



**WP4.D3
OFFICIAL PROPOSALS TO CEN TC312
AND WG'S**

Dissemination level: Public

August 2007

CONTENTS

*In total this Deliverable consists of
9 pages.*

This deliverable contains recommendations and proposals to CEN/TC312 from the NEGST project.

Recommendations and proposals to CEN/TC312 from the NEGST project

J.E. Nielsen, updated 16/9

0. Introduction

At the TC312 meeting in April 2006 it was agreed to update the standard EN12975 according to needs identified by experts participating in the EC FP6 project "NEGST" - see resolution 10 below:

RESOLUTION 10, CEN/TC 312 – GRAN CANARIA, SPAIN, 2006-04-03 & 04

CEN/TC 312 resolves to proceed on the creation of a new WI consisting of the revision of EN12975-1 and –2 once the financing is available for the implementation of M/369. In this revision the following topics will be considered:

- a) clarification of the application of the present standards to tracking and/or concentrating collectors,
- b) unglazed collectors: refined performance test conditions and prediction, improved sky temperature measurement,
- c) collector components - requirements and test methods,
- d) quality tests for evacuated tubes,
- e) improved exposure - accelerated ageing test of collectors,
- f) annual collector energy output.

The NEGST project has now completed and results in the form of recommendations and information related to the resolution above are - together with other relevant results achieved in the project - passed over to the TC312 in this document. The aim is to assist CEN TC312 in its efforts to improve and update standards in the solar thermal field.

1. Collector standards -> TC312/WG1

1.1 Collector components

1.1.1 Absorber surface durability

Consider use of the IEA-SHC document:

- *"Recommended qualification test procedure for solar absorber surface durability". IEA Solar Heating and Cooling Program, Task 27 Performance of Solar Façade Components Project: Service life prediction tools for Solar Collectors, Editor Bo Carlsson*

It is recommended to:

- either: Summarize the document: "Recommended qualification test procedure for solar absorber surface durability" in the next version of EN12975
- or: Further to develop it into standard of its own (then to be referred to in EN12975)

Document available from the NEGST WP4 deliverables list at:

- <http://www.solarkey.dk/negst-wp4-web/wp4-deliverables.html> -> Deliverable: WP4-D2.1.d1

Direct link to document:

- <http://www.solarkey.dk/negst-wp4-web/deliverables/WP4-D2.1.d1-RevProposal%20for%20IEA%20recommended%20procedure%20for%20qualificatio-SP.pdf>

1.1.2 Polymeric materials in solar collectors

Consider use of the Swedish method and requirement specification:

- *“Polymeric materials in solar collectors - Test methods and technical requirements”, Department of Chemistry and Materials Technology Borås 2004, Leo Spilg*

as a basis for potential future standardisation work in this field.

Document available from the NEGST WP4 deliverables list at:

- <http://www.solarkey.dk/negst-wp4-web/wp4-deliverables.html> -> Deliverable: WP4-D2.1.d2

Direct link to document:

- <http://www.solarkey.dk/negst-wp4-web/deliverables/WP4-D2.1.d2-SP-met%202884%20Polymer%20materials-SP.doc>

1.1.3 Quality testing of reflector materials and anti reflective coatings

Notice is given to TC312 that pre-normative work concerning reflectors and anti reflective coatings of cover materials is going on in IEA SH&C Task 27, which could at a later stage be used/adopted by TC312.

Link to IEA SH&C Task 27:

- <http://www.iea-shc.org/task27/index.html> (at the moment still “under construction”)

1.2 Collectors

1.2.1 Performance and quality testing of evacuated tubular collectors (ETCs)

Recommendations for improvements of the present EN12975 standard with respect to ETCs are been proposed in the following fields:

- Definitions
- Thermal performance testing - efficiency
- Thermal performance testing - thermal capacity
- Thermal performance testing - specification of physical parameters
- Quality testing - general
- Quality testing - high temperature resistance and exposure test
- Quality testing - mechanical loads
- Durability of reflector materials
- Quality testing - impact resistance
- Documentation

New test methods have been proposed in the following fields:

- Freeze testing of heat pipes
- Durability of glass to metal seals

For the detailed proposals please see the document:

- *“Recommendations on testing of evacuated tubular collectors (ETCs), Peter Kovacs, SP, 2006”*

Document is available from the NEGST WP4 deliverables list at:

- <http://www.solarkey.dk/negst-wp4-web/wp4-deliverables.html> -> Deliverable: WP4-D2.1.b

Direct link to document:

- <http://www.solarkey.dk/negst-wp4-web/deliverables/WP4-D2.1.b-ETC-testing-SP.doc>

1.2.2 Exposure testing of solar collectors

It is recommended to improve the exposure testing of solar collectors. Two tracks to follow have been treated in the NEGST project:

- One year outdoor procedure: CSTB method
- Short term indoor procedure: Australian method

Most participants in the NEGST project have the opinion that one year is too long a test period and recommend investigating further the possibilities for using a test procedure similar to the Australian short term procedure.

The following resource documents: are available from the NEGST WP4 deliverables list at:

- *Accelerated ageing test of solar collector, R. Morlot, B. Khebchace, CSTB, 2006*
- "AS-NZ S2712, STAGNATION TEST FOR COLLECTORS AND INTEGRAL COLLECTOR AND CONTAINER"

are available from the NEGST WP4 deliverables list at:

- <http://www.solarkey.dk/negst-wp4-web/wp4-deliverables.html> -> Deliverables:
 - WP4-D2.1.b
 - WP4-D2.1.j Final report (Annex 4):

Direct links:

- <http://www.solarkey.dk/negst-wp4-web/deliverables/WP4-D2.1.j-final%20report.pdf> (Annex 4)
- http://www.solarkey.dk/negst-wp4-web/deliverables/WP4-D2.1.c1-AS_NZS2712-SP.pdf

1.2.3 Test of flat plate collectors (with respect to flow rate and flow distribution)

Notice is given to TC312 that existing test procedures for performance testing of collectors - for certain types of collectors - do not give correct performance characterisation with „non-typical“ flow rates. See resource document:

- *INVESTIGATION ON TEST METHOD FOR A FLAT PLATE COLLECTOR, S. Furbo, DTU, January 2007*

Document is available from the NEGST WP4 deliverables list at:

- <http://www.solarkey.dk/negst-wp4-web/wp4-deliverables.html> -> Deliverable: WP4-D2.1.h

Direct link to document:

- <http://www.solarkey.dk/negst-wp4-web/deliverables/WP4-D2.1.h-Report%20collectors-DTU.doc>

1.2.4 Un-covered collectors

Concerning testprocedures for un-covered collectors, the following specific recommendations for revisions of EN12975 are given to TC312:

- Section 6.1.5.2.: Change the allowed thermal irradiance on a glazed collector from 105% irradiance of a black body at ambient temperature to 100%.
- Section 6.2.1.7.: Change the allowed relative long wave irradiation on an unglazed collector from $\pm 50 \text{ W.m}^{-2}$ to no higher than $+0 \text{ W.m}^{-2}$ and no less than -100 W.m^{-2}
- Section 6.2.4.8.1.: Drop the factor $(1+\cos \beta)/2$ from equation (25).
- Section 6.2.2.2.1.: Recommend contact sensors to measure the temperature of the artificial sky.
- Section 6.2.4.8.1.: If the value of ϵ/α is not known, change the suggested value from 0.95 to 0.85.
- Further investigations concerning the usefulness of measuring the long wave irradiation with a pyrometer during indoor tests are recommended.

Details see:

- *Improved Sky Temperature Measurement and Refined Testing Methods for Unglazed Collectors, D. Gottwald, arsenal research, 2006*

available from the NEGST WP4 deliverables list at:

- <http://www.solarkey.dk/negst-wp4-web/wp4-deliverables.html> -> Deliverables:
 - WP4-D2.1.j Final report (Annex 7)

Direct links:

- <http://www.solarkey.dk/negst-wp4-web/deliverables/WP4-D2.1.j-final%20report.pdf> (Annex 7)

1.2.5 Performance testing of air collectors (arsenal)

A first draft of a standard for testing glazed air collectors has been developed and is proposed to TC312.

See:

- *Thermal solar systems and components - Solar air collectors - Test methods (Draft standard for testing of solar air collectors based on EN12975 and ASHRAE 93-2003, arsenal research, 2007*

available from the NEGST WP4 deliverables list at:

- <http://www.solarkey.dk/negst-wp4-web/wp4-deliverables.html> -> Deliverables:
 - WP4-D2.1.j Final report (Annex 8)

1.2.6 Determination of incidence angle modifiers and application of present standards to tracking and concentrating collectors

Notice is given to TC312 that:

Testing of tracking and concentrating tracking collectors can be accurately carried out using existing procedure taking into consideration the guidelines given in the resource document:

- *Incidence angle modifiers and application of EN12975 to tracking and concentrating collectors, S. Fischer, 2006*

available from the NEGST WP4 deliverables list at:

- <http://www.solarkey.dk/negst-wp4-web/wp4-deliverables.html> -> Deliverables:
 - WP4-D2.1.g Tracking concentrating collectors
 - WP4-D2.1.j Final report (Annex 10)

2. Storage/controller/system standards -> WG3

2.1 Further development of test methods based on parameter identification

Input already included in the WG3 work on prCEN/TS12977.

2.2 Basic principles and concepts to be applied in the development on store test methods

TC312 is given notice that a resource document has been produced discussing fundamental principles of store and system testing. The purpose is to make futures standards as general as possible, i.e. open to new types of stores and systems. Pros et contras for different principles are set up and a number of both general and rather specific recommendations are given. These recommendations are very useful for testing experts when they design future test procedures. A concept leaving the choice of model open but requiring validation due to some standardized rules could be considered when making future standards.

Details see:

- *Towards new standards for advanced stores - final report, S. Furbo, DTU, April 2007*

available from the NEGST WP4 deliverables list at:

- <http://www.solarkey.dk/negst-wp4-web/wp4-deliverables.html> -> Deliverables:
 - WP4-D2.2.a Final report (Chapter 4.2 Research activities - Activities at SPF)

Direct link:

- <http://www.solarkey.dk/negst-wp4-web/deliverables/WP4-D2.2.a-Final-report.doc> (Chapter 4.2 Research activities - Activities at SPF)

2.3. Development of simulation models and test methods for stores with external heat exchanger

TC312 is given notice that specific proposals for determination of the heat loss coefficient of the “side-arm” heat exchanger have been prepared. Also a proposal for determination of hot water capacity as a function of temperature in the upper part of the store and the draw-off flow rate is presented.

Details see:

- *Towards new standards for advanced stores - final report, S. Furbo, DTU, April 2007*

available from the NEGST WP4 deliverables list at:

- <http://www.solarkey.dk/negst-wp4-web/wp4-deliverables.html> -> Deliverables:
 - WP4-D2.2.a Final report (Chapter 4.3 Research activities - Activities at DTU)

Direct link:

- <http://www.solarkey.dk/negst-wp4-web/deliverables/WP4-D2.2.a-Final-report.doc> (Chapter 4.3 Research activities - Activities at DTU)

2.4. Controllers

Input concerning advanced controllers already included in the WG3 work on prCEN/TS12977-5.

2.5. Combisystems

TC312 is given notice that an alternative method (to EN 15316-4-3) for simple calculation of combi systems has been drafted by ITW

Details see:

- *New Method For Calculating The Performance Of Combisystems, M. Peters, ITW, July 2007*

available from the NEGST WP4 deliverables list at:

- <http://www.solarkey.dk/negst-wp4-web/wp4-deliverables.html> -> Deliverables:
 - WP4-D2.4.b Calculating performance of combi-systems - ITW

Direct link:

- <http://www.solarkey.dk/negst-wp4-web/deliverables/WP4-D2.4.b-combi-calculation-ITW>

Other work performed in 2.5 is already included in the WG3 work on prCEN/TS12977-4.

2.6. Cooling

TC312 is given notice that the following resource document has been produced to assist future standardisation work in the field of solar cooling / air-conditioning

- *Contribution to a future development of CTSS method applicable to solar assisted air conditioning systems (or solar cooling systems), M.J. Carvalho, INETI, 2007*

The document includes:

- Survey of software for solar assisted cooling and testing standards for relevant HVAC:
 - An extensive survey of existing software relevant for use in system test procedures of the type “component testing and system simulation” (CTSS) for solar assisted cooling has been made. 10 software programmes/packages were analysed, and it was found that only 3 programs were relevant candidates for the purpose: TRNS, ColSim and INSEL.
- Survey of testing standards for relevant HVAC:
 - An extensive survey of existing test procedures relevant for test of cooling components in solar assisted cooling systems was done. Out of a long list of investigated standards and procedures the most relevant found were:
 - ANSI/ARI Standard 560-200. “Absorption water chilling and water heating packages”
 - ASHRAE Standard 139. “Method of testing for rating desiccant dehumidifiers utilizing heat for the regeneration process”, 1998R
 - Air-conditioning and Refrigeration Institute, Rating Standard 940. “Desiccant dehumidification components

The document is available from the NEGST WP4 deliverables list at:

- <http://www.solarkey.dk/negst-wp4-web/wp4-deliverables.html> -> Deliverables:
 - WP4-D2.5.a Survey of software and test methods

Direct link:

- http://www.solarkey.dk/negst-wp4-web/deliverables/WP4-D2.5.a-final_Survey_Software_Standards%20070528.doc

3. Others

3.1 Solar desalination

TC312 is given notice that pre-normative work is done in the field of desalination. The work is described in the two resource documents below. These documents should be taken into account if/when standardisation in the field of solar desalination starts.

The first document analyses the corrosion aspects of solar thermal desalination plants and give very specific recommendations for use of materials:

- *Guidelines for the selection of materials for solar thermal desalination plants, G.Panares, CRES, 2007.*

It's available from the NEGST WP4 deliverables list at:

- <http://www.solarkey.dk/negst-wp4-web/wp4-deliverables.html> -> Deliverables:
 - WP4-D2.7.a

Direct link:

- http://www.solarkey.dk/negst-wp4-web/deliverables/WP4-D2.7.a-Guidelines_material_desal_WP4_7-Cres.pdf

The second document:

- “Guidelines for performance testing of solar systems with desalination units”, G.Fiorenza et al, ENEA, 2007

deals with performance testing of solar thermal desalination plants. It:

- defines a general scheme of the solar desalination system for performance monitoring and testing;
- introduces a set of suitable indicators able to completely characterize the system performance;
- identifies the most relevant parameters to be monitored
- proposes simplified correlations for the prediction of the output of the system in different operational conditions.

It's available from the NEGST WP4 deliverables list at:

- <http://www.solarkey.dk/negst-wp4-web/wp4-deliverables.html> -> Deliverables:
 - WP4-D2.7.b

Direct link:

- http://www.solarkey.dk/negst-wp4-web/deliverables/WP4-D2.7.b-Desal_FinalReport-ENEA.pdf

3.2 Fluids

TC312 is recommended to consider initiating standardisation on “solar fluids”. A very solid basis for such work is presented in the four resource documents:

- *Report on corrosion and lifetime tests for solar fluids, M.Haller, P.Vogelsanger, SPF, 2005*
- *Report on properties and standard tests of solar fluids, M.Haller, P.Vogelsanger, SPF, 2005*
- *Recommendations for the elaboration of missing testing procedures for solar fluids, M.Haller, P.Vogelsanger, SPF, 2005*
- *Recommendations for the use of standards for solar fluid parameters, M.Haller, P.Vogelsanger, SPF, 2005*

available from the NEGST WP4 deliverables list at:

- <http://www.solarkey.dk/negst-wp4-web/wp4-deliverables.html> -> Deliverables:
 - WP4-D2.8.a Corrosion and lifetime
 - WP4-D2.8.b Properties and standard tests
 - WP4-D2.8.c Recommendations new test procedures
 - WP4-D2.8.d Recommendations for use of standards

Direct links:

- http://www.solarkey.dk/negst-wp4-web/deliverables/WP4-D2.8.a_report-corrosion-and-lifetime.pdf
- http://www.solarkey.dk/negst-wp4-web/deliverables/WP4-D2.8.b_report-fluid-properties.pdf
- http://www.solarkey.dk/negst-wp4-web/deliverables/WP4-D2.8.c_recommendation-development%20of%20standards.pdf
- http://www.solarkey.dk/negst-wp4-web/deliverables/WP4-D2.8.d_recommendation-use-of-standards.pdf

3.3 LCA (Life Cycle Assessment)

It recommended that TC312 initiate work towards a CEN/TS or CEN/TR giving guidelines for life cycle assessment of solar thermal systems. The guidelines should include rules for how to make a Standard Environmental Fact Sheet for solar thermal systems, making it possible to compare different environmental investigations of solar thermal systems and assess between different solar thermal products and different heating systems. The aim with the Environmental fact sheet is both to objectively declare a thorough presentation of an inventory of resource use (energy and material), emissions, waste, recycling etc for

the solar thermal product's complete life cycle and at the same time give an immediate objective and easy understandable overview of the most important assessments of the solar thermal system's environmental impact.

Therefore the Environmental fact has the following content:

- Rules for performing a life cycle inventory
- Declarations of the solar thermal product
- Energy payback time
- Avoided global warming impact

The Environmental fact sheet should be a certified declaration and may be the basis for future labelling of Solar Thermal Systems.

Details see:

- *Procedures for Environmental Performance Assessment of Solar Thermal Systems, AA. Wahlström, SP, 2007*

available from the NEGST WP4 deliverables list at:

- <http://www.solarkey.dk/negst-wp4-web/wp4-deliverables.html> -> Deliverables:
 - WP4-D2.9.b Final report

Direct link:

- <http://www.solarkey.dk/negst-wp4-web/deliverables/WP4-D2.9.b-final%20report.pdf>