
J. A. Nevshemal Raytheon UE&C
W. N. Prillaman Babcock & Wilcox Company
W. C. Ramsey, Jr. Southern Company Services, Inc.
W. B. Reuland Mollerus Engineering Corporation
R. F. Sacramo Halliburton NUS Corporation
J. C. Saldarini Raytheon Engineers & Constructors
J. Savy Lawrence Livermore National Laboratory
R. E. Scott Scott Enterprises
D. J. Spellman Oak Ridge National Laboratories
S. L. Stamm Stone & Webster Engineering Corporation
J. D. Stevenson Stevenson & Associates
C. D. Thomas, Jr. Yankee Atomic Electric Company
G. P. Wagner Commonwealth Edison Company
N. Weber Consultant
G. J. Wrobel Rochester Gas & Electric Corporation

Contents	Section	Page
	1. Introduction	1
	1.1 Scope	1
	1.2 Purpose	1
	2. Definitions	1
	3. System Function	2
	4. System Description	2
	5. System Performance Requirements	2
	5.1 General	2
	5.2 Capacity of Lube Oil Storage Capacity Requirements	2
	5.3 Component Performance Requirements	3
	6. Design Requirements	4
	6.1 Safety Classification and Applicable Codes and Standards	4
	6.2 Design Conditions	4
	6.3 Interfaces	5
	6.4 Testing, Inspection, and Maintenance Requirements	6
	6.5 Quality Assurance	7
	7. References	7
	Appendices	
	Appendix A Typical Subsystem Description	9
	Appendix B Suggested Lubricating Oil Practices	11
	Figures	
	Figure 1 Typical Lubricating Oil Subsystem Flow Diagram	10

Lubricating Oil Systems for Safety-Related Emergency Diesel Generators

1. Introduction

1.1 Scope. This standard provides functional, performance, and design requirements for lubricating oil systems for diesel generators that provide emergency onsite power for light water reactor nuclear power plants. The standard addresses all mechanical equipment associated with the lubricating oil system, with the exception of engine mounted components. These components, which are mounted directly to engine structure itself, are excluded, except to define interface requirements. This standard also includes the lubricating oil system instrumentation and control functional requirements. It excludes motors, motor control centers, switchgear, cables, and other electrical equipment used in the operation of the lubricating oil system, except to define interface requirements.

1.2 Purpose. The purpose of this standard is to define those features of lubricating oil systems required to ensure an adequate supply to emergency diesel generators, and to provide performance and design criteria that ensure sufficient lubricating oil is available under all plant conditions.

2. Definitions

Applicable definitions as stated in American National Standard Nuclear Safety Criteria for the Design of Stationary Light Water Reactors, ANSI/ANS-58.14-1993 [1],¹ shall be used for this standard. The following definitions shall also be applicable to this standard:

auto-load. The automatic application of loads to the diesel generator in a predetermined sequence.

design basis event (DBE). An event that is a condition of normal operation, including an anticipated operational occurrence, a design basis accident (or transient), an external event, or a natural phenomenon for which the plant must be designed to ensure that the three basic safety-related functions are achievable (see Title 10, "Energy," Code of Federal Regulations, Part 50,

"Domestic Licensing of Production and Utilization Facilities," Section 50.49 [2]).

emergency diesel generator (EDG). A diesel generator unit designed in accordance with American National Standard Criteria for Diesel Generator Units Applied as Standby Power Supplies for Nuclear Power Generating Stations, ANSI/IEEE 387-1995 [3], and installed to provide a standby power supply in accordance with American National Standard Criteria for Class 1E Power Systems for Nuclear Power Generating Stations, ANSI/IEEE 308-1992. [4] The diesel generators provide standby electric power to comply with the pertinent requirements of 10CFR50, Appendix A, "General Design Criteria for Nuclear Power Plants," Criterion 17, "Electric Power Systems" [5].

emergency start and operation. Automatic start and subsequent running or loading of the diesel engine, or both, in response to a safety signal such as emergency core cooling or loss of off-site power.

engine-driven oil pump. A pump which receives its motive power directly from the diesel engine and provides proper lubricating oil circulation under all operating conditions.

engine lubricating oil cooler. A heat exchanger that provides cooling of the lubricating oil to maintain temperature within specified operating limits.

keep-warm oil pump. An electric motor driven pump that circulates warm oil through the engine when the unit is in standby.

keep-warm heater. A heater used to warm the lubricating oil to within specified limits while the engine is in standby, to enhance engine starting reliability.

manual start. The starting of a diesel engine by operator action.

minimum required storage capacity. The minimum required quantity of lubricating oil to provide for engine consumption and operating needs during safety-related functions.

¹ Numbers in brackets refer to corresponding numbers in Section 7, References.