



DRAFT FINAL REPORT

36 MONTH
DELIVERABLE

September 2014

Table of contents

APPENDICES WP2	3
APPENDIX 2.6: Specifications for an pilot pathology database.....	4

APPENDICES WP2

APPENDIX 2.6: Specifications for a pilot pathology database

1. Description of a pathology case

The description of a pathology case is structured according to the following cause-defect-failure/effect chain:

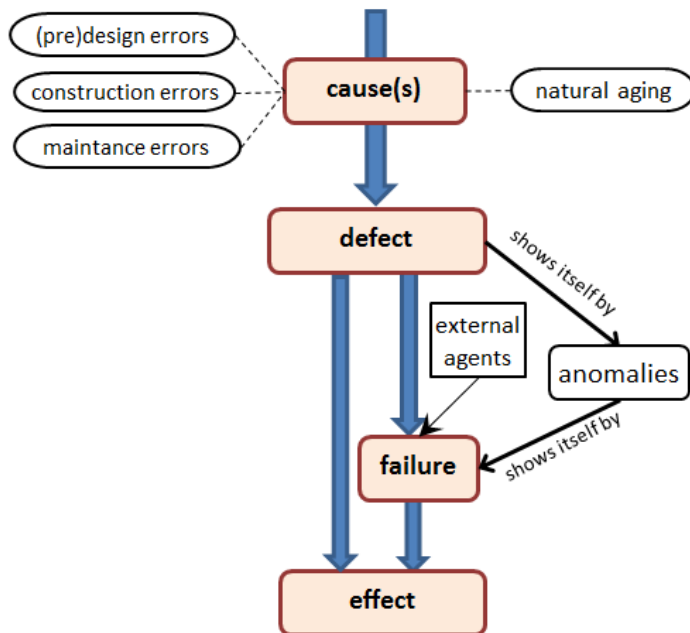


Figure 1: Source: adapted from CIB Report

The core elements in this description are 'defect' and 'failure'.

A defect is a situation where one or more building components do not perform its/their intended function(s); it implies a shortcoming in respect of some normative or perceived standard or requirement. For example: a crack in a partition wall. The type of defect may vary widely; from a minor crack to a major crack. Defects are caused either by natural ageing or by errors or omissions (arising from imperfect human activities) during different stages of the building process.

A failure is a situation in which a specific required function cannot be fulfilled any longer. For example: a minor crack in the wall may lead to loss of an aesthetic function, a major crack may imply the collapse of the wall and so the termination of the required use.

The defects can either remain in a latent form, or manifest themselves by the action of external agents. Interaction between external agents and defects is the necessary condition for the manifestation of the decay as failure. The failure of building components can be structural, i.e. loss of certain physical, chemical and technological characteristics. Or it can be performance failure, i.e. the drop of the initial performance level below an established acceptable limit. Or – most commonly – it may concern both aspects.

As a consequence of the failure, the effect (damage, injuries, non-functioning etc.) appears at the end of the process. But also a defect without a failure can lead directly to an undesirable effect.

The defective building component can be the same as the failed building component (like in the example of the crack in the partition wall leading to collapse of the same wall), but they can also be

different. For example: a crack in a facade wall, leading to water leakage entering in the electrical system behind the wall, causing a failure of the electricity system.

Ideally, all these elements are known from a certain pathology case, and can be specified in the input fields. But in many cases, only a general description of the pathology is known. Therefore, also a field 'general description of the pathology case' is included.

The diagram can also be depicted as follows (combining defect and failure, and adding the typical insurance effects):

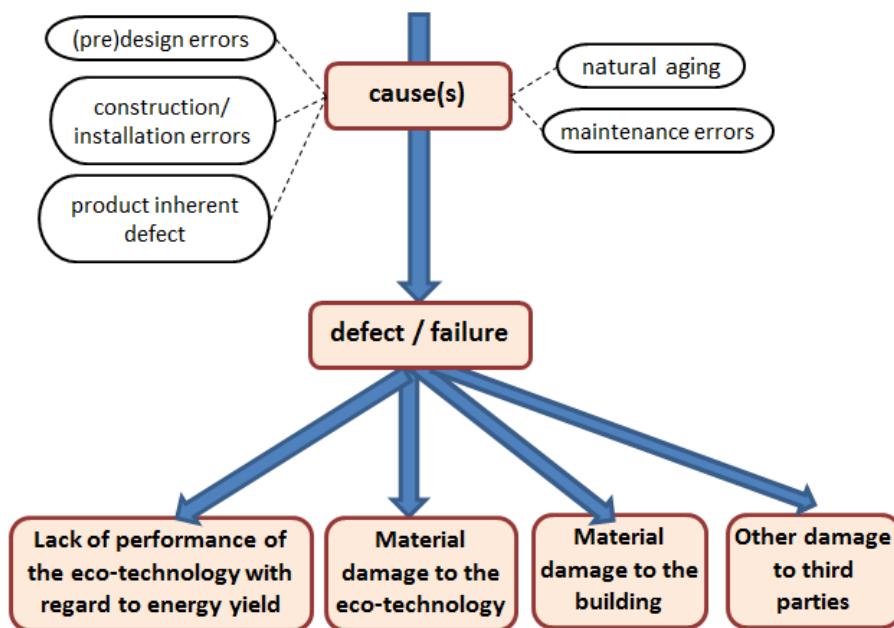


Figure 2: Source: adapted from CIB Report

2. Technical description of the platform for part 1 of the EQEO: The building pathology database

This technical description for the pathology database is similar to the one for quality signs directory of WP1. Both parts of the website will be hosting in the same platform.

Language, Database and Framework

We recommend only to use open source technologies:

Linux (SUSE / DEBIAN) with:

- Server Apache 2
- PHP 5.2.x
- Mysql 5.0x
- ZEND Framework with a release >= 1.8 embedded in project sources.

Architecture

Architecture 3 tiers:

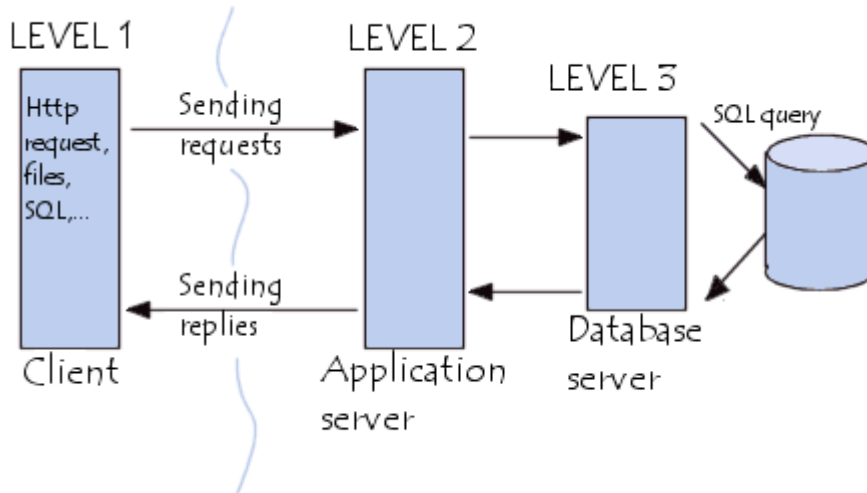
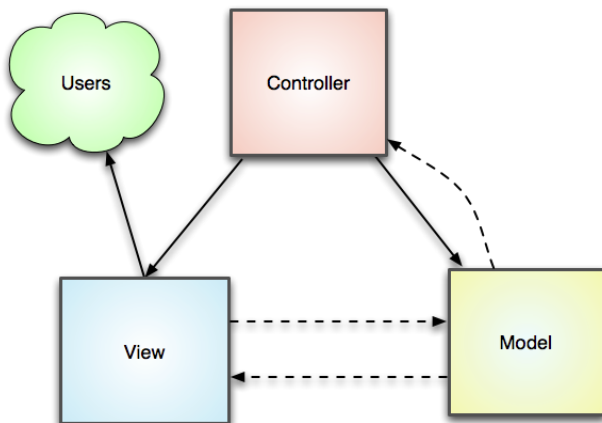


Figure 3: Architecture 3 tiers

'Model - View – Controller'- pattern:



- **Model:** This is the part of the application that defines its basic functionality behind a set of abstractions. Data access routines and some business logic can be defined in the model.
- **View:** Views define exactly what is presented to the user. Usually controllers pass data to each view to render in the format. Views will often collect data from the user, as well.
- **Controller:** Controllers bind the whole pattern together. They manipulate models, decide which view to display based on the user's request and other factors, pass along the data that each view will need, or hand off control to another controller entirely.

User-friendliness of the human–computer interface (HCI)

HCI has to be to be intuitive and easy to pick up.

Graphical charter defined for the general website of Elios II will be applied to the WP2 database, including logo and fonts colours.

The Building pathologies database website will be presented in English.

Navigators compliancy

The Building pathologies directory website has to be compliant with the following navigators:

- Internet Explorer >=8.0
- Firefox Version >=19

Users of the tool

The following users of the tool are distinguished:

- The *internet user*, as an anonymous visitor, accesses the public part where building pathology forms are available.
- The *contributors*, they are people who are going to fill a Building Pathology Form (BPF); in first instance the WP2 partners (NHBC, SBi, BBRI, Arcadis) will be responsible for filling the database with pathology cases.
- The *administrator* who is in charge to create contributors' access. In first instance, the administrator will be the WP2 leader and CSTB (IT section)

The internet users

Everybody can access the public part, but target groups are preferentially:

- Construction insurers and (re)insurers,
- Experts of construction.

The internet users will have only access to the consultation of the database, without need to connect by means of an account.

The contributors

The main role of this profile is to populate the database with building pathology data. During the pilot phase, the WP2-2 partners (NHBC, SBi, BBRI, Arcadis, TSUS) will be in charge to fill the building pathology forms.

The contributors have access to the module of edition, and create and update the pathology forms that they are responsible for.

The administrators

The administrators oversee the whole website, they have to create and update the contributor's accounts. The administrators can publish or unpublish the building pathology forms, but cannot modify the ones they didn't create.

The administrator role will be given to the leader of the WP2, technically assisted by CSTB (IT). The number of administrator is unlimited, it depends the maturity of the system. For the first instance, two administrators seem to be suitable to share the work.

Public part of the Building Pathologies directory

Internet users will have access to the list of all published building pathology sheets. They can get a detail view of each sheet and make an advanced search using their own criteria. They can as well export their result in an excel file containing the main data of the sheets.

Management of the contributor accounts

Only an administrator can create a contributor account.

Menus

Users' management

- User's list (Contributors + Administrators)
- Add a new user

The list of referenced users (Contributors + Administrators)

The users list displays all the contributors and the administrators of the pathology database. For each contributor, data displayed are the following:

- Country
- Organism
- Profile
- Name [family_name + first_name]
- Email
- Phone

From this list, possible actions allowed for an administrator are:

- The view of the detail sheet of the selected user;
- The modification of the data for the selected (0);
- The deletion of the selected user (0);
- The sending of the login and password of the user by email (6.1.6).

The user's list has to be paginated; by default ten users are displayed by page. Whereas this number can be changed by the user and be adapted to its screen size.

Links « Next » and « Previous » are available at the end of the list. On the same line below the list of users, the total number of elements is given.

All the columns of the list have to be sortable.

Create a « New user »

The form for a new user creation gathers the following fields (* for mandatory field):

- Family name*
- First name*
- Email*

- Country* (unique choice among the European countries)
- Phone number
- Profile (select 1 among proposed value : Administrator / Contributor)
- Password*(encrypted)
- Password confirmation* (encrypted)

A « Submit » button triggers the account creation for the user. A « Cancel » button cancels the action of creation.

Here are the tests for the account creation:

- All the mandatory fields are filled (*)
- Field value for password = field value for password confirmation
- Check that the user does not already exist in the WP2 user database: the test are based on Family name and Email field values

If the user already exists:

The following message is displayed:

« The creation has been aborted; this user is already referenced in Elios Database.

If the tests are OK, the following message « *Account has been successfully created* » ends the account creation procedure.

If errors are detected, the message displayed has to highlight the wrong fields.

Modification of users

The form for the modification of a user and the check functions are the same that for creation.

Deletion of users

The deletion of a user is a physical deletion. Only an administrator can delete users (contributor or another administrator). That means that at the end of the deletion procedure the user won't exist anymore in the pathology database. A connected administrator can't delete its own account.

Sending of connection parameters

This function is available from the user list and triggers an email to the user containing the login and password for the connection.

Edition of building pathologies cases

The data of building pathologies can be input and updated by contributors who have an account into the WP2 database, and administrators.

Menu

My cases

- View list of cases
- Add a case

Help

- Handbook

Creation of Building Pathology Sheet

Creation form

See below the fields necessary to fill in, to provide a complete description of a pathology case. An additional excel table gives some information on the description fields: applicability of question in relation to another question, or explanation on the field to provide to the contributor, etc.

In the form, fields need to have a “help” text to make clearly understand what kind of data is expected. For instance a “?” that provides a bubble with explanation at user click.

Most of the fields are optional. For many pathology records, not all data is available (or it would be too time-consuming to gather the data to fill in all the fields). The most essential fields for insurers are written in bold **UPPERCASE**. The following fields are mandatory to fill in, since these are considered essential to get a good understanding of a pathology case:

- Name of information provider (name of the organisation);
- Type of source for the description of the pathology case (inspection report, claim, literature etc.), and the reference name of the source (i.e. the name of the report, website link etc);
- Country or countries where the construction work or project is executed;
- Type of eco-technology (material/product/ system) that was involved in the defect/failure;
- Type of defect/failure;
- Type of consequence/effects of the defect/failure (4 categories multiple list);
- Cause of the defect/failure (if known).

No.	Field name	Type of field	Example
1	System serial number	Numerical (automatically generated)	1
2	Name of the information provider	Text	NHBC
3	Dossier code (internal code) of the information provider.	Numerical	P3462
4	Date of filling in this pathology record	Date (automatically generated)	
5	WHAT IS THE TYPE OF SOURCE OF THE DESCRIPTION OF THE PATHOLOGY CASE?	Predefined categories (multiple answers possible) <input type="checkbox"/> Based on an <u>inspection report</u> of a particular case/building; <input type="checkbox"/> Based on a sample of or an <u>existing database</u> with pathology cases; <input type="checkbox"/> Based on a <u>claim</u> ; <input type="checkbox"/> Based on <u>literature</u> , research papers, defect information sheets, etc., website <input type="checkbox"/> Based on <u>general knowledge/experience</u> <input type="checkbox"/> <u>Other</u>	Inspection report
6	NAME/TITLE OF THE SOURCE FOR THE PATHOLOGY CASE	<input type="checkbox"/> (titles of the sources, references, website link etc.)	www.thegreentower.fi
7	Name of construction work or project	Free memo text <input type="checkbox"/>	The Green Office Tower
8	COUNTRY OR COUNTRIES WHERE THE	Predefined with names of EU28	UK

	<p>CONSTRUCTION WORK OF PROJECT IS EXECUTED</p>	<p>countries in alphabetical order (multiple answers possible):</p> <ul style="list-style-type: none"> <input type="checkbox"/> Austria <input type="checkbox"/> Belgium <input type="checkbox"/> Bulgaria <input type="checkbox"/> Croatia <input type="checkbox"/> Cyprus <input type="checkbox"/> Czech Republic <input type="checkbox"/> Denmark <input type="checkbox"/> Estonia <input type="checkbox"/> Finland <input type="checkbox"/> France <input type="checkbox"/> Germany <input type="checkbox"/> Greece <input type="checkbox"/> Hungary <input type="checkbox"/> Ireland <input type="checkbox"/> Italy <input type="checkbox"/> Latvia <input type="checkbox"/> Lithuania <input type="checkbox"/> Luxembourg <input type="checkbox"/> Malta <input type="checkbox"/> Netherlands <input type="checkbox"/> Poland <input type="checkbox"/> Portugal <input type="checkbox"/> Romania <input type="checkbox"/> Slovakia <input type="checkbox"/> Spain <input type="checkbox"/> Sweden <input type="checkbox"/> United Kingdom <input type="checkbox"/> Don't know 	
9a	<p>Do you know the town where the construction work or project where the defect/failure has occurred?</p>	<ul style="list-style-type: none"> <input type="checkbox"/> yes <input type="checkbox"/> no 	
9b	<p>Town where the construction work or project is executed (if 9a is answered 'yes')</p>	<p>Text</p> <p><input type="checkbox"/> (please fill in the town)</p>	<p>London</p>
10a	<p>Geo-climatic character of the location of the construction work of project</p> <p><i>Notes: In some countries, a zip code + altitude, or click on a map, gives the climatic zone.</i></p>	<p>Predefined categories, plus empty field for free memo text (multiple answers possible):</p> <ul style="list-style-type: none"> <input type="checkbox"/> Near the coast <input type="checkbox"/> Rainy area <input type="checkbox"/> Windy area <input type="checkbox"/> Arctic/polar/cold <input type="checkbox"/> Tempered climate <input type="checkbox"/> Subtropics climate <input type="checkbox"/> Oceanic climate <input type="checkbox"/> Continental climate <input type="checkbox"/> Mediterranean climate <input type="checkbox"/> Earthquake area <input type="checkbox"/> Other 	<p>Near the coast</p>

		<input type="checkbox"/> Don't know	
10b	Other geo-climatic character, namely... (if 10a is answered with 'other')	Text <input type="checkbox"/> (please fill in the town)	
11a	Type of construction work – New or existing building?	Predefined categories plus 'don't know' (multiple answers possible) <input type="checkbox"/> New <input type="checkbox"/> Existing <input type="checkbox"/> Don't know <i>Type of work:</i> <input type="checkbox"/> Individual housing/dwellings <input type="checkbox"/> Collective housing, apartment buildings <input type="checkbox"/> Buildings with public access <input type="checkbox"/> Office buildings <input type="checkbox"/> Industrial buildings <input type="checkbox"/> Other buildings	New / office building / with high intrinsic risks
11b	Type of construction work - function of the building	<input type="checkbox"/> Individual housing/dwellings <input type="checkbox"/> Collective housing, apartment buildings <input type="checkbox"/> Buildings with public access <input type="checkbox"/> Office buildings <input type="checkbox"/> Industrial buildings <input type="checkbox"/> Other building <input type="checkbox"/> Don't know	
11c	Type of construction work – technical risks	<input type="checkbox"/> Buildings having extrinsic technical risks (e.g. near railway track) <input type="checkbox"/> Buildings having intrinsic technical risks (e.g. high-rise buildings) <input type="checkbox"/> Building without or with minor extrinsic/intrinsic risks <input type="checkbox"/> Don't know	
12	Starting date of the work	Date fixed format <input type="checkbox"/> ...-.- (yyyy-mm-dd) (please fill in) <input type="checkbox"/> Don't know	2010-01-01
13	End date of the work	Date fixed format <input type="checkbox"/> ...-.- (yyyy-mm-dd) (please fill in) <input type="checkbox"/> Don't know	2012-01-01
14a	Has the construction work or project been completed?	Boolean yes/no <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Don't know	Yes
14b	Was there a completion survey for the handover of the construction work/project to the client? (only if 14a is answered 'yes')	Boolean yes/no <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Don't know	Yes
14c	If yes, what was the date of the completion survey? (only if 14a is answered 'yes')	Date, plus 'don't now' <input type="checkbox"/> ...-.- (yyyy-mm-dd) (please fill in) <input type="checkbox"/> Don't know	2011-30-12
15	Was a Technical Inspection Service (TIS)	Boolean yes/no	

	contracted for this project?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Don't know	
	Date of the defect/failure/damage	Date, plus 'don't know' <input type="checkbox"/> ...-.- (day-month-year) (please fill in) <input type="checkbox"/> Don't know	01-07-2012
Eco-technology			
16	<p>CATEGORY</p> <p><i>Note: 'eco-technologies' are defined as: 'technologies which are (supposed to) contribute to the environmental performance of buildings (and whose use is less environmentally harmful than relevant alternatives)'. The following topics are considered to make up environmental performance:</i></p> <ul style="list-style-type: none"> - Energy; - Water; - Waste and pollution; - Protection of biodiversity and natural environment; - Minimization of the use of resources, <p><i>Within each topic we have identified one or more typical examples of technologies.</i></p>	<p>Predefined categories (based on the usual topics of the environmental performance of a building), plus empty fields for free memo text (multiple answers possible)</p> <p>ENERGY</p> <p><i>Use of renewable energy:</i></p> <ul style="list-style-type: none"> <input type="checkbox"/> photovoltaic panels (PV's) <input type="checkbox"/> wind turbine <input type="checkbox"/> solar hot water (SHW) <input type="checkbox"/> other technology with use of renewable energy <p><i>Energy efficiency techniques:</i></p> <ul style="list-style-type: none"> <input type="checkbox"/> mechanical ventilation with heat recovery (MVHR) <input type="checkbox"/> heat pump <input type="checkbox"/> active daylighting <input type="checkbox"/> domotics, e.g. controls of space heating <input type="checkbox"/> other energy efficiency technique <p><i>Thermal insulation:</i></p> <ul style="list-style-type: none"> <input type="checkbox"/> insulation made of bio-materials, like natural fibers (hemp) <input type="checkbox"/> cavity wall insulation (CWI) <input type="checkbox"/> solid wall insulation (SWI) <input type="checkbox"/> double skin curtain wall/façade <input type="checkbox"/> EPS (expanded polystyrene) panels <input type="checkbox"/> vacuum-insulated panels (VIP's) <input type="checkbox"/> glazed windows <input type="checkbox"/> other thermal insulation technique <p><i>Other energy conservation or efficiency techniques</i></p> <ul style="list-style-type: none"> <input type="checkbox"/> passive shading devices (e.g. brises soleils) <input type="checkbox"/> grey water heat recovery <input type="checkbox"/> other energy conservation or efficiency technique <p>WATER</p> <p><i>Water conservation techniques:</i></p> <ul style="list-style-type: none"> <input type="checkbox"/> green roof/ brown roof <input type="checkbox"/> in house water-treatment system <input type="checkbox"/> rainwater catchment basins, grey 	Energy conservation or efficiency techniques

		<p>water harvesting</p> <p><input type="checkbox"/> Other water conservation technique</p> <p><i>Water efficiency/management techniques:</i></p> <p><input type="checkbox"/> low-water use appliances, like spray taps, flush toilets</p> <p><input type="checkbox"/> other water efficiency/management technique</p> <p><i>Water metering:</i></p> <p><input type="checkbox"/> water leakage detection systems</p> <p><input type="checkbox"/> other water metering technique</p> <p>WASTE, POLLUTION, AND INDOOR ENVIRONMENTAL QUALITY</p> <p><i>Minimize pollution during construction:</i></p> <p><input type="checkbox"/> biological waste treatment systems to treat waste on-site</p> <p><input type="checkbox"/> separate/recycle waste</p> <p><input type="checkbox"/> other technique to reduce waste, pollution</p> <p><i>Enhancing indoor environmental quality</i></p> <p><input type="checkbox"/> low VOC materials (paints, kits, glues)</p> <p><input type="checkbox"/> other technique to enhance indoor environmental quality</p> <p><i>Limitation of emission of CO2, ozone depleting gasses, greenhouse gasses</i></p> <p><input type="checkbox"/> Technique/product/material for limitation of emission of CO2, ozone depleting gasses of greenhouse gasses</p> <p>PROTECTION OF BIO DIVERSITY AND NATURAL ENVIRONMENT</p> <p><input type="checkbox"/> roof garden</p> <p><input type="checkbox"/> other technique for protection of bio diversity and natural environment</p> <p>MINIMIZE THE USE OF RESOURCES</p> <p><i>Re-use or recyclability of construction works, their materials and parts after demolition</i></p> <p><input type="checkbox"/> recycled materials, for example aluminium or steel frame components/systems (up to 90% recyclable)</p> <p><input type="checkbox"/> other technique or material for minimizing the use of resources</p> <p><i>Usage of renewable materials:</i></p> <p><input type="checkbox"/> wood, bamboo</p> <p><input type="checkbox"/> paper-based</p>	
--	--	--	--

		<input type="checkbox"/> other renewable material <i>Minimize materials</i> <input type="checkbox"/> Biaxial hollow deck floors <input type="checkbox"/> Other technique that minimizes materials OTHER CATEGORY OF ECO-TECHNOLOGY <input type="checkbox"/> Other type of eco-technology	
17	Specific type (if known)	Free memo text <input type="checkbox"/> (please fill in the type of eco-technology, for example 'polycrystalline superimposed photovoltaic panels', or: 'acryl paints')	Photovoltaic panels
Description of the defect/failure			
18	Date of the defect/failure/damage	Date, plus 'don't know' <input type="checkbox"/> ..-.- (yyyy-mm-dd) <input type="checkbox"/> Don't know	2012-07-01
19	GENERAL DESCRIPTION OF THE PATHOLOGY (including the defect/failure, the defective part, the consequences/effects and the causes)	Text <input type="checkbox"/> (please fill in the general description of the pathology)	Defective power supply of PV-panel...etc.
20	TYPE OF DEFECT/FAILURE <i>Notes:</i> A <u>defect</u> is a situation where one or more building components do not perform its/their intended function(s); it implies a shortcoming in respect of some normative or perceived standard or requirement. For example: a crack in a partition wall. The type of defect may vary widely; from a minor crack to a major crack. Defects are caused either by natural ageing or by errors or omissions (arising from imperfect human activities) during different stages of the building process. A <u>failure</u> is a situation in which a specific required function cannot be fulfilled any longer. For example: a minor crack in the wall may lead to loss of an aesthetic function, a major crack may imply the collapse of the wall and so the termination of the required use .	Predefined categories, plus empty field for free memo text <input type="checkbox"/> Aesthetic defect/failure (i.e. Cracking or shrinkage cracking of concrete) <input type="checkbox"/> Functional failure (i.e. Leaks in elements such as roofs, walls and floors; malfunctioning of installations) <input type="checkbox"/> Defect or failure of materials (i.e. Corrosion of metals) <input type="checkbox"/> System failure of components and elements (i.e. Carbonation of concrete, leading to corrosion of creinforcement and subsequent cracking and spalling of concrete members) <input type="checkbox"/> Structural defect or failure (i.e. Subsidence - a downward movement of a building caused by below ground factors – such as desiccation of clay soil). <input type="checkbox"/> Non-structural defect/failure (i.e. Delamination of roof tiles and slates) <input type="checkbox"/> Reversible defect/failure (i.e. Jamming of doors and windows as a result of moisture intake by these	System failure of components

		<p>components – usually in winter; in the summer the wood dries out and the windows and doors become unstuck)</p> <ul style="list-style-type: none"> <input type="checkbox"/> Irreversible defect/failure (i.e. Chemical reactions such as sulphate attack on mortar or rendering) <input type="checkbox"/> Other defect/failure 	
21a	<p>Defective building component <i>Note: predefined categories according to SfB classification of building elements</i></p>	<p>Predefined categories, based on the SfB classification of building elements, plus free memo text (multiple answers possible)</p> <ul style="list-style-type: none"> <input type="checkbox"/> 1.Substructure <input type="checkbox"/> 2.Superstructure <ul style="list-style-type: none"> <input type="checkbox"/> 2A.External wall <input type="checkbox"/> 2B.Internal wall <input type="checkbox"/> 2C.Floors and galleries <input type="checkbox"/> 2D.Stairs, balustrades, ramps <input type="checkbox"/> 2E.Roof <input type="checkbox"/> 2F.Frames <input type="checkbox"/> 2G.Windows and external doors <input type="checkbox"/> 2H.Internal doors <input type="checkbox"/> 3.Finishes <ul style="list-style-type: none"> <input type="checkbox"/> 3A.Wall finishes <input type="checkbox"/> 3B.Floor finishes <input type="checkbox"/> 3C.Roof finishes <input type="checkbox"/> 3D.Ceiling finishes <input type="checkbox"/> 4.Services <ul style="list-style-type: none"> <input type="checkbox"/> 4A Refuse disposal <input type="checkbox"/> 4B.Drainage <input type="checkbox"/> 4C.Hot and cold water <input type="checkbox"/> 4D.Gases <input type="checkbox"/> 4E.Refrigeration <input type="checkbox"/> 4F.Space heating <input type="checkbox"/> 4G.Ventilation and air conditioning <input type="checkbox"/> 4H.Power <input type="checkbox"/> 4I.Lighting <input type="checkbox"/> 4J.Communications installations <input type="checkbox"/> 4K.Transport (lift and conveyor installations) <input type="checkbox"/> 4L.Security (protective installations) <input type="checkbox"/> 5.Furnishings (fittings and loose equipment) <input type="checkbox"/> 6.External works and services <input type="checkbox"/> Other 	Other: Power supply
21b	Other type of defective component (only if you choose 'other' on 21a)	<p>Text</p> <ul style="list-style-type: none"> <input type="checkbox"/> (please fill in) 	
22a	Failed building component	Predefined categories	

		<input type="checkbox"/> Same is defective component <input type="checkbox"/> Other component <input type="checkbox"/> Don't know	
22b	Other failed component, namely.... (only if you choose 'other' with 22a)	Text <input type="checkbox"/> (please fill in)	
23	DESCRIPTION OF THE CONSEQUENCES/EFFECTS OF THE DEFECT/FAILURE <i>Note: here the most relevant types of consequences/effects for insurers are categorized.</i>	Predefined categories: <input type="checkbox"/> Lack of performance of the eco-technology with regard to energy yield <input type="checkbox"/> Material damage to the eco-technology itself <input type="checkbox"/> Material damage to the building (for instance, leak caused by a PV panel) <input type="checkbox"/> Other damage to third parties (including situations with a risk for health and safety). <input type="checkbox"/> Other consequences/effects <input type="checkbox"/> Don't know	Material damage to the building
24	Was the defected product repaired or replaced?	Predefined: <input type="checkbox"/> Repaired <input type="checkbox"/> Replaced <input type="checkbox"/> Not yet <input type="checkbox"/> No <input type="checkbox"/> Don't know	Not yet
25a	HAS THE CAUSE OF THE DEFECT/FAILURE BEEN ANALYSED, OR IS IT KNOWN?	Boolean yes/no, plus empty field for free memo text <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Don't know	Yes
25b	IF YES, WHAT HAS BEEN THE CAUSE (GLOBAL OR IN DETAIL)? <i>Note: The categories are based on typical categories of failures in construction. We do not ask for who is responsible for the defect/failure. But if the responsibility has been determined (for example by arbitrage, by the court or otherwise), this can be mentioned in 'other'. You can choose also to indicate the type of actor who is held responsible (installer, designer, manufacturer, user, etc.)</i>	Predefined categories (multiple answers possible) <input type="checkbox"/> Requirements management (change in clients' requirements, misunderstanding of the effectiveness of the technology, poor project management, inaccurate engineering or architectural data) <input type="checkbox"/> (Pre)design errors <input type="checkbox"/> Product manufacture and delivery issues (faulty manufacture, late delivery, storage issues, awkward packaging, poor transport of product) <input type="checkbox"/> Construction/installation problems (incorrect installation documentation, failure in installation, poor workmanship, misuse of products, inadequate supervision, commissioning failure, vandalism)	Construction/installation problems

		<input type="checkbox"/> Operational failure (product failure once installed, incorrect user documentation) <input type="checkbox"/> Maintenance errors <input type="checkbox"/> Ageing and degradation (biological, chemical, physical, mechanical) <input type="checkbox"/> Other cause for defect/failure <input type="checkbox"/> Cause not yet known <input type="checkbox"/> Don't know	
25c	Other, namely	Text <input type="checkbox"/> (please describe the cause)	
Quality signs and qualifications			
26a	Were there quality signs in place at time of construction, related to the eco-technology?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Don't know	Yes
26b	Type of quality sign related to the defect/failure for the product/ material/ system in place at time of construction (if 26a answered with 'yes')	Predefined categories (multiple answers possible) <input type="checkbox"/> Quality sign(s) for works in place (or whole buildings) <input type="checkbox"/> Quality sign(s) for product(s) in place <input type="checkbox"/> Quality sign(s) for systems in place <input type="checkbox"/> Quality sign(s) for competence(s) of construction actors in place <input type="checkbox"/> Don't know	Products and competences
26c	Name of quality sign (if known) (if 26a answered with 'yes')	Text <input type="checkbox"/> (please enter the name(s) of the quality sign(s) in place at time of construction)	Qualibat, Avis Technique
27	Is the contractor/installer specialized in that technology?	Predefined categories (multiple answers possible) <input type="checkbox"/> Yes, <5 years experience <input type="checkbox"/> Yes, 5-10 years experience <input type="checkbox"/> Yes, >10 years experience <input type="checkbox"/> The installer/contractor is certified or recognized by an independent organisation for this technology or activity. <input type="checkbox"/> No or hardly any experience <input type="checkbox"/> Don't know	5-10 years of experience
28	How to avoid or prevent the defect/failure (lessons learned, prevention measures)	Free memotext <input type="checkbox"/> (please fill in)	Don't know
29	Here you can add any other comments or remarks you want to make.	Free memotext <input type="checkbox"/>	

	fieldnr	name of the field	Input screen			output screen		
			applicability of question in relation to another question	mandatory to fill in on input screen	explanation needed (by means popup)	complete description of a pathology case	visible in output screen after selection of criteria	sorting possible?
unique record key	1	System serial number		autom. generated		x		
	2	Name of information provider (name of the organisation)		yes		x		
	3	Dossier code (internal code) of the information provider for this pathology case.		no		x		
	4	Date of filling in this pathology record		autom. generated		x		
source	5	Type of source for the description of the pathology case		yes		x	x	yes
	6	Name/title of the source for the description of the pathology case (title of report, website link, etc.)	only if you choose 'Inspection report' or 'Literature' on 5	yes		x		
Details of the construction work where the eco-technology is installed and the defect/failure occurred	7	Name of construction work or project, where the defect/failure occurred		no		x		
	8	Country or countries where the construction work or project is executed		yes		x		
	9 a	Do you know the town where the construction work or project where the defect/failure has occurred?		no		x		
	b	Town where the construction work or project is executed	only if you choose yes on 9a	no		x		
	10 a	Geo-climatic character of the location of the construction work of project		no		x		
	b	other, namely	only if you choose 'other' with 10a	no		x		
	11 a	Type of construction work - New or existing building?		no		x		
	b	Type of construction work (function/other building / don't know)		no		x		
	c	Presence of risk (intrinsic/extrinsic/no special risks/don't know)		no		x		
	12	Starting date of the work		no		x		
	13	End date of the work		no		x		
	14 a	Has the construction work or project been completed? (yes/no/don't know)		no		x		
	b	Was there a completion survey for the handover of the construction work/project to the client?	only if you choose 'yes' on 14a	no		x		
	c	If yes, what was the date of the completion survey?						
	15	Was a Technical Inspection Service (TIS) contracted for this project? (yes/know/don't know)		no		x		
Eco-technology	16	Type of eco-technology (material/product/ system) that was involved in the defect/failure		yes		x	x	yes
	17	Specific type of eco-technology (if known)		no		x		
Description of the defect/failure	18	Date of the defect/failure/damage (year)		no		x		
	19	General description of the pathology, including the defect/failure, the defective part, the consequences/effects and the causes		yes		x		
	20	Type of defect/failure		yes		x	x	yes
	21 a	Defective building component		no		x		
	b	Other type of defective component, namely	only if you choose 'other' on 21a	no		x		
	22 a	Failed building component		no		x		
	b	Other failed building component, namely ...	only if you choose 'other'	no				
	23	Type of consequence/effects of the defect/failure (4 categories multiple list)		yes		x	x	yes
	24	Was the defected product repaired or replaced?		no		x		
	25 a	Has the cause of the defect/failure been analysed, or is it known? (yes/no/don't know)		yes		x		
	b	If yes, what has been the cause (global or in detail)?	only if you choose 'yes' on 25a	yes 'under condition'		x	x	yes
c	Other, please describe the cause	only if you choose 'other' on 25b	yes 'under condition'		x			
Quality signs and qualifications	26 a	Were there quality signs in place at time of construction? (yes/no/don't know)		no		x		
	b	Type of quality sign related to the defect/failure for the product/material/system in place at time of construction	only if you choose 'yes' on 26a	no		x		
	c	Name of quality sign if known	only if you choose 'yes' on 26a	no		x		
27	Is the contractor/installer specialized in that technology?		no		x			
Lessons learned	28	Lessons learned: How to avoid or prevent the defect/failure (lessons learned, prevention measures)		no		x		
Other comments/remarks	29	Other comments or remarks		no		x		

Management of building pathologies cases

Once the contributor is logged in, he can access all the cases he made before in a list. He can as well create a new case.

An administrator can see all the building pathology cases made by contributors and himself.

List view of cases

A contributor can only manage his own cases, and the list is composed of his cases.

The list of cases displays the following data:

- Type of eco-technology
- Type of defect/failure
- Cause(s)
- Effect/consequences
- Type of source

The list has to be paginated; by default ten cases are displayed by page. Whereas this number can be changed by the user and be adapted to its screen size.

Links « Next » and « Previous » are available at the end of the list. On the same line below the list of cases, the total number of elements is given.

All the columns of the list have to be sortable.

Data entered into the search section have to be kept by the system till the press of the button Reset.

Number of results displayed (by default: 10):

RESULTS OF THE SELECTION CRITERIA					
Type of eco-technology ▲▼ (sorting)	Type of defect/failure ▲▼	Cause(s) ▲▼	Effect/consequences ▲▼	Type of source ▲▼	
heat pump	functional failure	product manufacture	Lack of performance with regard to energy yield	literature	▲
heat pump	system failure of components	other	Material damage of the building	claim	▼
Total numer of hits: 2					

EXPORT

when you click on a line you get a pdf with the complete description of the pathology case

From this list, possible actions allowed for contributors (only on their own cases) or administrators are:

- The view of the detail sheet of the selected case
- The modification of the data for the selected case
- The publication or the unpublication of a case
- The deletion of the selected case
- The PDF export of a case

All those actions are represented by icons supplied by an indicative bubble. All icons are gathered in a toolbox provided at the end of each line of case.

A button « EXPORT » triggers an export in Excel format of the displayed cases. The cases may be the result of a search.

Important search functionality is provided, see section *Search function*.

Search functionality

The search section will be available on the public part of the WP2 website, but also to contributors and administrators. The search is multi criterion and there is no criteria mandatory. All the criteria are provided with a default value (see Figure 4: search form) and this default value can be easily set by user. For the request to the database, all criteria are separated with a “AND” close.

PRINT

FREE SEARCH

In the following table you can specify the criteria for selecting the pathology cases:			
items	= / ≥ ≤	selection criteria	remark
Type of eco-technology - category	=	predefined categories, plus empty field for free search text	all eco-technologies by default
Specific type of eco-technology		<input style="width: 90%;" type="text" value="free search text, for example *insulation*"/>	
Countries where the construction work of project were executed	=	predefined categories	all countries by default
Geo-climatic character of the location of the construction work or project	=	predefined categories, plus empty field for free search text	all geo-climatic characters by default
		<input style="width: 90%;" type="text" value="free search text, for example *facade*"/>	
Type of construction work	=	predefined categories, plus empty field for free search text	all construction works by default
		<input style="width: 90%;" type="text" value="free search text, for example *office*"/>	
Works/projects executed between and	≥ ≤	≥ <input style="width: 40%;" type="text" value="01-05-2010"/> ≤ <input style="width: 40%;" type="text" value="01-07-2012"/>	default selection: ≥ 01-01-1970 ≤ present
Date of the defect/failure	≥ ≤	≥ <input style="width: 40%;" type="text" value="01-01-2011"/> ≤ <input style="width: 40%;" type="text" value="01-12-2011"/>	default selection: ≥ 01-01-1970 ≤ present
Type of defect/failure	=	predefined categories, plus empty field for free search text	all defects/failures by default
		<input style="width: 90%;" type="text" value="free search text, for example *warranty*"/>	
Defective/failed building component	=	Predefined categories	all components by default
Consequences/effects of the defect/failure	=	Predefined categories	all conseq. by default
Cause of the failure/defect	=	predefined categories, plus empty field for free search text	all causes by default
		<input style="width: 90%;" type="text" value="free search text, for example *installation*"/>	
Quality signs involved	=	Predefined categories selection on specific type of quality sign: <input style="width: 80%;" type="text" value="name of the sign"/>	all signs by default
Lessons learned	=	<input style="width: 90%;" type="text" value="free search text, for example *control*"/>	

OK

Figure 4: search form

Results screen

After selection of the criteria, the pathology cases that conform to the criteria are displayed. See figure 5.

Number of results displayed (by default: 10):

RESULTS OF THE SELECTION CRITERIA					
<i>Type of eco-technology</i> ▲▼ (sorting)	<i>Type of defect/failure</i> ▲▼	<i>Cause(s)</i> ▲▼	<i>Effect/consequences</i> ▲▼	<i>Type of source</i> ▲▼	
heat pump	functional failure	product manufacture	Lack of performance with regard to energy yield	literature	▲
heat pump	system failure of components	other	Material damage of the building	claim	
					▼

Total number of hits: 2

when you click on a line you get a pdf with the complete description of the pathology case

Figure 5: Results screen.

Detail view of a pathology case

Detail of a pathology case is open to all and it is the same view as the one provided in the public part of the website. This view lists all the data of a building pathology case. From this detail view a link allows to export the sheet into PDF format.

Pathology sheet (as pdf, when you click on a line in the results-screen)

Name of information provider: NHBC
Date of filling in this pathology record: 2013-12-13
Source
Type of source for the description of the pathology case: Inspection report
Name/title of the source: www.greentower.uk
Construction work where the eco-technology is installed and the defect/failure occurred
Name of construction work or project: The Green Office Tower
Country or countries: UK
Town: London
Geo-climatic character: Near the coast
Type of construction work : New / Office building / high intrinsic technical risks
Starting date of the work : 2010-01-01
End date of the work : 2012-01-01
Has the construction work or project been completed?: yes
Was there a completion survey: yes
If yes, what was the date of the completion survey? 2011-12-30
Technical Inspection Service (TIS) contracted?: no
Eco-technology
Type of eco-technology involved in the defect/failure: PV-panels
Specific type of eco-technology: Superimposed PV panels
Description of the defect/failure
General description of the pathology: defective power supply caused fire
Type of defect/failure: System failure of components
Defective building component: Other: power supply
Failed building component: Other: PV-panel
Type of consequence/effect: Material damage to the building
Was the defected product repaired or replaced?: Not yet
Has the cause of the defect/failure been analysed, or is it known?: Yes
If yes, what has been the cause (global or in detail)?: Construction/installation problems
Other, please describe the cause:
Quality signs and qualifications
Were there quality signs in place at time of construction?: yes
Type of quality sign related to the ecotechnology: Products and competences
Name of quality sign: Qualibat, Avis Technique
Is the contractor/installer specialized in that technology?: 5-10 years of experience
Lessons learned: Don't know
Other comments or remarks:

Figure 6: Example of a PDF export of a building pathology sheet

This function allows all the data contained by a building pathology case into one PF sheet. This functionality will be provided by the public part of WP2 website. The sheet has to follow the given template at Figure 6: Example of a PDF export of a building pathology sheet.

Modification of a case

This function is allowed for a contributor on for its own cases. The same screen that the input screen is displayed populates with the original data of the case to modify.

Publish / unpublish cases

This function is allowed for a contributor for its own cases. Only a published sheet appears among the list of available cases in the front-office (public part of the website). This function allows contributors to only publish a sheet when it is completed. This function is especially useful during testing period to not make available hazardous data.

Deletion of cases

This function is allowed for a contributor for its own cases. This function removes a case from the database. An Alert window has to pop up asking confirmation before the deletion process is launched.

« EXPORT »

Export button allowed (all) user to export some data (to define) of building pathologies sheets in an Excel table.

3. Specifications for part 2 of the EQEO: 'Warning procedure'

Regarding the Warning Procedure, the idea is being able to gather and communicate the existing information ('rapidly'). The form has really no importance.

For the warning a very simple database structure is proposed:

- Name of the organisation / person who is doing the warning;
- Description of the eco-technology for which the warning is given;
- Description of the warning;
- Indication of the risk:
 - there is a clear and immediate risk for health and safety;
 - there is a clear and immediate risk for severe economic damages (one such case may lead to significant direct or indirect damages);
 - at this moment there is no clear and immediate risk for health and safety and/or severe economic damages, but maybe in future with widespread use.
- Possibility to add attachments.

4. Specifications for part 3 of the EQEO: the extract of the Quality Signs inventory

When quality signs associated to the pathology record are available, they will be recorded as well. These signs may concern construction products, construction systems, qualifications, performances of works.

Quality signs that are also recorded in the ELIOS2 quality signs directory will be indicated.

5. Results of the validation of the proposed database architecture

The pathology database architecture has been tested by filling it with information from two pathology cases. The resulting 'pathology sheets' are given hereunder.

Pathology sheet for case 1: solar panels with a fire risk

Name of information provider:	BBRI
Date of filling in this pathology record:	2013-09-10
Source	
<i>Type of source for the description of the pathology case:</i>	Based on literature, research papers, defect information sheets, website
<i>Name/title of the source:</i>	www.vwa.nl "NVWA warns for flammable solar panels"
Construction work where the eco-technology is installed and the defect/failure occurred	
<i>Name of construction work or project:</i>	15 known cases in EU
<i>Country or countries:</i>	several European countries
<i>Town:</i>	15,000 installations placed in Netherlands
<i>Geo-climatic character:</i>	Don't know
<i>Type of construction work:</i>	New and existing Individual housing/dwellings
<i>Starting date of the work:</i>	Don't know
<i>End date of the work:</i>	Don't know
<i>Has the construction work or project been completed?:</i>	Yes
<i>Was there a completion survey:</i>	Don't know
<i>If yes, what was the date of the completion survey?</i>	
<i>Technical Inspection Service (TIS) contracted?:</i>	Don't know
Eco-technology	
<i>Type of eco-technology involved in the defect/failure:</i>	Photovoltaic panels (PV's)
<i>Specific type of eco-technology:</i>	Polycrystalline Superimposed PV panels, Types Multisol P6-48, P6-54, P6-60 and P6-66`, supplied in the period August 2009 to February 2012 by Scheuten Solar Systems.
Description of the defect/failure	
<i>General description of the pathology:</i>	In these solar panels there is a faulty electrical connection that is flammable. These solar panels have caused 15 roof fires in several EU countries. A cable in the junction box behind the solar panel makes a poor contact with the PCB. This may cause sparks and can make the housing of the terminal box damage, melt and smolder. Then sparks can skip to the roof and cause fire. This risk increases as the sun gets stronger and as the solar panels age.

<i>Type of defect/failure:</i>	Defect or failure of materials
<i>Defective building component:</i>	Power supply of PV-panel
<i>Failed building component:</i>	PV-panel
<i>Type of consequence/effect:</i>	Material damage to the eco-technology itself / Material damage to the building
<i>Was the defected product repaired or replaced?:</i>	Not yet
<i>Has the cause of the defect/failure been analysed, or is it known?:</i>	Yes
<i>If yes, what has been the cause (global or in detail)?:</i>	Other
<i>Other, please describe the cause:</i>	Faulty electrical connection in the junction box behind the PV-panels causes sparkes and makes the housing of the terminal box melt and smolder. The risk increases as the sun gets stronger or as the PV-panels age.
Quality signs and qualifications	
<i>Were there quality signs in place at time of construction?:</i>	Yes
<i>Type of quality sign related to the ecotechnology:</i>	Don't know
<i>Name of quality sign:</i>	Don't know
<i>Is the contractor/installer specialized in that technology?:</i>	Don't know
Lessons learned:	For now a good solution hasn't been found. When a save method is available the NVWA will post it on its website www.nvwa.nl . Owners of the PVinstallations are to be advised to contact a installer and to have their installation safely turned off by an installer (risk for electroshock!).
Other comments or remarks:	The manufacturer went bankrupt and neglects to take appropriate measures and/or responsibility in this case.

Pathology sheet for case 2: Cellulose insulation waddings with a health risk

Name of information provider:	BBRI
Date of filling in this pathology record:	2013-09-10
Source	
<i>Type of source for the description of the pathology case:</i>	Literature, research papers, defect information sheets, website
<i>Name/title of the source:</i>	AQC and authority information www.qualiteconstruction.com "Procedures for thermal cellulose wadding insulation" (January 2013); www.sante.gouv.fr "Isolants à base de ouate de cellulose adjuvants d'ammonium" (July 2013)

Construction work where the eco-technology is installed and the defect/failure occurred	
<i>Name of construction work or project:</i>	General information
<i>Country or countries:</i>	France
<i>Town:</i>	Don't know
<i>Geo-climatic character:</i>	Don't know
<i>Type of construction work:</i>	New and existing Individual housing/dwellings
<i>Starting date of the work:</i>	Don't know
<i>End date of the work:</i>	Don't know
<i>Has the construction work or project been completed?:</i>	Don't know
<i>Was there a completion survey:</i>	Don't know
<i>If yes, what was the date of the completion survey?</i>	
<i>Technical Inspection Service (TIS) contracted?:</i>	Don't know
Eco-technology	
<i>Type of eco-technology involved in the defect/failure:</i>	Insulation made of biomaterials
<i>Specific type of eco-technology:</i>	Cellulose insulation waddings (with addition of ammonium salts), used as thermal insulation in homes that can be blown in lost roofs , blown into walls or projected by flocking. (Ammonium salts are chemical substances. They are used to reduce the risk of fire by making the treated materials more fire resistant. In the case of insulation based an adjuvanted cellulose wadding with ammonium salts , they represent 5 to 10% of the total mass of the wadding.)
Description of the defect/failure	
<i>General description of the pathology:</i>	As such , the ammonium salts are not toxic. However , in humid weather conditions , such salts can react with water molecules and produce ammonia, which is in the gaseous state under normal ambient conditions (temperature and pressure). Ammonia is an irritant gas. Inhalation of ammonia has a health risk. After a short exposure , ammonia can cause irritation or burns to the eyes and respiratory mucosa . Exposure to ammonia can cause coughing , shortness of breath or bronchiolitis . At high concentrations , the inhalation of ammonia may be characterized by severe respiratory effects, for example respiratory distress. Due to the high volatility of ammonia , it spreads preferentially in the attic rather than residential premises, however it is possible that it enters the living room. Moreover, the ammonium salts are used for their flame retardancy (either flame retardant),

	their degradation - and thus their loss of efficiency - may increase the risk of fire.
<i>Type of defect/failure:</i>	Irreversible defect/failure
<i>Defective building component:</i>	External Wall / Internal Wall / Floors and galleries / Roof
<i>Failed building component:</i>	Same as defective component
<i>Type of consequence/effect:</i>	Other damage to third parties (including situations with a risk for health and safety).
<i>Was the defected product repaired or replaced?:</i>	Don't know
<i>Has the cause of the defect/failure been analysed, or is it known?:</i>	Yes
<i>If yes, what has been the cause (global or in detail)?:</i>	Other
<i>Other, please describe the cause:</i>	Construction/installation problems. Ageing and degradation (biological, chemical, physical, mechanical)
Quality signs and qualifications	
<i>Were there quality signs in place at time of construction?:</i>	Yes
<i>Type of quality sign related to the ecotechnology:</i>	Products / competences
<i>Name of quality sign:</i>	Don't know
<i>Is the contractor/installer specialized in that technology?:</i>	Don't know
Lessons learned:	www.qualiteconstruction.com . Prescribers and installers are invited to contact their insurance company if they want to install this type of insulation. www.sante.gouv.fr . The use of cellulose insulation with addition of ammonium salts is prohibited as of June 21st 2013. If you want to remove the cellulose insulation from your building, please contact the manufacturer or the French syndicate of manufacturers.
Other comments or remarks:	