

Deliverable WP3.D1 and WP3.D2
WP3 - Inventory of guidelines
Overview of existing requirements in EU
countries and directives
Dissemination level: Public

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Reports on the gathering of existing requirements and guidelines

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1 SUMMARY

This report gives an overview of existing guidelines, requirements and standards in the participating countries dealing with the building integration of solar thermal collectors. The focus is on the building related aspects that become an issue when solar thermal components become part of the building structure itself. This is the case with façade-integrated but also roof-integrated or roof-replacing collectors.

A list of available standards and regulations dealing with this issue is given in this report, subdivided into the following sub-topics

- Strength of construction (regarding wind/snow loads)
- Avoiding fire risk
- Avoiding noise problems
- Avoiding construction damage
- Avoiding air leakage / thermal leakage (thermal bridges)
- Rain and moisture penetration
- Avoiding environmentally problematical materials

The following countries are covered in this report:

- Austria
- France
- Germany
- The Netherlands
- Norway
- Portugal
- Sweden

The deliverables WP3.D1 - "Reports on the gathering of existing requirements and guidelines" and WP3.D2 - "Overview of existing requirements in EU countries and directives" are included in this report.

2 Introduction

An overview of available national guidelines on integrating solar thermal technology in building envelopes in the participating countries, subdivided in legislation, test methods, calculation methods, requirements and “other guidelines”, were compiled during a time span of 6 months from October 2004 to March 2005. The main focus of the inventory are standards and guidelines that have to be met from the building point of view when solar collectors are integrated into a roof or a façade.

The requirements vary significantly within the EU member countries. This inventory gives an overview of the regulations in force in the countries that participated in WP3 of the NEGST project as well as existing European standards.

The purpose of the overview is to serve as a reference for existing guidelines in the participating countries and for the identification of gaps in the current regulations. The final goal is to make recommendations for common European standards. These standards should help manufacturers and installers of building integrated solar collectors by setting clear standards for solar collectors that are used as an integral part of the building structure.

The studied aspects are the integration of solar collectors with respect to the following topics:

- Strength of construction (wind/snow)
- Avoiding fire risk
- Avoiding noise problems
- Avoiding construction damage
- Avoiding air leakage / thermal leakage (thermal bridges)
- Rain and moisture penetration
- Avoiding environmentally problematical materials

Chapter 3 of this document explains the methods that were used by the different project partners to gather the information included in the inventory. In chapter 4, the structure of the inventory is explained in more detail. Finally, the inventory itself is included in the second part of this document.

3 Deliverable WP3.D1: 'Reports on the gathering of existing requirements and guidelines'

Each participating institution was responsible for identifying the relevant standards in their country. The following sections describe what methods were used by each institution to gather the necessary information.

Austria – AEE INTEC

The regulations, guidelines and national standards for Austria had been gathered by AEE INTEC and Austrian building physics experts in an earlier project, dealing with solar thermal collector integration in buildings in general and in façades in particular. Additional regulations etc. were searched for at the Austrian construction database for products and manufacturers (<http://www.bau-info.at/>).

Austria – arsenal research

Arsenal research carried out their gathering of information via a query from the database of the Austrian Standardization Institute and through internal knowledge.

France – CSTB

Being involved in the standardisation process in France, CSTB had the information internally at hand.

Germany – ITW

Gathering information about existing standards was mainly carried out by internet search. In Germany, there is a central publisher where all standards and guidelines can be obtained. The search function at the publisher's website www.beuth.de gives a good overview of existing standards and regulations on the searched topic. In addition, the revision date of each document, as well as the language in which it can be obtained, is indicated. On basis of these results, ITW had a brief look at the standards in the library in order to check the individual contents.

The Netherlands – TNO

The Dutch contribution to the inventory of guidelines comes mainly from the Dutch pre-standard NVN 7250 "Solar energy systems – Integration in roofs and façades – constructional aspects". Other standards and guidelines mentioned in the Dutch contribution has been referred to in the 'Normative and Informative References'-chapter in this standard NVN 7250.

TNO had an important role in setting up this pre-standard. Together with the BDA Group (a company of consultants in the field of façades and roofs) TNO has set up the text for this standard based upon earlier work of both organisations.

In 2004 an English version of the NVN has been published and at the moment there is a focus to have this aspect on the CEN agenda. A connection with the following CEN/TC is desired.

- CEN/TC 128 "Roof covering products for discontinuous laying and products for wall cladding"
- CEN/TC 128/SC "Prefabricated accessories for roofing"

Norway – Oslo University

The Norwegian information on standards and requirements were gathered by contacting the authorities mentioned in the report. Further, information was taken from earlier reports compiled by the University of Oslo.

Portugal – INETI

In the case of Portugal, the survey for the “Inventory of existing regulations, guidelines and national standards concerning integration of solar thermal in building envelopes for both roof integrated and façade integrated solar thermal collectors” was first based on contacts with the colleagues of the Department of Renewable Energies that work on thermal performance aspects of buildings. From their information, it was possible to conclude that “Strength of construction (wind/snow)”, “Avoid construction damage”, “Rain and moisture penetration, water tightness and maintenance of the roof” and “Avoid environmentally problematical materials” are covered, but not in a detailed form, by the legislation “General Regulation on Urban Buildings” (Regulamento Geral de Edificações Urbanas). This law is dated of 1951. Several amendments have been issued and its revision was decided. A new regulation is already prepared but not yet approved. The present law (dated of 1951) indicates that all constructions must be made with the best practice rules. (chapter I, Article 15th, 16th and 17th). No detailed guidelines are given concerning integration of solar thermal in building envelopes.

The legal document dated of 1951 has no specific references to solar thermal collectors and solar thermal systems.

A survey on the Internet was also performed. From this survey, it was also possible to identify other regulations, namely in what refers to “Strength of construction”, “Avoid Fire risk” and “Avoid noise problems”, but no specific guidelines are given concerning integration of solar thermal in building envelopes.

Sweden - SP

The inventory of Swedish requirements, regulations and guidelines was performed in cooperation between **SP**, Swedish National Testing and Research Institute and **Boverket**, the National Board of Housing, Building and Planning.

All the information is gathered in one single publication (with numerous references to the relevant standards etc). It is available on the internet and is continuously updated. One single authority (Boverket) has the overall responsibility for its maintenance and harmonisation to European regulations and standards. A number of technical experts at SP has also verified that the results of the inventory do not deviate significantly from practical experiences in the field of building construction.

4 Structure of the Inventory

The inventory is divided into 7 subsections dealing with the focal areas already mentioned in the introduction. In addition, a section containing standards dealing with solar thermal collectors in general rather than building integration is added. Each subsection starts with the European standards available for this topic and continues with the national standards and guidelines in each participating country.

For each standard, the number, name and a short description is stated. The standard is assigned a category such as legislation, test methods, calculation methods, requirements and other guidelines to further describe the type of document. Finally, the author or publisher and the date of publication is mentioned. In the last column, a reference number is given referring to further information about this document in the annex.

In the annex, a list of the institutions is given where the national and European standards can be obtained from in each participating country. In most cases, this is the national standardization institute or national standardisation body respectively. For regulations or guidelines that are not published by the national standardization institute, the source where these documents can be obtained from, is given in the 'notes'-section in the annex.

5 Deliverable WP3.D2: Overview of existing requirements in EU countries and directives

The delivered inputs from the task partners are compiled and listed in the following.

Countries included in this inventory:

- Austria
- France
- Germany
- The Netherlands
- Norway
- Portugal
- Sweden

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Strength of construction (wind/snow)

Number of Standard	Name	Short description	Legislation	Test methods	Calculation methods	Requirements	Other guideline	Author(s) / published by	Date of publication	Annex number
EUROPEAN										
EN 1991-1-3 DIN EN 1991-1-3 (D) +Sweden NS-EN 1991-1-3 (N)	Eurocode 1 - Actions on structures - Part 1-3: General actions - Snow loads	This standard includes load assumptions for snow loads in different regions.			x			CEN (European Committee for Standardisation)	2004-09	Note 1
EN 1991-1-4 DIN EN 1991-1-4 (D) +Sweden	Eurocode 1 - Actions on structures – Part 1-4: General actions, wind loads	This standard includes load assumptions for wind loads in different regions.			x			CEN	2004-09	
EN 12179 OENORM 12179 (A) NS-EN 12179 (N)	Curtain walls – resistance to wind load – test procedure			x				CEN	2000-10-01	Note 2
EN 13116 OENORM EN 13116 (A) NS-EN 13116 (N)	Curtain walls - Resistance to wind load - Performance requirements	The load-carrying capacity for fixed and movable parts in curtain walls during positive and negative static air pressure are defined in this standard.				x		CEN	2001-11-01	

EN 14019 OENORM EN 14019 (A) NS-EN 14019	Curtain Walling - Impact resistance - Performance requirements					x		CEN	2004-09 -01	
Austria										
OENORM B 4013	Design loads in building; snow and ice loads	This standard defines the calculation methods for steady loads from ice and snow on building components.				x		ON, Österreichisches Normungsinstitut (Austrian Standardisation Institute)	1983-12-01	Note 3
France										
Document général d’Avis Techniques – Groupe Spécialisé n°14	Effort analysis due to the climatic loads on a solar collector and its transparent cover	Evaluation of the maximum value of the efforts due to the wind on a solar collector					X	CSTB	1979-03	Note 4
Règles NV 65 (DTU P06-002)	Rules of calculation defining the effects of snow and wind on constructions and annexes	Aim is to fix the values of the climatic loads (snow and wind) and to give the methods evaluation of the corresponding efforts on the whole construction or its various parts.				X		CSTB	2000-04	Note 5
Règles N84 modifiées 95 (DTU P06-006)	Snow effects on constructions	Defines snow loads				X		CSTB	1996-09, 2000-04	Note 6
Germany										
Guideline	Design guide for support structures of solar collectors	Examples of appropriate fixing details and support structures					x	Beuth Verlag	2001	Note 7
DIN 1055-4	Design loads for buildings; imposed	calculation factors and equations for				x		DIN, Deutsches Institut	1986-08	Note 8

	loads; wind loads on structures unsusceptible to vibration	determination of resulting wind loads and wind pressure						für Normung (German Standardisation Institute)		
DIN 1055-5	Design Loads for Buildings; Live Loads; Snow Load and Ice Load	Load assumptions for different zones in Germany			x			DIN	1975-06	Note 9
Netherlands										
NVN 7250:2003	Solar energy systems – Integration in roofs and façades – constructional aspects'	This Dutch pre-standard on building integration of solar energy systems has been established based on existing guidelines.			x	x		NEN (Dutch Standardisation Institute)	2003	Note 10
Dutch Building Code		The Dutch building code prescribe all the requirements to any new building.	x			x				
NEN 6700:1991 incl. /A1:1997	Technical principles for building structures –	General principles for determination of the wind loads			x	x		NEN	1991, 1997	
NEN 6702:2001	Technical basis for construction of buildings – Loads, actions and transformations	Calculation of wind loads			x			NEN	2001	Note 11
NEN 6707:2001 incl. /C1:2002	Fixing of roofing material(s) – Requirements and determination methods				x	x		NEN	2001, 2002	
NEN 6708:1997 incl. /C1:1997	Fixing of roofing material(s) – Guidelines						x	NEN	1997	
NEN 6710:1991	Technical basis for	For determining the			x	x		NEN	1991, 2001	

incl. /A2:2001	building structures – <u>aluminium structures</u> – Basic requirements and simple calculation rules for mainly static loaded structures	specific values for the maximum loads and actions, a special safety class is applicable (for solar elements this safety class is either 2 or 3).								
NEN 6760:2001 incl. /C1:2002	Technical basis for building structures – <u>wood structures</u> – Basic requirements and test methods	For determining the specific values for the maximum loads and actions, a special safety class is applicable (for solar elements this safety class is either 2 or 3).			x	x		NEN	2001, 2002	
NEN 6770:1997 incl./A1:2001	Technical basis for building structures – <u>steel structures</u> – Basic requirements and simple calculation rules for mainly static loaded structures	For determining the specific values for the maximum loads and actions, a special safety class is applicable (for solar elements this safety class is either 2 or 3).			x	x		NEN	1997, 2001	
Norway										
TR - XII, § 7-32	Safety against actions of nature (slides, flooding, waves and wind)	The technical regulation includes requirements to construction works with regard to wind, etc.				x		National Office of Building Technology and Administration, Norway	1997-01-22	Note 12
TR - XII, § 7-33	Structural safety	The technical regulation includes requirements to construction works with regard to any load.				x		National Office of Building Technology and Administration, Norway	1997-01-22	Note 13
NS 3491-3	Design of structures - Design actions - Part 3: Snow loads (Corrigendum AC:2002 incorporated)	Rules for calculating snow load and requirements for snow loads for constructions			x	x		Standard Norway	2001	Note 14

NS 3491-4	Design of structures - Design actions - Part 4: Wind loads	Rules for calculating wind load and requirements for wind loads for constructions				x	x		Standard Norway	2002	Note 15
TR XII, § 7-32 abbreviates: Technical Regulations (under the Planning & Building Act of 14 June 1985 No. 77), Chap. XII, § 7-32. NS # abbreviates Norsk Standard no #.....											
Sweden											
BKR (BFS 1993:58 with amendments)	BKR "Byggkonstruktionsregler" Swedish Design Regulation (Boverkets Författningssamling)	Snow and wind loads specified in chapter 3:5 and 3:6 with further reference to: "Boverkets handbok om snö och vindlast" BSV from "Boverket".				x			Boverket (The National Board of Housing, Building and Planning)	1993 with latest amendments 2004	
EN-Eurocodes with nationally determined parameters are also accepted in Sweden when available. Some ENV-Eurocodes also accepted, however not ENV1992-1-4 on wind.											

Avoid fire risk

Number of Standard	Name	Short description	Legislation	Test methods	Material Classification	Requirements	Other guideline	Author(s) / published by	Date of publication	Annex number
EUROPEAN										
EN 1364-4	Fire resistance test for non load-bearing construction elements – part 4: curtain walls, partial design			x				CEN	2000-06-01	
EN 1991-1-2 DIN EN 1991-1-2 (D) NS-EN 1991-1-2 (N)	Eurocode 1 - Actions on structures - Part 1-2: General actions; Actions on structures exposed to fire	Design code for the description of the true fire behaviour and its impact upon structures.	x		x	x		CEN	2003-09	Note 17 Note 18
EN 13501-1 DIN EN 13501-1 (D) NS-EN 13501-1 (N)	Fire classification of construction products and building elements - Part 1: Classification using test data from fire reaction to fire tests	Classification of material classes. In addition to the fire behaviour, also the side effects like smoke or burning droplets are considered.			x			CEN	2002-06	Note 19
Austria										
Austrian Building Code		The different provinces of Austria have individual legislations on the fire protection of buildings	x			x				Note 20

OENORM B 3800 - 1	Behaviour of building materials and components in fire; building materials: requirements and tests	Classification according to combustibility, smoke formation when burning and drop formation when burning		x	x	x		ON Österreichisches Normungsinstitut	1988-12-01	Note 21
OENORM B 3800 - 2	Behaviour of building materials and components in fire - Components: definitions, requirements, tests	The construction elements are divided into fire resistance Classes		x	x	x		ON Österreichisches Normungsinstitut	1997-03-01	Note 22
OENORM B 3800 - 3	Behaviour of building materials and components in fire - Special components: Definitions, requirements, tests	Special construction elements definition of terms, requirements, tests. It lays down the requirements for special constructional elements		x		x		ON Österreichisches Normungsinstitut	1995-12-01	Note 23
OENORM B 3800 - 4	Behaviour of building materials and components in fire - Components: Classification of fire resistance	Classification into fire resistance classes. The construction elements are assigned to individual fire resistance classes. In this standard those constructional elements are listed which can be assigned to a fire resistance class without any testing.			x	x		ON Österreichisches Normungsinstitut		Note 24

TRVB - Technical guidelines preventive fire protection, <u>109</u>	Technical Guidelines for Preventive Fire Protection - Combustible Construction Materials in the Building Sector	Defines the technical fire protection requirements made of construction materials in the building sector.				x	x	“Austrian Federal Fire Fighters Association“ and the “Austrian Fire Prevention Authorities“	1998	Note 25
TRVB - Technical guidelines preventive fire protection, <u>130</u>	Technical Guidelines for Preventive Fire Protection - Schools, part 1 Structural Measures	Defines preventive fire protection for schools with the exception of those designed for mentally or physically handicapped students.				x	x	“Austrian Federal Fire Fighters Association“ and the “Austrian Fire Prevention Authorities“	1977	See above
TRVB 143	Hostels, structural measures	The purpose of this guideline is to determine unified requirements with regard to preventive fire protection with regard to the construction of hostels.				x	x	“Austrian Federal Fire Fighters Association“ and the “Austrian Fire Prevention Authorities“	1995	Note 26
France										
Arrêté du 30 juin 1983	Decree of the 30th of June 1983 relating to installations and building materials classification according to their fire performance – definitions of the testing methods	The aim of this decree is to define the testing methods and the classification according to the fire performance of installation and building materials.	x	x	x			J.O.	1983-08 1996-11	Note 27

Arrêté du 31 janvier 1986	Decree of the 31st of January 1986 relating to the fire-protection of the residential buildings (apartment only)	constructive technical specification to facilitate the fire-resistance of the residential buildings, and the smoke-clearing of horizontal and vertical circulations (staircase, elevator)	x		x	x		J.O.	1986 1989	
Germany										
DIN 4102-2	Fire Behaviour of Building Materials and Building Components; Building Components; Definitions, Requirements and Tests	Includes terms and definitions of structural fire protection, requirements and examinations for construction materials and components		x		x		DIN	1977-09	Note 28
Netherlands										
NVN 7250:2003	Solar energy systems – Integration in roofs and façades – constructional aspects'	Regarding fire safety				x		NEN	2003	Note 10
NEN 6063:1991 incl. /A1:1997	Determination of the fire behaviour of roofs on external exposure to flying brands	Solar elements as a part of the roof shall not lead to an inflammable roof.		x		x		NEN	1991, 1997	Note 29

NEN 6065:1991 incl. /A1:1997	Determination of the contribution to fire propagation of building products	Solar elements that do not have a roof function and can be considered as a separate construction need to comply to the requirements of the Dutch Building Code, to be checked according to NEN 6065.		x		x		NEN	1991, 1997	
NEN 6068:2001	Determination of the resistance to fire movement between spaces	According to the Dutch Building Code requirements exist with respect to the resistance against the fire penetration / jump over between particular spaces and buildings.		x		x		NEN	2001	Note 30
NEN 6069:1991 incl. /A2:2001	Determination of the fire resistance of elements of building constructions	the fire resistance concerning the dividing function of parts of the external partition, both from inside to outside AND from outside to inside		x			x	NEN	1991, 2001	
Norway										
TR - VII, §7-24	Ignition, development and spread of fire and smoke	General requirements to construction works to limit ignition, development and spread of fire and smoke.					x	National Office of Building Technology and Administration, Norway	1997-01-22	Note 31

NS 3919	Classification of fire resistance and reaction to fire - Materials, building elements, coverings and surfaces	The standard determines the classes of fire resistance of materials, building elements, coverings and surfaces.				x		Standard Norway	1997	Note 32
Portugal										
Legislation (DLn°64/90)	Safety regulation against fire in buildings	Legal rules to verify that the risk of fire is avoided or minimized. No specific references to Solar Thermal Collectors and Solar Thermal Systems.	x						1990-02-21	
Sweden										
BFS 1993:57 with amendments	Swedish Building Regulation BBR chapter 5 includes several references to national and international standards.	Heating installations shall be installed so that they cannot ignite adjacent construction parts. States surface temperature of adjacent construction parts of combustible material must not exceed 85 °C	x			x		Boverket (The National Board of Housing, Building and Planning)	2002	Note 33

Avoid noise problems

Number of Standard	Name	Short description	Legislation	Test method	Calculation methods	Requirements	Other guideline	Author(s) / published by	Date of publication	Annex number
EUROPEAN										
EN 12354-3 OENORM EN 12354-3 (A) NEN-EN 12354-3:2000 (NL) NS-EN 12354-3 (N)	Building acoustics – calculation of acoustic properties of buildings from the properties of the building parts	part 3: airborne sound insulation of external construction parts against outside noise.			x			CEN	2000-11-01	Note 34
EN ISO 140-5 DIN EN ISO 140-5 (D) NS-EN ISO 140-5 (N)	Acoustics - Measurement of sound insulation in buildings and of building elements - Part 5: Field measurement of airborne sound insulation of facade elements and facades (ISO 140-5:1998)	Description of two different measurement procedures		x				CEN	1998-12	Note 35 Note 36
EN ISO 717-1 DIN EN ISO 717-1 (D) NS-EN ISO 717-1 (N)	Acoustics - Rating of sound insulation in buildings and of building elements - Part 1: Airborne sound insulation (ISO 717-1:1996)							CEN	1997-01	Note 37

Austria											
OENORM B 8115	Sound insulation and room acoustics in building construction - Requirements for sound insulation	This OENORM determines the requirements for the soundproofing of the exterior walls depending on the sound emissions predominant at the site.					x		ON Österreichisches Normungsinstitut	1998-10	Note 38
ÖAL guideline no. 26	Noise protection in domestic architecture, basic planning principles.	Guidelines for the prevention of noise						x	Austrian Committee for the Prevention of Noise (ÖAL)		Note 39
Austrian Building Code		The different provinces of Austria have individual legislations on the sound insulation of buildings	x				x				Note 40
Germany											
DIN 4109	Sound insulation in buildings; requirements and testing			x			x		DIN	1989-11	Note 41
Netherlands											
NVN 7250:2003	Solar energy systems – Integration in roofs and façades – constructional aspects	This is a pre standard regarding noise					x	x	NEN	2003	Note 10
NEN 5077:2001	Noise control in buildings	Determination methods for performances concerning airborne sound insulation, impact sound insulation, sound proofing of partitions and sound levels caused by technical services		x	x				NEN	2001	Note 42

NPR 5272:2003	Noise control in buildings	Noise control in buildings – Directions for the application of the calculation method for noise control of façades based on NEN-EN 12354-3: 2000			x			NEN	2003	
Norway										
TR - VIII, §8-42	Protection against noise	General requirements for construction works for protection against noise.				x		National Office of Building Technology and Administration, Norway	1997-01-22	Note 43
Portugal										
Legislation (DL n°292/2000; revised by DL n° 259/2002)	Regulation against noise	Legal rules to prevent noise and noise pollution in order to preserve the health and well-being of populations - No specific references to Solar Thermal Collectors and Solar Thermal Systems	x						2000-11-14 2002-11-23	
Sweden										
BFS 1993:57 with amendments	Swedish Building Regulation BBR Chapter 7.	Exterior walls shall provide insulation from outdoor noise, down to specified levels	x				x	Boverket (The National Board of Housing, Building and Planning)	2002	Note 44
SS 025267	Building acoustics- Classification of sound levels	Classification of sound/ noise levels in buildings and dwellings					x	SIS	2004	

SS EN ISO 717/1,2	Building acoustics- Evaluation of noise reduction in buildings and building components	Calculation methods and definitions for noise reduction.			x		x	SIS	2002	
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Avoid construction damage

Number of Standard	Name	Short description	Legislation	Test method	Calculation methods	Requirements	Other guideline	Author(s) / published by	Date of publication	Annex number
EUROPEAN										
No European standards available										
Austria										
OENORM B 2320	Wooden residential houses – Technical requirements	This standard contains technical requirements for wooden residential houses				x		ON Österreichisches Normungsinstitut	2000-06-01	Note 45
OEKL BMBI 46	Ventilated facade coverings including the outer insulation	This requirement deals with a clam-shell (zweischalige), multilayered (mehrschichtige) construction. Systems, functional characteristics, substructure, heat insulation, ventilation, facade coverings and construction details are exemplified.				x		Österreichisches Kuratorium für Landtechnik und Landentwicklung	1980-04	Note 46
OESTV B 29	Guidelines for the surface protection in the inner parts of buildings and in facades EKS Nr. 90						x	Österreichischer Stahlbauverband	1998	Note 47

OENORM B 6400	External thermal insulation composite systems - Application	This standard has to be applied for external thermal insulation composite systems (WDVS) in building construction on surfaces according to the European approval guideline ETAG 004	x					ON Österreichisches Normungsinstitut	2004-08-01	Note 48
France										
DTU 33.1 XP P28-002-1, -2	Building construction work - Curtain-walling – part 1 : Technical specifications part 2: Special clauses	This document gives technical specifications concerning the implementation conditions for roof and façade, taking the materials they are made of glass into account.					x	AFNOR	1996-12	
DTU 33.1 NF P28-002-3	Building construction work - Curtain-walling – part 3 : Informative annex : upkeep	This document gives technical specifications concerning the implementation conditions for roof and façade, taking the materials they are made of glass into account.					x	AFNOR	2000-06	

DTU 40.11 NF P32-201-1, -2	Building works - Private contracts - Roof covering made of slates – part 1 : Technical specifications part 2 : Special clauses	This document gives technical specifications concerning the implementation conditions for roof and façade, taking the materials they are made of slates into account.					x	AFNOR		
DTU 40.14 NF P39-201-1	Building works - Private contracts - Roof covering made of asphalt shingles – part 1 : Technical specifications part 2 : Special clauses	This document gives technical specifications concerning the implementation conditions for roof and façade, taking the materials they are made of asphalt shingles into account.					x	AFNOR	1991- 06,1993-05, 2001-01	
DTU 40.21 NF P31-202-1	Building works - Private contracts - Roof covering made of slipping or grooved clay tiles – part 1 : Technical specifications	This document gives technical specifications concerning the implementation conditions for roof and façade, taking the materials they are made of slipping or grooved clay tiles into account.					x	AFNOR	1997-10, 2001-09	
DTU 40.22 NF P31-201-1	Building works – Roof covering made from hollow terracotta tiles – part 1 : Technical specifications	This document gives technical specifications concerning the implementation conditions for roof and façade, taking the materials they are made of hollow terracotta tiles into account.					x	AFNOR	1993-05, 1996-12, 1999-01, 2001-09	

DTU 40.23 NF P31-204-1	Building works - Roof covering made of clay plain roofing tiles – part 1 : Technical specifications	This document gives technical specifications concerning the implementation conditions for roof and façade, taking the materials they are made of clay plain roofing tiles into account.					x	AFNOR	1996-09, 2001-09	
DTU 40.24 NF P31-207-1	Building works - Private contracts - Private contracts - Roof covering made of interlocking concrete tiles – part 1 : Technical specifications	This document gives technical specifications concerning the implementation conditions for roof and façade, taking the materials they are made of interlocking concrete tiles into account.					x	AFNOR	1993-05, 1999-02, 2001-06	
DTU 40.24 NF P31-207-2	Building works - Private contracts - Private contracts - Roof covering made of interlocking concrete tiles – part 2 : Special clauses	This document gives technical specifications concerning the implementation conditions for roof and façade, taking the materials they are made of interlocking concrete tiles into account.					x	AFNOR	1993-05	
DTU 40.25 DTU P31-206	Concrete roofing tiles and fittings – Product specifications and Special clauses	This document gives technical specifications concerning the implementation conditions for roof and façade, taking the materials they are made of concrete roofing tiles into account.					x	AFNOR	1984-12, 1985-05, 1997-06, 2000-04, 2000-12	

DTU 40.35 NF P34-205-1 et -2	Building works - Roofing with profiled sheeting made of coated steel sheet – part 1 : Technical specifications part 2 : Special clauses	This document gives technical specifications concerning the implementation conditions for roof and façade, taking the materials they are made of coated steel sheet into account.					x	AFNOR	1997-05	
DTU 40.36 NF P34-206-1 et -2	Building works - Profiled roof covering made of pre-painted aluminium sheet or aluminium sheet – part 1 : Technical specifications part 2 : Special clauses	This document gives technical specifications concerning the implementation conditions for roof and façade, taking the materials they are made of pre-painted aluminium sheet or aluminium sheet into account.					x	AFNOR	1993-05	

<p>DTU 65.12 NF P50-601-1 et -2</p>	<p>Building works - Private contracts - Plain solar collector installations using heat transfer liquid, used for heating and the production of domestic hot water – part 1 : Technical specifications part 2 : Special clauses</p>	<p>Technical specifications for the installation of flat- plate collectors for heating and DHW. Integration in buildings is covered by this standard excluding : - drilling in the external walls of buildings for passage of pipings; - realization of the supports in masonry; - roofing and water tightness works (depending on roof types – cf. DTU).</p>					x	AFNOR	1993-05, 1998-10, 2000-10	
<p>Règles PS-MI 89 révisées 92 NF P06-014</p>	<p>Earthquake résistant construction rules - Earthquake résistant Construction of individual houses and of related buildings - 1992 revised PS-MI 89 rules - field of application - design -- construction</p>	<p>Rules for earthquake- proof construction. earthquake-proof Construction of the dwelling-buildings (single house or collective).</p>					x	AFNOR	1995-03, 2001-02	

Netherlands											
NVN 7250:2003	Solar energy systems – Integration in roofs and façades – constructional aspects	Interstitial condensation, that lead to damage to the building construction					x	x	NEN	2003	Note 10
NEN 1014:1992 incl. /C2:2000	Lightning Protection	Requirements for lightning protection, if applied					x		NEN	1992, 2000	
Sweden											
BFS 1993:58 with amendments	Swedish Design regulation BKR	This document gives technical specifications concerning the implementation conditions for roof and façade, taking the materials they are made of into account.	x		x		x		Boverket	Latest amendments 2004	

Thermal requirements, avoid air leakages / thermal bridges

Number of Standard	Name	Short description	Legislation	Test methods	Calculation methods	Requirements	Other guideline	Author(s) / published by	Date of publication	Annex number
EUROPEAN										
EN ISO 10077-1 OENORM EN ISO 10077-1 (A) NS-EN ISO 10077-1 (N)	Thermal performance of windows, doors and shutters - Calculation of thermal transmittance	Part 1: Simplified method (ISO 10077-1:2000)			x			CEN	2004-09-01	Note 49
EN ISO 10211-1 OENORM EN ISO 10211-1 (A) NS-EN ISO 10211-1 (N)	Thermal bridges in building construction - Heat flows and surface temperatures	Part 1: General calculation methods (ISO 10211-1:1995)			x			CEN	2002-10-01	Note 50
EN ISO 10211-2 OENORM EN ISO 10211-2 (A) NS-EN ISO 10211-2 (N)	Thermal bridges in building construction - Heat flows and surface temperatures	Part 2: Calculation of linear thermal bridges (ISO/DIS 10211-2:1995)			x			CEN	2001-09-01	Note 51
EN ISO 14683/AC OENORM EN ISO 14683/AC (A) NS-EN ISO 14683 (N)	Thermal bridges in building construction - Linear thermal transmittance	Simplified methods and default values (ISO 14683:1999) (Corrigendum)			x			CEN	2000-09-01	Note 52

EN 12412-2 OENORM EN 12412-2 (A) NS-EN 12412-2 (N)	Windows, doors and shutters - Determination of thermal transmittance by hot box method	Part 2: Frames		x				CEN	2003-10-01	
EN 13187 OENORM EN 13187 (A) NS-EN 13187 (N)	Thermal performance of buildings - Qualitative detection of thermal irregularities in building envelopes - Infrared method (ISO 6781:1983, modified)			x				CEN	1999-03-01	Note 53
EN 12153 OENORM EN 12153 (A) NS-EN 12153 (N)	Curtain walls – air permeability – test procedure			x				CEN	2000-10-01	Note 54
Austria										
Austrian Building Code	The different provinces of Austria have individual legislations on the heat transfer coefficient of exterior walls		x							Note 55
OENORM B 8110 part 1	Heat insulation	Regulates the required heat transfer coefficients				x		ON, Österreichisches Normungsinstitut	1998-06-01	Note 56

France										
Règles Th-Bât	Rules of calculation of thermal characteristics of the walls in the construction – New buildings	Calculation method concerning walls for applying French thermal regulation Including calculation of walls, windows, doors thermal transmittances, linear thermal transmittance...								1997-02
	Appendix n° 1 and 2 with the decree of the 1 st December 2000 - Approval of the methods of calculation Th-C and Th-E envisaged in articles 4 and 5 of the decree of the 29 th November 2000 relating to the thermal characteristics of the new buildings and the new parts of frame.	French thermal regulation (Th-C is the calculation method giving the energy consumption of a building, Th-E deals with summer comfort).								2000-12
Germany										
DIN 4108-2	Thermal insulation and energy economy in buildings – Thermal bridges - Examples for planning and performance	Definition of minimum requirements for the insulation of building components							DIN	2004-01 Note 57

Netherlands											
NVN 7250:2003,	Solar energy systems – Integration in roofs and façades – constructional aspects	Thermal requirements described in this pre standard						x	NEN	2003	Note 10
NEN 1068:2001 incl. /A1:2001	Thermal insulation of buildings – Calculation methods	The thermal insulation of buildings shall be resistant against the high temperatures that can occur (especially conc. solar thermal systems)						x	NEN	2001	
NEN 2686:1988 incl. /A1:1997	Air leakage of buildings – Measurement method	The mounting of solar energy elements on buildings provides special attention of the installation and construction. This standard deals with the necessary requirements concerning air leakage (air tightness)						x	NEN	1991, 2001	
Norway											
TR - VIII, § 8-2 to 8-23	Use of energy	This technical regulation includes measures for achieving low energy demand for construction works.	x						National Office of Building Technology and Administration, Norway	1997-01-22	Note 58

Portugal											
Legislation (DL n°40/1990)	Regulation on the Characterization of Thermal Behaviour of Buildings	Legislation (DL n°40/1990) Regulation on the Characterization of Thermal Behaviour of Buildings	x							1990-02-06	Note 59
Legislation (DL n° 118/1998)	Regulation on Energy Systems for Building Climatisation	Legislation (DL n° 118/1998) Regulation on Energy Systems for Buildings Climatisation	x							1998-05-07	Note 60
Sweden											
BFS 1993:57 with amendments	Swedish Building Regulation BBR Chapter 9 includes several references to national and international standards (see EN's above).	General and specific requirements for the energy performance of buildings	x		x	x	x		Boverket	2002	Note 61
BSV "Boverkets handbok om Termiska beräkningar"	Handbook on thermal calculations	Guidelines and calculation methods to calculate thermal losses in the building envelope.			x		x		Boverket	2003	

Rain and moisture penetration, water tightness and maintenance of the roof

Number of Standard	Name	Short description	Legislation	Test methods	Calculation methods	Requirements	Other guideline	Author(s) / published by	Date of publication	Annex number
EUROPEAN										
EN 12155 OENORM EN 12155 (A) NS-EN 12155 (N)	Curtain walls – Water tightness – Laboratory test under static pressure	Façade		x				CEN	1998-01-01	Note 62
EN 13051 OENORM EN 13051 (A) NS-EN 13051 (N)	Curtain walls – Water tightness - Field test without air pressure using a water spray bar	Façade		x				CEN	1998-01-01	
EN 12155 OENORM EN 12155 (A)	Curtain walls – heavy rain impermeability – laboratory test applying static pressure			x				CEN	2000-10-01	
EN 12365-1 OENORM EN 12365-1 (A) NS-EN 12365-1 (N)	Building hardware - Gasket and weather stripping for doors, windows, shutters and curtain walling	- Part 1: Performance requirements and classification				x		CEN	2003-12-01	
EN 12365-2 OENORM EN 12365-2 (A) NS-EN 12365-2 (N)	Building hardware - Gasket and weather stripping for doors, windows, shutters and curtain walling	Part 2: Closing force test method		x				CEN	2003-12-01	

EN 12365-3 OENORM EN 12365-3 (A) NS-EN 12365-3 (N)	Building hardware - Gasket and weather stripping for doors, windows, shutters and curtain walling	Part 3: Deflection recovery test method		x				CEN	2003-12-01	
EN 12365-4 OENORM EN 12365-4 (A) NS-EN 12365-4 (N)	Building hardware - Gasket and weather stripping for doors, windows, shutters and curtain walling	Part 4: Long term recovery test method		x				CEN	2003-12-01	
EN ISO 13788 DIN EN ISO 13788 (D) NS-EN ISO 13788 (N)	Hygrothermal performance of building components and building elements - Internal surface temperature to avoid critical surface humidity and interstitial condensation - Calculation methods (ISO 13788:2001)				x			CEN	2001-11	
France										
DTU 43.1 NF P84-204-1 et -2	Work execution - Waterproofing work on flat roofs with masonry support – part 1 : Technical specifications part 2 : Special clauses	The following documents give technical specifications concerning the water tightness on flat roof with masonry support.					x	AFNOR	1994-07, 2001-03	

DTU 43.2 NF P84-205-1 et -2	Building works – Private contracts – Waterproofing of roofs on load-bearing masonry supports having a slope of 5 % - part 1 : Technical specifications part 2 : Special clauses	The following documents give technical specifications concerning the water tightness of roofs on load-bearing masonry supports having a slope of 5 %					x	AFNOR	1993-05	
DTU 43.3 NF P84-206-1	Building works – Grooved sheet metal roofing with waterproof coating – part 1 : Technical specifications	The following documents give technical specifications concerning the water tightness of roof and façade, taking the materials they are made of grooved sheet metal with waterproof coating into account.					x	AFNOR	1995-06	

DTU 43.4 NF P84-207-1	Building works - Roof made of load-bearing wood and wood product panels with waterproof coverings – part 1 : Technical specifications	The following documents give technical specifications concerning the water tightness of roof and façade, taking the materials they are made of load-bearing wood and wood product panels with waterproof coverings into account.					x	AFNOR	1993-05, 1995-12	
DTU 43.4 NF P84-207-2	Building works - Private contracts - Roof made of load-bearing wood and wood product panels with waterproof coverings – part 2 : Special clauses	The following documents give technical specifications concerning the water tightness of roof and façade, taking the materials they are made of load-bearing wood and wood product panels with waterproof coverings into account.					x	AFNOR	1993-05	

DTU 59.1 NF P74-201-1 et -2	painting - building painting works – part 1 : Technical clauses book part 2 : Special clauses	The following documents give technical specifications concerning the choice of products used under building painting work and the technical conditions to do this work.						x	AFNOR	1994-10, 2000-10	
Germany											
DIN 18531	Water-proofing of roofs; concepts, requirements, design principles	Part 1 to 4: inspection and maintenance, dimensioning, design, materials and design principles					X		DIN	2004-07	Note 63
RAL GZ 429	Gütesicherung Dachbau							x	Gütegemeinschaft Holzbau-Ausbau-Dachbau e.V., Berlin	2002-03	Note 64
Netherlands											
NVN 7250:2003,	Solar energy systems – Integration in roofs and façades – constructional aspects'	- about moisture control -					x	x	NEN	2003	Note 10

NEN 2778:1991 incl. /A2:2001	Moisture prevention in buildings – Test methods	The external walls of a residence area as well as a toilet or bath room shall be watertight (required by the Dutch Building Code). This needs to be tested acc. to NEN 2778:1991. A special test method especially for solar thermal integration is not present.		x				NEN	1991, 2001	
Dutch Building Code		The Dutch building code prescribe all the requirements to any new building. Also about the water tightness	x			x				
Norway										
TR - VIII, 8-37	Moisture	Technical regulation on avoiding and limiting moisture in construction works.				x		National Office of Building Technology and Administration, Norway	1997-01-22	Note 65

Portugal										
	A new regulation on the subjects "Strength of construction, "Avoid construction damage", "Rain and moisture penetration, water tightness and maintenance of the roof", "Avoid environmentally problematical materials" is prepared but not yet approved									Note 16
Sweden										
BFS 1993:57 with amendments	Swedish Building Regulation BBR Chapter 6:5 and 6:6	Requirements to prevent harmful moisture in building constructions				x		Boverket	2002	Note 66

Avoid environmentally problematic materials

Number of Standard	Name	Short description	Legislation	Test methods	Calculation methods	Requirements	Other guideline	Author(s) / published by	Date of publication	Annex number
EUROPEAN										
Council Directive 67/548/EEC	Approximation of the laws, regulations and administrative provisions relating to the classification, packaging and labelling of dangerous substances		x					Europäischer Rat	1967	Note 67
00/32/EG	Commission Directive 2000/32/EC of 19 May 2000 adapting to technical progress for the 26th time Council Directive 67/548/		x					ABI EG (2000)	2000-05	
Austria										
OENORM B 3802-2	Protection of timber used in buildings - Chemical protection of timber	regulates preventive measures for components with load bearing and/or strengthening functions				x		ON Österreichisches Normungsinstitut	1998-04-01	Note 68

OENORM B 3804	Protection of timber used in buildings - Wooden buildings constructed by prefabricated building components - Constructive and chemical timber preservation measures	This standard is to be used for statically loaded strengthening wooden building components in the hazard classes 1 and 2 according to OENORM B 3802-2				x		ON Österreichisches Normungsinstitut	2002-03-01	Note 69
Germany										
RAL-UZ 73	Basis for the awarding of the "Blue Angel"- Label for solar thermal collectors	Description of requirements the collector has to fulfil in order to obtain the quality label				x		RAL		Note 70
GefStoffV	Gefahrstoffverordnung: Regulation for the protection against hazardous substances including all technically relevant changes	Classification of hazardous substances incl. list of forbidden substances				x		Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit BGB1 I	1999	Note 71
VwVwS	Administrative regulation for substances hazardous to water	Classification of substances, definition of water-pollution classes				x		Umweltbundesamt	1999	Note 17

Netherlands											
NVN 7250:2003,	Solar energy systems – Integration in roofs and façades – constructional aspects	requirements on materials used					x	x	NEN		Note 10
NEN 3413:1994	Foam strips – Requirements and test methods	Foam plastic sealing materials need to comply with NEN 3413; these materials also need to be resistant against the high temperatures occurring using solar thermal (>180°C).		x			x		NEN	1994	
NEN 5656:1993	Rubber building gaskets – Solid, load bearing and non-load bearing gaskets	Specification and test methods (Synthetic) rubber sections need to comply to this standard		x			x		NEN	1993	
NEN-ISO 11600:2002	Constructions of buildings – Jointing products – Classification and requirements for sealants	Other sealing materials than mentioned above shall comply to NEN-ISO 11600:2002					x				
Norway											
§ 106, Planning and Building Act	Technical installations	Demands and requirements on technical installations	x						National Office of Building Technology and Administration, Norway	1985-06-14	Note 73
TR - XIII, § 8-1	Environment and health	Demands and requirements on technical installations with regard to environment and health					x		National Office of Building Technology and Administration, Norway	1997-01-22	Note 74

TR - XIII, § 77	Demands on products for the building construction	Describes the demands and requirements on a construction work and on products used in constructing a building.				x		National Office of Building Technology and Administration, Norway	1997-01-22	Note 75
Sweden										
BFS 1993:57 with amendments	Swedish Building Regulation BBR Chapter 6:2.	Emission of gases and particles from construction materials must not affect the indoor environment to such an extent that it affects the health of the occupants when the air exchange rates are as specified in chapter 6:232	x			x	x	Boverket	2002	

General standards regarding solar thermal systems

Number of Standard	Name	Short description	Legislation	Test methods	Calculation methods	Requirements	Other guideline	Author(s) / published by	Date of publication	Annex number
EUROPEAN										
EN 12975-1 (N)	Thermal solar systems and components – Collectors	Part 1: General requirements				x		CEN	2001-02-01	
EN 12975-2 (N)	Thermal solar systems and components - Collectors	Part 2: Test methods		x				CEN	2002-03	
EN 12976-1 (N, A)	Thermal solar systems and components - Factory-made systems	Part 1: General requirements				x		CEN	2002-03	
EN 12976-2 (N,A)	Thermal solar systems and components - Factory-made systems	Part 2: Test methods		x				CEN	2001-03	
ENV 12977-1 (A)	Thermal solar systems and components - Custom-built systems	Part 1: General requirements				x		CEN	2001-10	
ENV 12977-2 (A)	Thermal solar systems and components - Custom-built systems	Part 2: Test methods		x				CEN	2001-10	
ENV 12977-3 (A)	Thermal solar systems and components - Custom-built systems	Part 3: Performance characterisation of stores for solar heating systems		x				CEN	2001-10	

Austria											
ÖNORM M 7701	Solar energy installations – Approximative calculation method for the dimensioning of flat collectors in domestic hot water systems						x		ON Österreichisches Normungsinstitut	2004-09-01	
ÖNORM M 7731	Solar heating systems for heating of water – requirements and tests			x			x		ON Österreichisches Normungsinstitut	2004-05-01	
Denmark											
BPS Nr. 94 ISBN nr.: 8772930721	BPS 94 - HVAC details. Large solar thermal systems for domestic hot water.	This Danish reference guidelines for larger SHW systems for installation and building integration						x	BPS-Centret	1991	Note 76

France											
DTU 65.12 NF P50-601-1 and -2	Building works - Private contracts - Plain solar collector installations using heat transfer liquid, used for heating and the production of domestic hot water – part 1 : Technical specifications part 2 : Special clauses	Technical specifications for the installation of flat-plate collectors for heating and DHW. Integration in buildings is covered by this standard excluding : - drilling in the external walls of buildings for passage of pipings; - realization of the supports in masonry; - roofing and water tightness works (depending on roof types – cf. DTU).						x	AFNOR and CSTB	1987-12 1998-10 2000-10	Note 77

Technical guideline n°1 bis	Quality of the water distribution installations intended for human consumption and in the indoor of buildings: design, realization, maintenance	Quality of the installations of water distribution for human consumption and inside buildings: design, realization, maintenance.					x	Ministère de la Santé and CSTB	1990	Note 78
Directives UEATc	UEATc directives for the approval of the solar collectors with liquid circulation						x	UEATc	1986-06	
DTU 39 NF P78-201-1 et -2	Building works - Glass mirror and glazing work – part 1 : Technical specifications part 2 : Special clauses	Technical specifications concerning the work of mirror manufacture on buildings in construction. - thickness of the glazing according to the mechanical constraints (wind, objects or people falls, - nature of the glazing according to the requirements of safety - implementation specifications (rabbets, water-tightness,...) and recommendation for special glazing : insulating, laminated, tinted					x	AFNOR	1987-02, 1988-11, 1993-05, 1997-07, 1998-05, 2000-10	

Norway											
§ 74.2, Planning and Building Act	Arrangement and appearance	Regulates the look of the exterior of a building, the aesthetic requirements in itself and in relation to the surroundings	x						National Office of Building Technology and Administration, Norway	1985-06 -14	Note 79
Chap. 7, part 1, Norwegian HVAC Norm	Thermal solar systems	Technical regulations for demands, planning and installation of small and large thermal solar systems						x	Varmeinfo	2000-10-12	Note 80
Chap. 7, part 2, Norwegian HVAC Norm	Thermal solar systems	Guidelines for "Technical regulations for demands, planning and installation of small and large thermal solar systems"						x	Varmeinfo	2000-10-12	Note 81

ANNEX

Where the national and European standards can be obtained

Austria	<p>Österreichisches Normungsinstitut (Austrian Standardisation Institute) Heinestraße 38, 1020 Wien, Austria Ph.: +43-1-213 00-0 Fax: +43-1-213 00-818 E-Mail: office@on-norm.at www.on-norm.at</p>	Norway	<p>Standard Norge (for norms with "NS-EN...") Postboks 242 1326 Lysaker, Norway Ph.: +47 67 83 86 00 Fax: +47 67 83 86 01 E-Mail: info@standard.no www.standardnorge.no/ www.standard.no/ekatalog/member/</p>
France	<p>AFNOR - Association Française de Normalisation 11, avenue Francis de Pressensé 93571 Saint-Denis La Plaine Cedex www.afnor.fr</p>	Portugal	<p>Portuguese Legislation IMPRENSA NACIONAL-CASA DA MOEDA, SA Av. António José de Almeida, 1000-042 Lisboa, Portugal Ph.: 21 781 07 00 www.incm.pt</p>
Germany	<p>Beuth Verlag GmbH Burggrafenstraße 6, 10787 Berlin, Germany Ph.: 0049 30 2601-0 Fax: 0049 30 2601-1260 E-Mail: postmaster@beuth.de www.beuth.de</p>	Sweden	<p>Boverket (national board of housing, building and planning for guidelines and building regulations) The National Board of Housing, Building and Planning Box 534, 371 23 Karlskrona Sweden Ph.: +46 455-35 30 00 Fax.: +46 455-35 31 00 E-mail: registraturen@boverket.se www.boverket.se/</p> <p>SIS (for standards), Swedish Standards Institute SIS Förlag AB, 118 80 Stockholm, Sweden Ph.: +46 8-555 523 10 E-mail: sis.sales@sis.se www.sis.se</p>
Netherlands	<p>NEN - Nederlands Normalisatie-instituut Kalfjeslaan 2, PO Box 5059, 2600 GB Delft, The Netherlands Ph.: +31 15 2690390 Fax: +31 15 2690190 www.nen.nl</p>		

NOTES

Note 1

NS-EN 1991-1-3

Eurocode 1 - Actions on structures - Part 1-3: General actions - Snow loads

Summary from "Standard Norway's" homepage:

(1) EN 1991-1-3 gives guidance to determine the values of loads due to snow to be used for the structural design of buildings and civil engineering works. (2) This Part does not apply for sites at altitudes above 1,500 m, unless otherwise specified. NOTE 1: Advice for the treatment of snow loads for altitudes above 1,500 m may be found in the National Annex. (3) Annex A gives information on design situations and load arrangements to be used for different locations. NOTE: These different locations may be identified by the National Annex. (4) Annex B gives shape coefficients to be used for the treatment of exceptional snow drifts. NOTE: The use of Annex B is allowed through the National Annex. (5) Annex C gives characteristic values of snow load on the ground based on the results of work carried out under a contract specific to this Eurocode, to DGIII / D3 of the European Commission. The objectives of this Annex are: - to give information to National Competent Authorities to help them to redraft and update their national maps; - to help to ensure that the established harmonised procedures used to produce the maps in this Annex are used in the member states for treating their basic snow data. (6) Annex D gives guidance for adjusting the ground snow loads according to the return period. (7) Annex E gives information on the bulk weight density of snow. (8) This Part does not give guidance on specialist aspects of snow loading, for example: - impact snow loads resulting from snow sliding off or falling from a higher roof; - the additional wind loads which could result from changes in shape or size of the construction works due to the presence of snow or the accretion of ice; - loads in areas where snow is present all year round; - ice loading; - lateral loading due to snow (e.g. lateral loads exerted by drifts); - snow loads on bridges.

Note 2

NS-EN 12179

Curtain walling - Resistance to wind load - Test method

Summary from "Standard Norway's" homepage:

This Norwegian Standard defines the method for determining the resistance to wind load of curtain walling, both its fixed and openable parts, under positive and negative static air pressure. NOTE This standard applies to any curtain walling product as defined in prEN 13830:2000.

Note 3

OENORM B 4013 - Design loads in building; snow and ice loads

This standard describes the calculations of the snow and ice load, which effect the building construction.

Note 4

Document général d’Avis Techniques – Groupe Spécialisé n°14

This document aims to evaluate the maximum value of the efforts due to the wind on a solar collector, as well as those due on its transparent cover. The results make a distinction between compression efforts (directed towards the back of the collector and perpendicular to this one) and suction efforts (in opposite direction). Requirement can be retrieved from CSTB - Centre Scientifique et Technique du Bâtiment, 4, av. du Recteur Poincaré, 75782 Paris Cedex 16, France. www.cstb.fr

Note 5

Règles NV 65 (DTU P06-002)

Rules of calculations defining the effects of snow and the wind on constructions and annexes.

The aim of this document is to fix the values of the climatic loads (snow and wind) and to give evaluation methods of the corresponding efforts on a building or its different parts.

The rules takes into account:

- influence of the form of the building
- existence of significant suctions in particular on curved surfaces and the roofs
- coexistence of external and interior actions whose combination gives the real action of the wind on the walls
- increase of the inside actions (overpressures or depressions) of a building when the wall have openings
- increase of the depressions in certain zones, in particular on the edges of roof and in the zones of wake
- increase or reduction of the wind’s effect according to the ratios on the sides to the height of construction

The rules try to translate the effects of phenomena known such as:

- variation of the speed of the wind with the geographical situation and with the local topographic conditions
- increase of the speed of the wind with the height above the ground-level and braking the wind near the ground
- increase in turbulence in the vicinity of the obstacles
- reduction of the global effect of turbulent winds on large-sized buildings

The rules apply to the majority of the buildings: dwelling, offices or industrial. Simplified rules for rectangular buildings are given.

Note 6

Règles N84 modifiées 95 (DTU P06-006)

Snow effects on constructions.

The aim of this document is to define the representative values of the load of snow on any surface located above ground-level and subjected to the snow drift, and in particular on the roofs. It deals only with the static effects of snow. The dynamic effects or impact due to falls of blocks of snow are not treated.

Note 7

Tragkonstruktionen für Solaranlagen

(Design Guide for Support Structures of Solar Collectors)

Content:

The guide comprises the results of an investigation that was carried out in the context of the research project “Solarthermie 2000” concerning definition and survey of design loads and wind loads. It gives examples of appropriate fixing details according to the roof construction as well as different construction details of support structures for the most usual collector types and arrays.

Note 8

DIN 1055-4: Lastannahmen für Bauten; Verkehrslasten, Windlasten bei nicht schwingungsanfälligen Bauwerken

(Load assumptions for buildings; wind loads for structures not prone to oscillation)

Content:

The standard gives calculation factors and equations for determination of resulting wind loads and wind pressure. Besides some aerodynamic coefficients like pressure coefficients for different roof structures or elevated drag coefficients are given.

Note 9

DIN 1055-5: Lastannahmen für Bauten; Verkehrslasten, Schneelast und Eislast

(Load assumptions for buildings; live loads, snow loads and ice loads)

Content: This standard describes how snow and ice loads can be considered. In addition a map showing different zones of snow loads in Germany is included.

Note 10

NVN 7250:2003 Solar energy systems – Integration in roofs and façades – constructional aspects'

In the Netherlands this standard covers the whole range of aspects mentioned in this inventory of guidelines. In this standard references have been made to other standards that deal with a specific aspect and are mentioned in the specific inventory sections.

Note 11

NEN 6702:2001 - Technical basis for construction of buildings – Loads, actions and transformations

The total wind load on structures and constructions can be calculated using NEN6702:2001. Because the effective wind load to be calculated for specific solar elements are not sufficient described in NEN 6702:2001, a special description has been made in NVN7250:2003 to deal with this aspect. This standard NEN 6702:2001 also describes how to deal with special combination of loads and actions upon a roof; these requirements also apply for solar elements integrated in the roof.

Note 12

TR - XII, § 7-32

Safety against actions of nature (slides, flooding, waves and wind)

This technical regulation in the Norwegian Planning and Building Act says that construction works shall be located and designed so that they have satisfactory safety against being damaged by actions of nature (slides, flooding, waves and wind); if not, special evaluation is required.

National Office of Building Technology and Administration, Norway, contact data:

STATENS BYGNINGSTEKNISKE ETAT, P.O. Box 8742 Youngstorget, (vistor address: Møllergt. 16 · 7. etg.), 0028 Oslo, Norway.

Ph.:+47 22 47 56 00, Fax.: +47 22 47 56 11, E-mail: be@be.no <http://www.be.no>

Note 13

TR - XII, § 7-33

Structural safety

This technical regulation in the Norwegian Planning and Building Act includes that construction works shall be so designed that they have sufficient safety against failure under the loads, which can arise during the presumed use. The requirement applies to the construction works in its final state as well as during construction.

Note 14

NS 3491-3

Design of structures - Design actions - Part 3: Snow loads (Corrigendum AC:2002 incorporated)

This Norwegian Standard gives rules and methods for calculating snow loads on roof. This standard is to be used with standard NS 3490 "Design of structures - Requirements to reliability ". This standard does not give guidelines for - dynamic effects as consequence of snow gliding or falling from higher laying roofs; - loads caused by blocked gutters due to ice; - increased wind loads due to that snow or ice change the size or shape of a

building; - snow loads at locations having permanent snow; - avalanches; - loads due to ice; - increase of loads due to strong rain on snow-covered roofs.

Note 15

NS 3491-4

Design of structures - Design actions - Part 4: Wind loads

This Norwegian Standard gives rules for determining wind speeds and for calculation the corresponding wind loads for constructions. The regulations are relevant for constructions with heights up to 200 m over the surrounding ground level. The properties of the surroundings are taken into account. The standard does not include all types of aero-elastic wind effects. The standard includes wind data for all Norway, Svalbard and coastal regions, except from those areas listed in section 5.4.1. The standard can be applied to offshore constructions, after approval by the Norwegian Petroleum Directorate. The standard regulates also procedures for special cases, which are not covered by this standard.

Note 16

The items:

“**Strength of construction (wind/snow)**”, “**Avoid construction damage**”, “**Rain and moisture penetration, water tightness and maintenance of the roof**”, “**Avoid environmentally problematical materials**” are covered, but not in a detailed form, by the legislation – General Regulation on Urban Buildings (*Regulamento Geral de Edificações Urbanas*). This law is dated of 1951. Several amendments have been issued and its revision was decided. A new regulation is already prepared but not yet approved.

The legal document dated of 1951 has no specific references to Solar Thermal Collectors and Solar Thermal Systems. The new regulation is not yet publicly available but it is known that it will include some important aspects in what refers to solar systems, since it **allows municipalities** to make **mandatory** the use of solar thermal systems in buildings. The idea is to have some thing identical the local “*Ordenças*” in Spain.

The present law (dated of 1951) indicates that all constructions must be made with the best practice rules. (chapter I, Article 15th, 16th and 17th). No detailed guidelines are given concerning integration of solar thermal in building envelopes.

Note 17

EN 1991-1-2: Eurocode 1 – Content :

- thermal and mechanical impact on structures exposed to fire
- mandatory and non-mandatory regulations for thermal and mechanical impact
- building dimensioning in case of fire (fire scenario, temperature calculation)
- thermal impact on temperature calculation (temperature-time-curve, fire models)
- mechanical impact on load capacity calculations

Standard written by Umweltsbundesamt, contact data:
Umweltbundesamt, Postfach 33 00 22, D-14191 Berlin, ph.: +49-30 8903-0, Fax: +49 (0)30 8903-2285, www.bundesumweltamt.de

Note 18

NS-EN 1991-1-2

Eurocode 1 - Actions on structures - Part 1-2: General actions; Actions on structures exposed to fire

Summary copied from "Standard Norway's" homepage:

(1) The methods given in this Part 1-2 of EN 1991 are applicable to buildings, with a fire load related to the building and its occupancy. (2) This Part 1-2 of EN 1991 deals with thermal and mechanical actions on structures exposed to fire. It is intended to be used in conjunction with the fire design Parts of prEN 1992 to prEN 1996 and prEN 1999 which give rules for designing structures for fire resistance. (3) This Part 1-2 of EN 1991 contains thermal actions related to nominal and physically based thermal actions. More data and models for physically based thermal actions are given in annexes. (4) This Part 1-2 of EN 1991 gives general principles and application rules in connection to thermal and mechanical actions to be used in conjunction with EN 1990, EN 1991-1-1, EN 1991-1-3 and EN 1991-1-4. (5) The assessment of the damage of a structure after a fire, is not covered by the present document.

Note 19

NS-EN 13501-1

Fire classification of construction products and building elements - Part 1: Classification using test data from fire reaction to fire tests Summary copied from

Summary copied from "Standard Norway's" homepage:

This European Standard provides the reaction to fire classification procedure for all construction products, including products incorporated within building elements. Products are considered in relation to their end use application. This document applies to two categories, which are treated separately in this European Standard: – construction products, excluding floorings; – floorings. NOTE The treatment of some families of products is still under review and can necessitate amendments to this standard (see European Decision2000/147/EC).

Note 20

Austrian Building Code

The 9 different provinces in Austria have established regulations to fire proof buildings. Building categories are defined depending on size, type of building or usage (industry, official buildings etc) with different requirements for exterior walls and façade coverings.

Note 21

OENORM B 3800 – 1: Behaviour of building materials and components in fire; building materials: requirements and tests

Defines classes for combustibility, smoke formation and drop formation

Combustibility

Combustibility class A: not combustible

Combustibility class B: combustible

Combustibility class B 1: hardly combustible

Combustibility class B 2: normal combustibility

Combustibility class B 3: readily combustible

Smoke formation when burning

Smoke formation class Q 1: weak formation of smoke

Smoke formation class Q 2: normal formation of smoke

Smoke formation class Q 3: pronounced formation of smoke

Drop formation when burning

Drop formation class Tr 1: no drop formation

Drop formation class Tr 2: dropping

Drop formation class Tr 3: igniting, dropping

Moreover the requirements are determined for the individual classes and the test specifications.

Note 22

OENORM B 3800 – 2: Behaviour of building materials and components in fire - Components: definitions, requirements, tests

The following fire resistance classes are defined:

- F 30 fire retardant
- F 60 extremely fire retardant
- F 90 fire resistant
- F 180 extremely fire resistant

Moreover the requirements of the individual classes and test provisions are determined.

Note 23

OENORM B 3800 – 3: Behaviour of building materials and components in fire - Special components: Definitions, requirements, tests

The following are considered to be special constructional elements:

- Compartment walls of which no special mechanical requirements are made
- Non-structural outer wall constructional elements
- Roof coverings
- Fire protection surrounds
- Fire protection glazing

Note 24

OENORM B 3800 – 4: Behaviour of building materials and components in fire - Components: Classification of fire resistance

Technical fire protection terms are defined in the OENORMS listed above and the requirements and test provisions are laid down. Determining the technical fire protection properties of constructional elements in dependence on the utilisation type is done exclusively in the legal provisions in the provinces. In OENORM B 3836 „Separation of cable through-bearings“ of 1 December 1984 requirements are determined for the separation of (electrical) cable through-bearings and test provisions are defined.

Note 25

TRVB - Technical guidelines preventive fire protection: Technical Guidelines for Preventive Fire Protection- Combustible Construction Materials in the Building Sector“ and Technical Guidelines for Preventive Fire Protection- Schools, part 1 Structural Measures

The „Technical Guidelines for Preventive Fire Protection“ are guidelines which are issued by the Associations of the “Austrian Federal Fire Fighters Association“ and the “Austrian Fire Prevention Authorities“. The technical guidelines for preventive fire protection (TRVB) are designed so that in TRVB 109 “Combustible construction materials in the building sector“, edition 1998, general requirements are laid down regarding the combustibility of construction materials. In addition separate TRVBs are issued for buildings for special use.

TRVB 109 “Combustible Construction Materials in the Building Sector“, edition 1998

TRVB 109 lays down the technical fire protection requirements made of construction materials in the building sector. These provisions apply to all buildings provided that no separate TRVBs are issued for buildings for special use. The purpose of this guideline is to determine standardised requirements re. the combustibility of construction materials.

TRVB 130 “Schools, part 1 Structural Measures“, edition 1977

The purpose of this guideline is unified minimum requirements with regard to preventive fire protection for all schools with the exception of those designed for mentally or physically handicapped pupils. There are correspondingly stricter measures for cases like this. TRVB 130 determines the following:

- In buildings with more than one storey load-bearing and bracing walls, their support (binding beams) and pillars and bearers have to be made at the least to be fire resistant (F 90).

- Sufficiently resistant constructional elements (W 90) have to be arranged on external walls between the openings (windows etc.) of the different stories to protect against the effects of fire so that the fire crossover path from storey to storey equals at least 1 [m] .
- Bracket-mounted external wall elements (curtain walls) have to be separated off in a fire-resistant manner (F 90) to guard against an attack of fire from storey to storey (Prevention of an attack of fire in the area between the ceiling and the external wall element itself.)

“Austrian Federal Fire Fighters Association“ can be found at “Österreichischer Bundesfeuerwehrverband“, Siebenbrunnengasse 21/ 3, A-1050 Wien, Ph.:+43-1-5458230, Fax: +43 (1) 545 82 30 DW 13, <http://www.bundesfeuerwehrverband.at>, office@bundesfeuerwehrverband.at
The “Austrian Fire Prevention Authorities“ can be found at “Zentralstelle für Brandverhütung“, Siebenbrunnengasse 21, A-1050 Wien, Ph.: +43-222-552502-0, Fax.: +43-222 552502-43,

Note 26

TRVB 143: Hostels, structural measures

The purpose of guideline TRVB 143 is to determine unified requirements with regard to preventive fire protection with regard to the construction of hostels. This guideline applies to hostels as of 15 beds respectively 30 beds. Hostels in the sense of this guideline are also buildings or building parts, which are not always used as a hostel, are only occasionally rented to guests and apartment buildings. The pre-requisite for the validity of this guideline is adherence to the decree on the minimum equipment for hostels, issued by the BMfWA, concerning the minimum size of rooms. This TRVB determines the following:

Load-bearing walls and supports are to be of fire-resistant design (F 90), in small enterprises in an open design of construction a flame-retardant design is sufficient (F 30). A fire-resistant external wall part W 90 at a height of at least 1.2 [m] (total of the ceiling thickness, the window parapet and the window lintel) is to be built between the window of the individual stories in all types of enterprises with the exception of small enterprises in an open design of construction with an automatic fire alarm in full protection design in accordance with TRVB S 123 provided that each of these stories is to form a separate fire section in itself (see also chapter 6.3).

Front linings. In buildings with up to five stories (ground floor and four upper floors) wood may also be used (not ventilated) as a front lining. In the same way wooden constructional elements are allowed as design elements in fronts. Remarks: contrary to the provisions of TRVB 109 only non combustible insulating materials may be used in wood lined outer walls.

Note 27

Arrêté du 30 juin 1983 : Classification des matériaux de construction et d'aménagement selon leur réaction au feu et définitions des méthodes d'essais

The aim of this decree is to define the testing methods and the classification according to the fire performance of installation and building materials. The requirements of this decree apply (except particular cases) with finished building materials, the coatings applied to their supports and materials of interior installation.

J.O. can be found at Les Journaux Officiels, 26 Rue Desaix, 75015 Paris, France. www.journal-officiel.gouv.fr

Note 28

DIN 4102-2: Fire Behaviour

Content:

In this standard behaviour of construction materials and components as a result of fire impact, terms and definitions, requirements and test methods for components are laid down

- proof of fire resistance classes
- requirements for building components
- test methods for building components

Note 29

NEN 6063:1991 incl. /A1:1997: Determination of inflammability of roofs

A roof may not have any fire risk - determined according to NEN 6063. This requirement obviously also applies in case a solar element has been integrated in the roof. For the several applications it needs to be checked whether the installation / building-in of a solar element does not lead to an inflammable roof.

Note 30

NEN 6068:2001: Determination of the resistance against fire penetration and fire jump over between spaces

According to the Dutch Building Code requirements exist with respect to the resistance against the fire penetration / jump over between particular spaces and buildings. It is dependant on the design of the building(s) and the properties of the building parts whether it complies to the regulations. Evaluation shall be taken place according to a calculation, established in NEN 6068.

Note 31

TR - VII, §7-24

Ignition, development and spread of fire and smoke

1. This technical regulation in the Norwegian Planning and Building Act says that construction works shall be executed and equipped such as these, to an acceptable level, reduce the probability of fire arising, and such that the threat of fire and smoke spreading can be reduced accordingly. The usage of the construction works as well as the necessary time for escape and rescue shall be considered.
2. Ignition and development of fire: materials and surfaces not contributing to an unacceptable degree of development of the fire shall be used. Main consideration should be given to the time required for flash over, heat release, smoke production, and development of toxic gases.
3. Construction works shall be divided into fire sections and fire compartments, in order to reduce or prevent spread of fire and smoke inside, unless such spread is prevented by other means.
4. Technical installations are to be executed or equipped such that the installation does not substantially increase the threat of a fire arising or spreading. Installations, which are presumed to have a function during a fire, shall be so designed and executed that their function is maintained during the intended time.

National Office of Building Technology and Administration, contact data:

STATENS BYGNINGSTEKNISKE ETAT, P.O. Box 8742 Youngstorget, (visitor address: Møllergt. 16 · 7. etg.), 0028 Oslo, Norway.

Ph.: +47 22 47 56 00, Fax: +47 22 47 56 11, E-mail: be@be.no <http://www.be.no>

Note 32

NS 3919

Classification of fire resistance and reaction to fire - Materials, building elements, coverings and surfaces

This Norwegian Standard defines classes of fire resistance for materials, building parts, claddings, surfaces, roofing and floor covers.

Note 33

BFS 1993:57 with amendments

Swedish Building Regulation BBR (BFS 1993:57 with amendments) chapter 5. Includes several references to national and international standards. To be more specific, chapter 5.4 deals with "Protection against the starting of fire". A key requirement in this chapter is "Heating installations shall be installed so that they cannot ignite adjacent construction parts. The surface temperature of adjacent construction parts of combustible material must not exceed 85 °C." and "Insulation of parts that can reach temperatures exceeding 85 °C must be made with incombustible insulation material"

In chapter 5 there is also regulations about measures to be taken to prevent fire from spreading via the façade which could affect the design of an integrated collector.

Note 34

NS-EN 12354-3

Building acoustics - Estimation of acoustic performance of buildings from the performance of elements - Part 3: Airborne sound insulation against outdoor sound

Summary copied from "Standard Norway's" homepage:

This European Standard specifies a calculation model to estimate the sound insulation or the sound pressure level difference of a façade or other external surface of a building. The calculation is based on the sound reduction index of the different elements from which the façade is constructed and it includes direct and flanking transmission. The calculation gives results, which correspond approximately to the results from field measurements according to EN ISO 140-5. Calculations can be carried out for frequency bands or for single number ratings. The calculation results can be used also for calculating the indoor sound pressure level due to for instance road traffic; this use is treated in the informative annex D. This document describes the principles of the calculation model, lists the relevant quantities and defines its applications and restrictions. It is intended for acoustical experts and provides the framework for the development of application documents and tools for other users in the field of building construction, taking into account local circumstances. The model is based on experience with predictions for dwellings; it can also be used for other types of buildings provided the dimensions of constructions are not too different from those in dwellings.

Note 35

Two different procedures of measuring sound insulation of building elements (building element procedure) and of whole exterior walls (collective procedure).

Note 36

EN ISO 140-5

Acoustics - Measurement of sound insulation in buildings and of building elements - Part 5: Field measurement of airborne sound insulation of facade elements and facades (ISO 140-5:1998)

Summary copied from "Standard Norway's" homepage:

This part of ISO 140 specifies two series of methods (element methods and global methods) for measurement of the airborne sound insulation of façade elements and whole façades, respectively. The element methods aim to estimate the sound reduction index of a façade element, for example a window. The most accurate element method uses a loudspeaker as an artificial sound source. Other, less accurate, element methods use available traffic noise. The global methods, on the other hand, aim to estimate the outdoor/indoor sound level difference under actual traffic conditions. The most accurate global methods use the actual traffic as sound source. In addition, a loudspeaker may be used as an artificial sound source. An overview of the methods is given in table 1. The element loudspeaker method yields an apparent sound reduction index which, under certain circumstances [e.g. taking account of measurement precision (see 7.1)], can be compared with the sound reduction index measured in

laboratories in accordance with ISO 140-3 or ISO 140-10. This method is the preferred method when the aim of the measurement is to evaluate the performance of a specified façade element in relation to its performance in the laboratory. The element road traffic method will serve the same purposes as the element loudspeaker method. It is particularly useful when, for different practical reasons, the element loudspeaker method cannot be used. These two methods will often yield slightly different results. The road traffic method tends to result in lower values of the sound reduction index than the loudspeaker method. In annex D this road traffic method is supplemented by the corresponding aircraft and railway traffic methods. The global road traffic method yields the real reduction of a façade in a given place relative to a position 2 m in front of the façade. This method is the preferred method when the aim of the measurement is to evaluate the performance of a whole façade, including all flanking paths, in a specified position relative to nearby roads. The result cannot be compared with that of laboratory measurements. The global loudspeaker method yields the sound reduction of a façade relative to a position 2 m in front of the façade. This method is particularly useful when, for different practical reasons, the real noise source cannot be used. The result cannot be compared with that of laboratory measurements.

Note 37

NS-EN ISO 717-1

Acoustics - Rating of sound insulation in buildings and of building elements - Part 1: Airborne sound insulation (ISO 717-1:1996)

Summary copied from "Standard Norway's" homepage:

This part of ISO 717 a) defines single-number quantities for airborne sound insulation in buildings and of building elements such as walls, floors, doors and windows; b) takes into consideration the different sound level spectra of various noise sources such as noise sources inside a building and traffic outside a building; and c) gives rules for determining these quantities from the results of measurements carried out in one-third-octave or octave bands in accordance with ISO 140-3, ISO 140-4, ISO 140-5, ISO 140-9 and ISO 140-10. The single-number quantities in accordance with this part of ISO 717 are intended for rating the airborne sound insulation and for simplifying the formulation of acoustical requirements in building codes. The required numerical values of the single-number quantities are based on results of measurements in one-third-octave bands or octave bands. For laboratory measurements made in accordance with ISO 140-3, ISO 140-9 and ISO 140-10, single-number quantities should be calculated using one-third-octave bands only. The rating of results of measurements carried out over an enlarged frequency range is dealt with in annex B.

Note 38

OENORM B 8115: Sound insulation and room acoustics in building construction - Requirements for sound insulation

The requirements made of sound insulation in structural engineering are defined in OENORM B 8115 part 2 of 1 October 1998. According to the individual building regulations this standard is explicitly to be taken into consideration when planning.

This OENORM determines the requirements made of the soundproofing of the outer walls depending on the sound immisions predominant at the site. In as far as no data is available on the sound immisions, design guidelines are indicated for permissible immisions.

Note 39

ÖAL guideline no. 26: Noise protection in domestic architecture, basic planning principles.

The Austrian Committee for the Prevention of Noise (ÖAL) provides guidelines for the prevention of noise. ÖAL guideline no. 26 „Noise protection in domestic architecture, basic planning principles“ “Chapter 4.2 Structural Requirements“ points out the provisions of OENORM B 8115 part 2 in terms of noise insulation requirements regarding external constructional elements. Some noise protection requirements made with regard to constructional elements are not laid down in the ÖAL guidelines.

Austrian Committee for the Prevention of Noise (ÖAL) can be found at ÖAL, Dr. Karl-Heinz Greßlehner, Sonnenhang 7, 4292 Kefermarkt, Ph.: +43-7947-6448; Fax.: +43-7947-6448-4, www.oal.at

Note 40

Austrian Building Code

	R_w Value [dB] Mean sound insulation	R_{res,w} Value [dB] Mean sound insulation of the exterior walls including windows and doors to the outside
Austrian Provinces Values within the range:	42 – 47 or according to OENORM B 8115	33 - 43

Note 41

DIN 4109: Schallschutz im Hochbau; Anforderungen und Nachweise

(Sound insulation in buildings; requirements and testing)

Content:

Construction examples and calculation methods, guidelines for planning and execution; proposals for increased sound insulation; recommendations for sound insulation in personal living and working areas

Note 42

NEN 5077:2001: Sound proofing in buildings

The protection against noise from outside shall comply to the Dutch Building Code. Determination is according to NEN 5077. Whether a building provided with solar energy does comply to the requirements of NEN 5077, can only be determined from the building with the solar energy system totally installed and applied.

Note 43

TR - VIII, §8-42

Protection against noise

This technical regulation in the Norwegian Planning and Building Act says that construction works shall be constructed in such manner that they protect the users of the construction works or nearby against noise which: is harmful to hearing, reduces the ability of concentration and the efficiency of work, makes necessary communication difficult, prevents the perception of danger signals, prevents rest and recreation, reduces the quality of sleep, or creates stress reactions.

Impact sound: Buildings shall be so constructed that the impact sound pressure level and other structure-borne sound in one user area, in the case of intended normal use of other user areas, public rooms or outdoor areas, is so reduced that no significant noise disturbance will arise for the users.

Noise from technical installations: The technical installations of a building shall be such, or be so protected, that they do not yield sound levels which may cause significant disturbance to the users in the building/user area or in outdoor areas intended for recreation or play, or in outside rooms for permanent occupation in another building.

Outdoor noise: Buildings shall be so located, designed, constructed and/or protected that the sound level from existing outdoor sources, or sources presumed in the planning of the particular area, do not prevent satisfactory sound conditions for work, sleep, rest, and recreation in the building and for recreation and play in outdoor areas intended for this. The requirement also applies to structure-borne noise sources.

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Note 44

BFS 1993:57 with amendments

Swedish Building Regulation BBR (BFS 1993:57 with amendments) chapter 7 in brief: Exterior walls shall provide insulation from outdoor noise, down to specified levels. Installations in a building have specified limits for maximum allowed noise.

Note 45

OENORM B 2320: Wooden residential houses - Technical requirements

This standard gives requirements for residential wooden buildings, which walls, roofs and ceiling construction mainly consists of wooden constructions, but also from constructions partly made from wood or block constructions. These regulations also apply for building components made from wood.

Note 46

Available from "Österreichisches Kuratorium für Landtechnik und Landentwicklung", Gußhausstraße 6, A-1040 Wien; Ph.:+ 43-1-5051891, Fax: + 43-1-5051891-16, E-Mail: office@oekl.at. www.oekl.at

Note 47

Available from "Österreichischer Stahlbauverband", Wiedner Hauptstrasse 63, A-1045 Wien, Ph.:+43-1-503 94 74, Fax: extension 227.
www.stahlbauverband.at/

Note 48

OENORM B 6400: External thermal insulation composite systems - Application

This standard covers the national user criteria for the manufacture of WDVS and surveys the application areas. The test methods are defined in ETAG 004 for WDSV, with European authorisation and in the ETAG 014 for dowels for WDSV. The working of WDSV according to OENORM B 6110 and OENORM B 6135 is carried out through OENORM B 6410.

Note 49

NS-EN ISO 10077-1

Thermal performance of windows, doors and shutters - Calculation of thermal transmittance, Part 1: Simplified method (ISO 10077-1:2000)

Summary copied from "Standard Norway's" homepage:

This standard specifies methods for the calculation of the thermal transmittance of windows and doors consisting of glazed or opaque panels fitted in a frame, with and without shutters. It allows for: - different types of glazing (glass or plastics; single or multiple glazing; with or without low emissivity coatings; with spaces filled with air or other gases); - various types of frames (wood; plastic; metallic with and without thermal barrier; metallic with pinpoint metallic connections or any combination of materials); - where appropriate, the additional thermal resistance introduced by different types of shutters, depending on their air permeability. Curtain walls and other structural glazing, which are not fitted in a frame, are excluded from this standard. Roof windows are also excluded because of their complex geometrical frame sections. Default values for glazing, frames and shutters are given in the informative annexes. Thermal bridge effects at the rebate or joint between the window or doorframe and the rest of the building envelope are excluded from the calculation. The calculation does not include: - effects of solar radiation; - heat transfer caused by air leakage; - calculation of condensation; - ventilation of air spaces in double and coupled windows.

Note 50

NS-EN ISO 10211-1

Thermal bridges in building construction - Heat flows and surface temperatures, Part 2: Calculation of linear thermal bridges (ISO/DIS 10211-2:1995)

Note 51

NS-EN ISO 10211-2

Thermal bridges in building construction - Heat flows and surface temperatures, Part 2: Calculation of linear thermal bridges (ISO/DIS 10211-2:1995)

Note 52

NS-EN ISO 14683

Thermal bridges in building construction - Linear thermal transmittance, Simplified methods and default values (ISO 14683:1999) (Corrigendum)

Summary from the "Standard Norway's" homepage:

This standard deals with simplified methods for determining heat flows through linear thermal bridges which occur at junctions of building elements. It is not applicable to thermal bridging associated with window and door frames or curtain walling. It specifies requirements relating to thermal bridge catalogues and manual calculation methods, and provides a limited number of tabulated default values of linear thermal transmittances.

Note 53

NS-EN 13187

Thermal performance of buildings - Qualitative detection of thermal irregularities in building envelopes - Infrared method (ISO 6781:1983, modified)

Summary copied from "Standard Norway's" homepage:

This standard specifies a qualitative method, by thermographic examination, for detecting thermal irregularities in building envelopes. The method is used initially to identify wide variations in the thermal properties, including air tightness, of the components constituting the external envelopes of buildings. In this standard two forms of thermography are specified: Testing with an IR camera is primarily intended for the inspection of the overall performance of new buildings or the result after a rebuilding operation. Simplified testing with an IR camera is suitable when carrying out audits, e.g. at the site of a rebuilding project or at production control or other routine inspections. These two adaptations differ mainly with regard to the reporting and the presentation of results. The results obtained by means of this method have to be interpreted and assessed by persons who are specially trained for this purpose. This standard applies to the determination of the location of thermal irregularities and to the location of air

leakage paths through the enclosure. This standard does not apply to the determination of the degree of thermal insulation and air tightness of a structure. For such determinations, examinations by other methods are required.

Note 54

NS-EN 12153

Curtain walls – air permeability – test procedure

Summary copied from "Standard Norway's" homepage:

This standard defines the method to be used to determine the air permeability of curtain walling, both its fixed and openable parts. It describes how the specimen shall be tested under positive and negative air pressure. NOTE : This standard applies to any curtain walling product as defined in prEN 13830:2000.

Note 55

Austrian Building Codes

	U-Value [W/m²K] Heat transfer coefficient of the outer walls	U_m-Value [W/m²K] Mean heat transfer coefficient for facades, if the window and door area cover more than 30% of the facade
Austrian Provinces Values within the range:	0,35 - 0,56	0,75 - 0,92

Note 56

OENORM B 8110 part 1: Heat insulation

The requirements for heat insulation are regulated by OENORM B 8110 part 1. Whilst standard B 8110 part 1 of 1 February 1983, which has already been withdrawn by the Austrian Standardisation Institute, defines the standards as a result of an ensemble of heat transition coefficients, the new edition of OENORM B 8110 part 1 of 1 June 1998 (VN) basically regulates the requirements made of heat protection by determining a maximum heating requirement and renounces prescribing an ensemble of heat transition coefficients.

Note 57

DIN 4108 Beiblatt 2: Wärmeschutz und Energie-Einsparung in Gebäuden - Wärmebrücken - Planungs- und Ausführungsbeispiele

(Thermal insulation and energy economy in buildings - Thermal bridges - Examples for planning and performance)

Note 58

TR - VIII, § 8-2 to 8-23

Use of energy

This technical regulation in the Norwegian Planning and Building Act says that construction works with installations shall be executed in such manner as to promote a low demand for energy and power which does not exceed the overall limitations established in this Chapter. The demand for energy and power shall be such as to ensure a justifiable indoor environment. The construction works and its installations shall be executed in such manner as to minimize the need for cooling and so as to avoid an unnecessary cooling demand.

§ 8-21 Requirements for the need of energy and power for a building may be established in one of the three alternative ways:

by the use of overall energy limitations adapted to various categories of buildings

by satisfying requirements for the heat insulating performance of each and every element of the building

by the use of overall limitations to heat loss based on a redistribution between the different building elements.

§ 8-22 Air tightness: Buildings shall be so impervious that the effect of thermal insulation is not reduced by unintentional flow of air through them. Moisture shall not be allowed to penetrate and reduce the effect of thermal insulating or worsen the design life of the building. Buildings shall be so impervious that the indoor climate is not negatively affected and in such manner that unpleasant draught does not occur.

§ 8-23 Materials favourable to energy and the environment: Where it is documented that a building is made from materials requiring low energy consumption in their production and abolishment, and the materials otherwise have good environmental qualities, it may be accepted that the building consumes more energy in its period of operation than what follows from § 8-21 No. 1. It must be shown as being probable that the total energy consumption for production of materials, operation of the building and abolishment of the materials does not exceed the general level expressed in this Chapter.

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Note 59

Item “**Thermal requirements, avoid air leakages / thermal bridges**”. Legislation (DL n°40/1990) Regulation on the Characterization of Thermal Behaviour of Buildings (*RCCTE – Regulamento das Características de Comportamento Térmico dos Edifícios*). 06.02.1990

- No specific references to Solar Thermal Collectors and Solar Thermal Systems

Summary:

This regulation states the rules to take into account in the design of buildings in order that:

- a) The thermal comfort inside the building is assured without excessive consumption of energy
- b) The building elements do not suffer from pathologies due to condensation

Note 60

Legislation (DL nº 118/1998) Regulation on Energy Systems for Buildings Climatization (*RSECE – Regulamento dos Sistemas Energéticos de climatização em Edifícios*), 07.05.1998

- No specific references to Solar Thermal Collectors and Solar Thermal Systems

Summary:

This regulation states the rules to take into account in the design of energy systems for building climatization, in order that:

- a) The conditions of climate comfort and environment quality inside the building are assured, taking into account also energy efficiency
- b) The quality and safety of the installations is assured
- c) The environment is preserved

- **RSECE – this regulation was revised and there is already a new version which is not publicly available yet.**

- **RCCTE – this regulation was revised and there is already a new version which is not publicly available yet.**

The objectives of the revision of these regulations were:

- a) Convergence with the European Directive on Energy Performance on Buildings and European Standards (ISO EN 13790)
- b) Raise the quality requirements
- c) Demand Qualification of Designer and Energy Auditors

In this revision the installation of a solar thermal system and the energy delivered by this system will be considered in the heat balance of the building in a positive way.

Legislation (DLnº64/90) - Safety regulation against fire in buildings (*Regulamento de Segurança Contra Incêndios em Edifícios de Habitação*) (21.02.90)

Legal rules to verify that the risk of fire is avoided or minimized.

- No specific references to Solar Thermal Collectors and Solar Thermal Systems

Legislation (DL nº292/2000; revised by DL nº 259/2002) - Regulation against noise (*Regulamento Geral do Ruído*) (14.11.2000 and 23.11.2002)

Legal rules to prevent noise and noise pollution in order to preserve the health and well-being of populations

- No specific references to Solar Thermal Collectors and Solar Thermal Systems.

Note 61

Swedish Building Regulation BBR (BFS 1993:57 with amendments) chapter 9

Includes several references to national and international standards. There are specific requirements on max. heat loss coefficients for the building envelope (taking thermal bridges into account) and for the air tightness of the entire building.

Note 62

NS-EN 12155

Curtain walls - Water tightness - Laboratory test under static pressure

Summary copied from "Standard Norway's" homepage:

This standard defines the method for determining the water tightness of curtain walling, both its fixed and openable parts. It describes how the outside face of the specimen should be subjected to a continuous film of water with a positive static air pressure. NOTE This standard applies to curtain walling in accordance with prEN 13830: 2000.

Note 63

Part 1: Design Principles

- requirements for water-proofing of roofs
- kind of stresses (mechanical, thermal)
- requirements for design (draining of roofs)

Part 2: Materials

Part 3: design principles (wind loads, construction of details, dimensioning)

Part 4: inspection and maintenance

Note 64

RAL-GZ: Gütezeichen Dachbau (Quality label roof construction)

Gütezeichen Dachbau is a quality label that is granted to carpentry for the correct construction of roofs (structure work and finishes) made of timber and derived timber products. It also concerns the modification of attic floors up to roof covering and roof drainage. The requirements that

have to be met by the craftsman do include some useful indications concerning the interference of the mounting frame into the surface of the roof and walls of the building.

Requirement published by Gütegemeinschaft Holzbau - Ausbau - Dachbau e.V., contact data:

Gütegemeinschaft Holzbau - Ausbau - Dachbau e.V. , Kronenstraße 55-58, D-10117 Berlin, ph.:+49-3020314-538, fax:+49-03020314-561

Note 65

TR - VIII, 8-37

Moisture

This technical regulation in the Norwegian Planning and Building Act includes:

1. General requirements: Construction works shall be so designed as to prevent rain or snow, surface water, ground water, supply water and air moisture from penetrating and causing moisture damage, mould, fungi or other hygienic problems.
2. Moisture protection: This first part of this subsection describes the demands on the ground surface around construction works and building elements below ground level. Façade covers, windows, doors, and installations passing through walls shall be so designed as to allow harmful moisture to dry out. Roofs shall have sufficient slope for the runoff of rain and melted snow. If condensation can occur under the roofing, or the roofing is not sufficiently water tight, then the underlying structure must be protected by means of a watertight layer.

Subsection 3 is on "Sanitary rooms".

4. Moisture in building: Materials and structures shall be so dry at the time of placing/ sealing that problems of growth of micro-organisms, decay of organic materials and increased gas emission do not arise.

National Office of Building Technology and Administration, contact data:

STATENS BYGNINGSTEKNISKE ETAT, P.O. Box 8742 Youngstorget, (visitor address: Møllergt. 16 · 7. etg.), 0028 Oslo, Norway.

Ph.: +47 22 47 56 00, Fax: +47 22 47 56 11, E-mail: be@be.no <http://www.be.no>

Note 66

Swedish Building Regulation BBR (BFS 1993:57 with amendments) chapter 6:5 and 6:6.

Includes references to national standards. "Parts of the envelope (roofs, walls) shall be so constructed with respect to tilt angle, underlayer, sealings, bushings, mechanical load and water drainage that the forming of harmful moisture is prevented"

Note 67

EG-Verordnung 67/548/EWG: Einstufung, Verpackung und Kennzeichnung gefährlicher Stoffe

Classification, packing and labelling of hazardous materials

Content: Classification of hazardous substances in different categories. These categories are divided into explosive, combustible, contaminative materials and materials that are harmful to health. Annex I includes a categorization with the respective hazardous materials.

Note 68

OENORM B 3802-2: Protection of timber used in buildings - Chemical protection of timber

This standard regulates preventive measures together with the application of the wood protection medium in combination with OENORM B 3801 and OENORM B 3803-2 and -3. This standard is not to be used on dimensionally stable wooden constructions. However, it is distinguished between components with load bearing and/or strengthening functions. Preventive chemical wood protection measures for windows and doors outside are considered in OENORM B 3803.

Note 69

OENORM B 3804: Protection of timber used in buildings - Wooden buildings constructed by prefabricated building components - Constructive and chemical timber preservation measures

This standard regulates the manufacture and installation of wooden single and multi store buildings, consisting of remanufactured components, which correspond to the requirements stated in OENORM B 2310. This standard is to be used for statically loaded strengthening wooden building components in the hazard classes 1 and 2 according to OENORM B 3802-2. This standard is not applicable for buildings with load bearing building elements.

Note 70

RAL-UZ 73: Grundlage für die Umweltzeichenvergabe für Sonnenkollektoren

Qualification scheme for the award of the environmental label „blue angel“ for solar collectors

Content: This guideline contains a description of the necessary requirements the respective solar collector has to fulfil in order to obtain the quality label. The requirements comprise a yearly energy gain of 525 kWh/(m²a) at a solar fraction of 40%. Besides other requirements concerning the use of environmental “friendly” materials have to be fulfilled, e.g. confirmation that no halogenized hydrocarbon is used. Also safety instructions acc. to the standard EN 12975-2 have to be met.

Requirement published by RAL, contact data:

RAL, Deutsches Institut für Gütesicherung und Kennzeichnung e.V.

Siegburger Straße 39, D-53757 Sankt Augustin, ph.: +49/2241/1605-0, fax.:+49/2241/1605-11, eMail: RAL-Institut@RAL.de

Note 71

GefStoffV: Gefahrstoffverordnung

Regulation for the protection against hazardous substances

Content: The aim of this regulation is the classification, identification, labelling, packaging and handling of hazardous substances. It also contains a list of forbidden substances like asbestos or benzene as well as particular regulations for the handling of dangerous substances.

Requirement published by Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit, contact data:

Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit, Alexanderplatz 6, D-10178 Berlin, ph.:+49-1888-305-0, fax: 01888-305-4375, www.bmu.de

Note 72

VwVwS: Verwaltungsvorschrift Wasser gefährdender Stoffe

Administrative Regulation water endangering materials

Content: Classification of substances that are able to affect adversely the physical, chemical and biological consistence of the water. Definition of so-called water pollution classes (WGK 1 = low hazardous to water; WGK 2 = hazardous to water; WGK 3 = severely hazardous to water). In the annex a detailed list of substances that are non-hazardous to water as well as a list with substances that are hazardous to water is given.

Note 73

§ 106 Planning and Building Act, Technical installations

Paragraph § 106 of the Norwegian Planning and Building Act describes the demands and requirements on technical installations. The owner shall ensure that the installation is done by qualified personnel. The municipality can demand necessary measures if the installation causes unnecessary nuisance to the surroundings. It is referred to the Pollution Control Act which is valid in cases where a permit has been granted for the installation pursuant to the Pollution Control Act.

National Office of Building Technology and Administration, contact data:

STATENS BYGNINGSTEKNISKE ETAT, P.O. Box 8742 Youngstorget, (vistor address: Møllergt. 16 · 7. etg.), 0028 Oslo, Norway.

Ph.: +47 22 47 56 00, Fax: +47 22 47 56 11, E-mail: be@be.no <http://www.be.no>

Note 74

TR - XIII, § 8-1

Environment and health

The life of works shall in all phases, i.e. execution, usage and demolition, be managed with a reasonable load on resources and environment, and without worsening quality of life and living conditions. Materials and products for use in construction works shall be manufactured with justifiable use of energy and with the aim of preventing unnecessary pollution. Construction works shall be so designed and executed that little energy is consumed and little pollution is caused during the life of the works, including demolition.

Note 75

TR - XIII, § 77

Demands on products for the building construction

Describes the demands and requirements on a construction work and on products used in constructing a building (CE-marking).

Note 76

Published by “BPS-centret”, www.bps.dk

Note 77

Guideline can be obtained from CSTB - Centre Scientifique et Technique du Bâtiment, 4, av. du Recteur Poincaré, 75782 Paris Cedex 16, France.
www.cstb.fr

Note 78

Guideline can be obtained from Ministère de la Santé et des solidarities, www.sante.gouv.fr

Note 79

§ 74.2, Planning and Building Act

Arrangement and appearance

Sub-section 2 of § 74.2 in the Norwegian Planning and Building Act says that "the municipality shall ensure that any work that is subject to the provisions of this Act is planned and carried out in such a way that, in the municipality's opinion, it satisfies reasonable aesthetic requirements both in itself and in relation to the surroundings. Measures taken pursuant to this Act shall be aesthetically well designed in accordance with the functions thereof and with respect for natural and built-up surroundings. Unsightly colours are not permitted and may be required to be changed."

National Office of Building Technology and Administration, contact data:

STATENS BYGNINGSTEKNISKE ETAT, P.O. Box 8742 Youngstorget, (visitor address: Møllergt. 16 · 7. etg.), 0028 Oslo, Norway.

Ph.: +47 22 47 56 00, Fax: +47 22 47 56 11, E-mail: be@be.no <http://www.be.no>

Note 80

Chap. 7, part 1, Norwegian HVAC Norm

Thermal solar systems, Technical regulations.

Chapter 7 part 1 of the Norwegian HVAC Norm includes demands on small and large thermal solar systems with regard to planning, demands to the heating system, to products, to installation and not-pressurized heating systems.

The Norwegian HVAC Norm: "Varmenormen" can be obtained from Varmeinfo, Essendropsgate 3, 0368 Oslo, Norway. brosjyrer@varmeinfo.no,

Ph.: +47 23 08 78 28 (30), Fax: +47-23 08 77 96, www.varmeinfo.no.

Note 81

Chap. 7, part 2, Norwegian HVAC Norm

Thermal solar systems, Guidelines to "Technical regulations".

Chapter 7 of part 2 of the Norwegian HVAC Norm gives guidelines on of thermal solar systems. It includes types of thermal solar systems and components, guidelines for planning and special attention on systems for larger buildings.