

This is a preview of "ISO/TR 10217:1989". Click [here](#) to purchase the full version from the ANSI store.

REPORT

TR 10217

First edition
1989-09-15

**Solar energy — Water heating systems — Guide
to material selection with regard to internal
corrosion**

*Énergie solaire — Système de production d'eau chaude — Guide pour le choix de
matériaux vis-à-vis de la corrosion interne*



Reference number
ISO/TR 10217 : 1989 (E)

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.

The main task of ISO technical committees is to prepare International Standards. In exceptional circumstances a technical committee may propose the publication of a technical report of one of the following types :

- type 1, when the necessary support within the technical committee cannot be obtained for the publication of an International Standard, despite repeated efforts;
- type 2, when the subject is still under technical development requiring wider exposure;
- type 3, when a technical committee has collected data of a different kind from that which is normally published as an International Standard ("state of the art", for example).

Technical reports are accepted for publication directly by ISO Council. Technical reports of types 1 and 2 are subject to review within three years of publication, to decide whether they can be transformed into International Standards. Technical reports of type 3 do not necessarily have to be reviewed until the data they provide are considered to be no longer valid or useful.

ISO/TR 10217, which is a technical report of type 3, was prepared by Technical Committee ISO/TC 180, *Solar energy*.

Annex A of this Technical Report is for information only.

© ISO 1989

All rights reserved. No part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from the publisher.

International Organization for Standardization

Case postale 56 • CH-1211 Genève 20 • Switzerland

Printed in Switzerland

Solar energy — Water heating systems — Guide to material selection with regard to internal corrosion

1 Scope

This Technical Report provides a discussion of the parameters that have a bearing on the internal corrosion of solar water heating systems.

The following topics are not dealt with in this Technical Report:

- problems of compatibility between polymeric materials (plastics and rubber) and fluids;
- corrosion risks concerning the enclosure and the external surface of the absorber;
- safety and health questions, especially the toxicity of heat-transfer fluids.

In many fields, the corrosion problem is hard to deal with, because it overlaps several matters. As far as solar systems are concerned, corrosion prevention cannot be treated only in respect of a component, or only as a durability problem, or only as a design problem. It cannot be solved only by specific tests, or only by design recommendations.

This Technical Report addresses the question of which requirements are necessary, to predict with confidence long failure-free lifetimes in active solar systems, from the point of view of internal corrosion. It gathers information provided in previous papers on this subject (especially bibliography references 2, 3 and 4) while staying in agreement with them.

2 Corrosion risk statement

If corrosion effects are considered as a reliability problem for the system, because corrosion can reduce the quality of the system, the following points may be detailed.

2.1 The **degradating agent** is internal corrosion. Its effects are different according to

- materials;
- couples of materials;
- temperature;
- fluid circulation;
- fluid oxygen content;
- fluid aggressive ions content.

2.2 The **materials** concerned are

- absorber materials;
- pipes and fitting materials;
- fluids;
- welding materials.

2.3 The **functional characteristics** of the system are

- pressure resistance;
- efficiency of thermal transfer between the sun and the storage;
- high and low temperature resistance.

2.4 The **failure modes** (i.e. the ways for the degradating agent to act on the materials to weaken their functional characteristics or those of the system) are

- bad design choice (materials and conditions of use of the system);
- degradation of materials during service life;
- bad maintenance.

3 Discussion

Internal corrosion damage in solar systems is generally detected too late: it is reported as a serious problem, which requires replacement of significant parts of the system^[3], but inspection studies^[12,13] give little information on this subject; a visual inspection, even completed by user-consultation, is not able to show the growing effects of internal corrosion before the first pitting occurs.

Among the types of damage reported, most are related to the use of aluminium absorbers without precautions^[5].

Several documents treat the corrosion problem as presented previously: it is a whole-system problem, and initial design and material-choice recommendations are emphasized as a way to prevent corrosion damage^[2,11]. Even in standards, the problem is sometimes left to expert advice^[10]. A table of acceptable or unacceptable conditions can summarize all the data given about installation parameters, metal/fluid pairs and metal association^[1,4].