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Identification of fuel assemblies for nuclear power reactors

Identification des assemblages combustibles destinés aux réacteurs nucléaires

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

International Standard ISO 10979 was prepared by Technical Committee ISO/TC 85, *Nuclear energy*, Subcommittee SC 5, *Nuclear fuel technology*.

Annex A of this International Standard is for information only.

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Identification of fuel assemblies for nuclear power reactors

1 Scope

This International Standard specifies requirements for the unique identification of fuel assemblies utilized in nuclear power plants. It was developed primarily for commercial light-water reactor fuel, but may be used for any reactor fuel contained in discrete fuel assemblies that can be identified with an identification code as specified by this International Standard.

This International Standard defines the characters and proposed sequence to be used in assigning identification to the fuel assemblies. The identification is intended to be borne by the fuel assembly throughout its lifetime.

This International Standard aims at providing an organizing principle for fuel assembly identification systems in order to guarantee unequivocal identification at any time and any place in the world (see also IAEA Safety Guide 50-SG-QA 11).

Considering that existing standards for fuel assembly identification (such as ANSI/ANS-57.8-1978, DIN 25 433, IAEA Safety Guide 50-SG-QA 11) assure unequivocal identification in their respective fields of application, this International Standard allows without restriction the further application of these standards. Moreover, it is intended that this International Standard be used as a guideline for new definitions of identification systems.

2 Normative reference

The following standard contains provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the edition indicated was valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent edition of the standard indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 3098-1:1974, *Technical drawings — Lettering — Part 1: Currently used characters.*

3 Definitions

For the purposes of this International Standard, the following definitions apply.

3.1 fuel assembly: Component containing a fissile material and forming a unit in charging and discharging a reactor.

3.2 lifetime (of a fuel assembly)**:** Period of time starting at the time of assembling of the fuel assembly in the fabricator's facility and ending when the assembly is destroyed as an entity.

4 Basic requirements for identification systems

4.1 Identification code

Each fuel assembly shall carry a unique code consisting of between 6 and 8 alphanumeric characters.

NOTE 1 The alphanumeric characters are the Arabic numerals 0 to 9 and the letters of the English alphabet from A to Z.

The letters B, F, I, O, Q and Z shall not be used.

The rightmost character of the identification code shall be used as a test character.

4.2 Allocation of the identification code

The identification code shall be assigned to the individual fuel assembly without repetition i.e. previously allocated identification codes shall not be re-used. Therefore, the identification code shall be allocated by agreement with the authority or institution responsible for an identification system.

4.3 Determining the test character

The test character is intended to prevent reading errors. It is determined by the preceding characters of the identification code using the rules in table 1.

The preceding characters of the identification code shall be padded to seven characters with leading zeros.

The value associated with the first character of this value is multiplied by 17, that associated with the second character by 13, that associated with the third character by 11, that associated with the fourth by 7, that associated with the fifth by 5, that associated with the sixth by 3 and that associated with the seventh by 2; these products are then added. The test character value is the difference between the next greater multiple of 30 and this sum. The test character is the character associated with this value in table 1. If the difference amounts to 30, the test character is zero.

4.4 Additional marking

At the discretion of the fabricator or operator, additional marking may be added to the fuel assembly. This marking should be in a separate area but where this is not considered possible or desirable, then the additional marking shall be separated from the unique identification code by a "*" or "/". Confusion shall not be possible. Any additional mark shall consist of less digits than the unique identification code.

5 Style of characters and application of identification mark

5.1 Style of characters

The characters used for the identification marking on fuel assemblies shall be Arabic numerals and capital letters in, or similar to, the vertical standard lettering for use in drawings conforming to ISO 3098-1.

5.2 Arrangement of identification code on fuel assembly

The characters of an identification code shall be arranged in horizontal order from left to right, in vertical order from top downwards, or clockwise (reading from the inside outwards) in the sequence specified.

Table 1 — Character values

Character	Value	Character	Value	Character	Value
0	0	A	10	N	20
1	1				
2	2	C	11	P	21
3	3	D	12		
4	4	E	13	R	22
5	5			S	23
6	6	G	14	T	24
7	7	H	15	U	25
8	8			V	26
9	9	J	16	W	27
		K	17	X	28
		L	18	Y	29
		M	19		

5.3 Location and application of identification code on fuel assembly

The identification code shall be applied to an essential component of the fuel assembly in such a manner that it can be very easily read. If elements of the identification code are identical for a group of fuel assemblies or if, for other reasons, they do not necessarily have to be identifiable on the fuel assembly (e.g. a code for the identification of the reactor), the code need not be so conspicuous.

5.4 Size of characters comprising identification code

The characters of the identification code, including the test character, shall all be of the same size.

5.5 Method of application of identification code to fuel assembly

The identification code shall be applied so that it does not affect the performance and integrity of the fuel assemblies and shall remain readable and indelible during its use in the reactor core.

6 Fuel assembly identification after modification of the fuel assembly

After modification (e.g. repair) of a fuel assembly, the identification code shall remain unmodified if the component to which it is applied will continue to be used. Such modifications shall be registered.

7 Other identification systems

If identification codes are used outside the field of application of an existing system, e.g. ANSI/ANS-57.8, the system to which the code belongs shall be indicated. This indication need not be made on the fuel assembly itself.

Annex A
(informative)

Bibliography

[1] IAEA Safety Guide 50-SG-QA 11, *Quality Assurance in the Procurement, Design and Manufacture of Nuclear Fuel Assemblies.*

[2] ANSI/ANS-57.8-1978[1] , *Nuclear Fuel Assembly Identification.*

[3] DIN 25 433:1988, *Kennzeichnung von Brennelementen für Leistungsreaktoren* [*Fuel assembly identification for nuclear power reactors*].

1) Currently under revision.