American National Standard

REAFFIRMED
October 26, 1982
ANSI/ANS-14.1
ANSI N394-1975;R1982

REAFFIRMED
April 11, 1989
ANSI/ANS-14.1
ANSI N394-1975;R1982;
R1989

REAFFIRMED
May 3, 2000
ANSI/ANS-14.1
ANSI N394-1975;R1982;
R1989;R2000

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...se reactors

WITHDRAWN
April 23, 2004
ANSI/ANS-14.1
ANSI N394-1975 (R2000)

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published by the
American Nuclear Society
244 East Ogden Avenue
Hinsdale, Illinois 60521, USA

ANS-14.1
ANSI N394-1975

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American National Standard
Operation of Fast Pulse Reactors

Secretariat
American Nuclear Society

Prepared by the
American Nuclear Society
Standards Committee
Working Group ANS-14.1

Published by the
American Nuclear Society
244 East Ogden Avenue
Hinsdale, Illinois 60521

Approved January 22, 1975
by the
American National Standards Institute, Inc.

American National Standard

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Published by

American Nuclear Society
244 East Ogden Avenue, Hinsdale, Illinois 60521

Printed in the United States of America

Foreword

(This Foreword is not part of American National Standard Operation of Fast Pulse Reactors N394-1975/ANS-14.1)

Nuclear devices designed and operated for purposes of research and as sources of sharp, intense pulses of fission-produced radiation have functioned successfully for more than a score of years. In the usual operation, super-prompt criticality is established in a mass of unmoderated fissile metal, radiation is produced, and the nuclear reaction is immediately terminated by characteristics inherent in the fissile material itself. These devices have come to be known as fast pulse reactors. This standard provides direction in the use of such specialties so that the risk of damage to personnel and equipment can be minimized. It was prepared by individuals having extensive and intimate experience in the operation of this type of reactor.

Three drafts of the standard were prepared by Subcommittee 14 of the Standards Committee of the American Nuclear Society. The third draft was approved unanimously by letter ballot of the Subcommittee in April 1971. Revisions to that draft were issued in May 1972 and March 1974. At the time of the final issuance, the membership of the Subcommittee was:

A. De La Paz, Chairman, *White Sands Missile Range*
L. M. Bonson, *Sandia Laboratories*
K. Elliot, *Albuquerque Operations Office, U.S. Atomic Energy Commission*
L. P. Holland, *Oak Ridge National Laboratory*
A. H. Kazi, Aberdeen Pulse Radiation Facility
R. L. Long, University of New Mexico
J. M. Reuscher, *Sandia Laboratories*
T. F. Wimett, *Los Alamos Scientific Laboratory*

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The American National Standards Committee N17, Research Reactors, Reactor Physics and Radiation Shielding, which reviewed and approved this standard in 1973, had the following membership:

W. L. Whittemore, Chairman
R. S. Carter, Secretary

Organization Represented	*Name of Representative*
American College of Radiology	M. M. Ter Pogossian
American Institute of Chemical Engineers	R. Duffy
American Nuclear Society	W. L. Whittemore
American Physical Society	W. W. Havens, Jr.
	H. Goldstein (Alt.)
American Public Health Association	C. G. Amato
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Health Physics Society	C. A. Willis
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National Bureau of Standards	R. S. Carter
National Council on Radiation Protection and Measurements	A. B. Chilton
Society of Nuclear Medicine	(M. Glos)
U.S. Atomic Energy Commission (Regulatory)	Karl R. Goller
	R. J. Schemel (Alt.)
U.S. Atomic Energy Commission (General Manager's Office)	P. B. Hemmig
	J. W. Lewellen (Alt.)
Individual Members	J. E. Olhoeft
	A. M. Perry
	E. A. Warman

Contents

Operation of Fast Pulse Reactors

1. Scope

This standard is for the guidance of those involved in the design, operation, and review of fast pulse reactors. It has been formulated in general terms to be applicable to all current fast pulse reactors. This standard does not apply to periodically pulsed reactors or booster assemblies.

Operation and maintenance of fast pulse reactors shall be carried out in accordance with this standard and the other applicable ANS-14 and ANS-15 documents.

2. Definitions

2.1 Limitations. The definitions given below should not be regarded as encyclopedic. Other terms with definitions accepted by usage and by standardization in the nuclear field are not included.

2.2 Glossary of Terms

shall and should. The word "shall" is used to denote a requirement, the word "should" to denote a recommendation. To conform to this standard, all operations shall be performed in accordance with its requirements but not necessarily with its recommendations.

fast pulse reactor (also referred to as fast burst reactor). An essentially unmoderated assembly of fissionable material designed to be operated at either a steady-state power level or to produce short duration high intensity pulses of fission radiation.

scram. The act of shutting down a reactor suddenly by operation of the reactor safety. Reactor shutdown shall be defined as the condition where as a minimum the safety block is fully withdrawn.

control elements. As used herein, the term "control elements" includes those reactor fuel or reflector components whose movement increases or decreases the reactivity of the reactor and includes control rods, pulse rod, safety block and reflectors or equivalent.

safety block. The safety block is that control element having a reactivity worth such that its movement is the primary mechanical means of shutting down the operation.

safety device. A mechanism or system designed to move a safety or control element to reduce the reactivity of a fast pulse reactor.

reactor operating staff. Those personnel, including reactor supervisor and reactor operator personnel, certified in accordance with procedures established by management to carry out operation of the reactor.

reactor supervisor. The individual in charge of reactor operations; equivalent to a senior reactor operator.

neutron decay interval. The interval of time in the pulse production cycle of the reactor during which a subcritical configuration is attained to allow for decay of delayed neutron precursors.

3. Administrative Procedures

(1) Responsibility for the safety of operation shall be assigned unambiguously by management.

(2) Prior to the start of each experiment, an experiment plan shall be reviewed and approved in accordance with procedures approved by management.

(3) At least two members of the reactor operating staff shall be present in the reactor facility area during operation of the reactor and one of these shall be present at the control console at all times during operation of the reactor. At least two members of the reactor operating staff shall be present at the reactor control console area at the time of the pulse.

(4) At least two individuals, one of which is a member of the reactor operating staff, shall be present during reactor maintenance or experimental setup operations involving access to the reactor. The member of the operating staff should be present at the reactor control console when power is provided for movement of the control elements. Such maintenance or experimental setup operations shall require approval of the reactor supervisor or his designee.