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MaTrID: Market Transformation Towards Nearly Zero Energy Buildings Through Widespread Use of Integrated Energy Design



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With contributions from the whole MaTrID-team.

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Project webpage

www.integrateddesign.eu

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Summary

About the project

The IEE-project MaTrID – market transformation towards nearly zero energy buildings through widespread use of integrated energy design – started in June 2012 and ended in December 2014. The project aimed to support the implementation of the Directive on the Energy Performance of Buildings. In this context the building design phase is of particular importance. Integrated Design (ID) in general is the most appropriate approach to reduce the complexity of the design process and to facilitate the interactions between the members of the design team. ID allows them to provide the best solution for the whole building. It is not limited to energy efficiency and goes beyond this issue. The greatest benefits are provided only if applied in the earliest stages of the project, when changes to the design are still easy to implement.

Integrated Design for nearly zero energy buildings

A major challenge for property owners, public authorities and developers is the **implementation of NZEBs in the near future**. The Energy Performance of Buildings directive (EPBD) applies to new constructions and buildings undergoing a major renovation and means that the properties will be built with an energy demand close to zero. This means that in less than one decade all new buildings will have to demonstrate very high energy performances and their reduced or very low energy needs will be significantly covered by renewable energy sources.

The **design of a NZEB requires an interdisciplinary approach**. Reducing the energy demand in buildings requires specifications for different designers and engineers, such as architects, building physics or façade designers. For this reason, the introduction of an interdisciplinary design team in the very early planning phase is fundamental for the successful design of NZEBs. In this context the building design phase is of particular importance.

Integrated Design is an approach that considers the design process as well as the physical solutions. The **overall goal** is to **optimize buildings** as whole system **throughout the lifecycle**. For the purpose of reaching high sustainability performance, the alternative building and technical solutions should be developed and discussed by an *integrated*, multidisciplinary team. ID emphasizes a decision process rooted in informed choices with regard to the project goals, and on systematic evaluation of design proposals. This approach for building design is paralleling the principles of environmental management referred in the international ISO 14001 standards. Here, identifying and prioritizing goals and developing an evaluation plan with milestones for follow-up, are central issues.





Following Figure 1 indicates the importance of the Integrated Design process at the early phases. Therefore, a shift of work load and enhancement to the early phases very likely will pay off in the lifecycle of the building.



Figure 1: Early design phases offer opportunity for large impact on performance to the lowest costs and disruption. (Source: ID Process Guide. <u>www.integrateddesign.eu</u>).

Experience from building projects applying ID shows that the investment costs may be about 5% higher, but the **annual running costs will be reduced** by as much as 40-90 %. The process of ID emphasizes that the performance of buildings should be assessed in a lifecycle perspective, both regarding costs and environmental performance.





More about the project, Integrated Design and the ID tool-kits can be found at <u>www.integrateddesign.eu</u>.

MaTrID	Market Transformation Towards Nearly Zero Energy Buildings Through Widespread Use of Integrated Energy Design		
Runtime	June 2012 – December 2014		
Budget	1.2 Mio. EUR		
EU contribution	75%		
Associated Directive	Energy Performance of Buildings Directive (2010/31/EU)		
No. of project partners	11		
Major Outputs	Establishing a common understanding among building developers and designers with respect to IED;		
	European Integrated Design Tool-Kit;		
	11 national ID Tool-Kits;		
	160 seminars with stakeholders and 4 expert training sessions ;		
	Large scale test for integrating IED in design processes in 10 partner countries resulting in 24 pilot projects with 260,000 m ² ;		
	Policy recommendations;		
	120 presentations; 60 publications;		
	GreenBuilding Integrated Design Award 2014.		
Impact	1+ mio. people reached;		
	Additional renewable energy: 0.7 Mtoe/y (2013-2020);		
	Primary Energy savings: 2.3 Mtoe/y (2013-2020);		
	Reduction of GHG-emissions: 1.2 Mt CO_2e/y (2013-2020).		





Project partners

Austria	e7 Energie Markt Analyse GmbH Klemens Leutgöb www.e-sieben.at	ENERGIE MARKT ANALYSE
Greece	National and Kapodistrian University of Athens (U.o.A) Theoni Karlessi www.uoa.gr	ATIONAL & KAPODISTRIAN
Italy	Politecnico di Milano (eERG) Marco Pietrobon www.eerg.it	e erec .a module Efficiency Research Group Greps & forma all infects of enga
Portugal	CEEETA-ECO, Energy Consultants, Ltd Carlos Laia www.ceeeta-eco.pt	
Norway	Asplan Viak AS Per F. Jørgensen www.asplanviak.no	osplan viak
Sweden	KanEnergi Sweden AB Ronnie Hollsten www.kanenergi.se	Kan energi
Slovenia	Gradbeni inštitut ZRMK, d.o.o. Center za bivalno okolje, gradbeno fiziko in energijo Marjana Šijanec Zavrl www.gi-zrmk.si/ZRMKinstitut/	Gradbeni inštitut ZRMK Building and Civil Engineering Institute
Slovakia	Slovenská inovačná a energetická agentúra (SIEA) Eduard Jambor www.siea.sk	
Poland	Narodowa Agencja Poszanowania Energii (NAPE) Jerzy Kwiatkowski www.nape.pl	National Energy Conservation Agency
Latvia	SIA "Ekodoma" (EKODOMA) Agris Kamenders www.ekodoma.lv	RIGA J J sia EKODOMA
United Kingdom	Building Research Establishment Ltd (BRE) Andy Sutton www.bre.co.uk	bre





1 Success stories in partner countries

United Kingdom

Through the project, it is now possible to score BREEAM "Innovation Credits" for demonstrating that the use of the Integrated Design approach described in MaTrID has realised improvements to the building design. BREEAM credits are also available for site agents who have achieved the Site Sustainability Manager course related to the work done in MaTrID, and finally the awarding of BREEAM 'normal' credits for Integrated Design use is to be considered for future revisions of BREEAM.

As a result of the MaTrID project, BRE have strengthened their consultancy offering around early sustainability design advice under the heading "**Client Sustainable Design Advisor**". This consultancy service will continue to be offered to the UK industry by the BRE, providing support on (amongst other things) the use of Integrated Design. One notable appointment where the client specified the MaTrID project as being a key factor is for the University of Wales Trinity St David's new Swansea Campus; this project is likely to see buildings being developed for upwards of a decade, and with a drive for Integrated Design embedded in all of them.

Norway

ID has a very strong commitment in Norway, in the areas where sustainable building is being pushed. There has been high building activity in recent years, including the period of the MatrID project, and also the environmental ambitions have been a major factor in building programmes etc. As part of this, ID has been advocated by leading actors (researchers as well as practitioners), and **is regarded as "best practice" design methodology**. However, in more traditional settings, architects often view their role as representing the multidisciplinary expert, who will not have any gain from consultant advice in designing the concept of a building. The next phase, therefore, in setting goals for spreading ID in the Norwegian context, will be to make ID mainstream practice. Asplan Viak will **continue to work towards implementing ID** in its own organization as well as together with external actors, in building projects with high environmental goals, but hopefully also in more ordinary projects.





Sweden

The demand for seminars soon became high and we immediately got a huge positive response. Property owners and architects liked that we came to them and spoke about IED. Several of our seminars also led on to direct consequence assignments energy **studies of the building envelope**, delivery systems, and others.

Austria, Greece, Italy and UK

A strong cooperation between MaTrID and AIDA could be established. About **10 events** were performed in common. Especially important to mention is the common training session on IED with experts in Vienna. More information can be found at: <u>www.integrateddesign.eu/toolkits/workshops.php</u>.





2 The ID Tool-Kit

2.1 The European ID Tool-Kit

During the past 2.5 years an easily applicable European ID tool-kit has been developed. The tool-kit consists of an *ID Process Guide*, a *Tenant Brief*, a *Client Brief*, a *Supplement on Remuneration Models* and a *Supplement on Case Studies and Lessons learned* (see Figure 2). This tool-kit helps to get all stakeholders started in the very early planning phase. The guidelines and its supplements address clients, contractors, engineers from all disciplines and facilitators to learn about the benefits from application of an Integrated Design approach. Also the ID Tool-kit has been translated and adapted to 11 national regulations and circumstances.



Figure 2: The ID Process Guide (Source: The ID Process Guide; <u>www.integrateddesign.eu</u>).





The relevance of the concept is based on the well-proven observation that changes and improvements of the design are relatively easy to make at the beginning of the design process, but become increasingly difficult and disruptive as the process unfolds.

Thus, the performance of buildings should be assessed in a lifecycle perspective, both regarding environmental performance (LCA) and costs (LCC). The ID model of collaborative design emphasizes that the very early phases of design need more attention because well informed decisions here will pay off in the rest of the building process, as well as through into the lifecycle of the completed building. Well informed planning from the start can allow buildings to reach very low energy use and reduced operating costs at very little extra capital cost, if any.

When considered against the whole life cycle of a building, the running costs are significantly higher than construction and refurbishment costs; thus, it becomes obvious that it is a short-sighted approach to squeeze the first design phase regarding resources. Experience from building projects applying ID shows that the investment costs may be about 5 % higher, but the annual running costs will be reduced by as much as 40-90 % (see Figure 3).

TASKS	COSTS	COMMENTS
Concept and Pre-design	5 -10 % more	Based on experience
Detailed engineering	< 5 % more the first projects 5-10% less in the next projects	Based on experience – smoother process caused by more detailed concept design
Building costs	5 – 10 % more	3-6 % for Passive houses
Operational costs	40 – 90 % less	Based on experience
Building faults	10 – 30 % less	Because of better plan- ning and better follow up during construction

Figure 3: Estimations of increased/ reduced costs connected to ID (Source: The ID Process Guide; www.integrateddesign.eu).





The ID process has been prepared in an easily applicable step-by-step manner (see Figure 4) with comprehensive explanation. All documents can be found at <u>www.integrateddesing.eu</u>.



Figure 4: Overview of the ID process. The creative problem solving process (2) runs parallel in time with monitoring the progress according to the goals (3) (Source: The ID Process Guide; <u>www.integrateddesign.eu</u>).

2.2 National ID Tool-Kits

The European ID Tool-Kit was translated and adapted to the national requirements and circumstances of 11 MaTrID project partners. All national ID Tool-Kits can be found at <u>www.integrateddesign.eu/toolkits/national_markets.php</u>.



Figure 5: Example cover pages of the Austrian and Latvian IED Tool-Kits (Source: http://www.integrateddesign.eu/toolkits/national_markets.php).





3 Lessons Learned

The design of NZEB requires an interdisciplinary approach already in the design phase. Specifications from involved architects, construction engineers and facade designers are required. For this reason, the early introduction of a design team is compulsory for the design of NZEBs. In this context the building design phase is of particular importance.

Integrated Design, ID, is a valuable assisting approach to reduce the complexity of the design process to identify benefits and drawbacks of alternative design concepts. ID also allows decision makers to act based on transparent facts. Only if ID is applied from the very beginning of the design phase it can assumed that a cost-effective solution for NZEB can be identified, as only at the early design phases changes of the general design concept can be implemented at low cost. The application of ID is part of the best way towards the intended NZEB at low cost.

Integrated Design is an approach that considers the design process with an overall goal of optimizing buildings as whole systems throughout the lifecycle. Initially, for the purpose of reaching high sustainability performance, the alternative construction and technical solutions should be developed and discussed by an integrated, multidisciplinary team. ID emphasizes a decision process rooted in informed choices with regard to the project goals, and on systematic evaluation of design proposals.

This approach for construction design is paralleling the principles of environmental management referred in the international ISO 14001 standards. Both in ID and ISO14001, identifying and prioritizing goals, and developing an evaluation plan with milestones for follow-up, are central issues.

To succeed with an ID process, it is important that overall energy issues are discussed already in the initial planning phase. It is important that the client understands the advantages of using the ID process in conjunction with planning. It is important that a multidisciplinary team with energy skills becomes involved as early as possible in the planning process in order to influence the design. A successful planning process ensures a cost-effective energy optimization.

Once the ID process is in place, the results will depend on how well the design team can communicate and work together during the planning phase.





The outcome of the pilot projects have been analyzed using the SWOT method. See results in Table 1. A SWOT analysis is a structured method used to evaluate strengths, weaknesses, opportunities and threats involved in a project or process.

Table 1: Results from the MaTrID pilot projects have been analyzed by the SWOT method (Source: Lessons learned from good practice examples; www.integrateddesign.eu/downloads/index.php).

Strengths	Weaknesses	Opportunities	Threats
ID is an Iterative process which secures that all energy related issues will be handled before the process leave for the next step The outcome of the planning process will be more thorough and consist of fewer contradictions and inconsistencies. This in turn will result in fewer last minute changes and fewer building faults	Relatively unknown in the construction industry Difficult to change traditional way of planning and constructing Demands good communication Demands an ID facilitator, which is a new role in the planning process The project manager needs to share responsibility and mandate to the ID facilitator Increased planning costs	EU directive about NZEB will increase the market for NZEB buildings and ID is an effective method for reaching NZEB energy demands The ID process gather expertise from different work fields resulting in synergies Fewer last minute changes and fewer building faults will show that in total the ID process is cost effective Future improvements of the method is relatively simple, e.g. it would be easy to add a process for increased accessibility for disabled people	Lack of knowledge and information about ID and the benefits using it among stakeholders Difficulties in finding the right way of using ID for each single project Client willingness of paying more for the planning process For best results it is important to use ID from the very beginning of the project, preferably even before there is a drawing. This can be a threat, as many projects demand a drawing to achieve funding

To succeed with an ID process and construct buildings with near-zero energy requirements, it is crucial that the process is involved as early as possible, preferably already in the initial planning phase. The client's understanding of advantages from using the ID process in conjunction with planning is of highest importance as that will result in enough mandate for the design team to fully succeed. For a cost effective energy optimized design, it is important that an ID facilitator becomes involved as early as possible in the planning process.

There is a need for more knowledge among and information to public planning officers and potential clients.

All design team members must understand the benefits of ID and how the process works. The awareness about how each member is expected to contribute in the various planning





phases is also of highest importance. A major challenge is to keep the iterative solution methodology throughout the planning phase and not fall back into the traditional way of working, although the former initially takes somewhat more time.

The design team needs to consist of people who can think creatively and have an ability to work across traditional professional areas.

Once the ID process is in place, the results will depend on how well the design team can communicate and work together during the planning phase. Different technical solutions and frequent meetings, in real life or over telephone, will be required.

Recommendations for action:

- Establish a sound cooperation between project developer, main contractor, architect, facade supplier and consultants very early.
- Use ID from the very beginning of the project.
- Prepare your kick-off workshop very well.
- Install an ID facilitator. It might be of advantage to have such an experienced project manager on board.
- Apply a life cycle cost analysis. This can be a powerful tool to support the decision making process.
- Take some time to explain the whole design team how the ID process works and what the benefits are.
- Strike an agreement on a suitable file sharing tool. It turned out that BIM is a useful tool.





4 Training Sessions

In total 4 training sessions with experts were conducted, reaching about 150 stakeholders from all over Europe. Knowledge about processes, goal setting, etc. was presented during training sessions to external stakeholders. Also (draft) guidelines were distributed prior training session. Thus, valuable feedback on presentations and guidelines could be obtained. Thereby the involvement of EU key actors was very important.

Location	Date	Торіс	Explanation
Gothenburg, Sweden	23 May 2013	The European ID Process Guide	Distribution of ID Process Guide draft in advance; Feedback on first draft of ID Process Guide obtained; Relevant questions on ID discussed.
Riga, Latvia	22 Jan. 2014	LCC/LCA in the very early planning phases	Distribution of ID Process Guide draft in advance; Focus was given to input from architects; Plenary discussion on experiences with ID in order to incorporate practical know- how into the ID Process Guide; Obtainment of feedback on the ID Process Guide.
Milan, Italy	5 June 2014	Lessons learned and development policy recommendations	Distribution of ID Process Guide draft in advance; Focus was given to input from communities; Plenary discussion on lessons learned from ID and policy recommendations for WP5; Obtainment of feedback on the ID Process Guide.
Vienna, Austria	26 November 2014	Lessons learned from Integrated Design Processes in practice	Common event with AIDA; Distribution of final ID Process Guide; Sharing lessons learned from good practice across Europe; Securing ID beyond the project scope; training session at the GB ID Award winner "aspern IQ" + visit of the building and construction site.

Table 2: Locations, dates and topics of ID training sessions.



All presentations and minutes can be found at <u>www.integrateddesign.eu/toolkits/workshops.php</u>.



5 Market development with pilot projects

The core of the project was the application of the ID Tool-Kits in the building design phase. This was demonstrated in 24 pilot projects across Europe. Demonstration projects have been accompanied from the first idea of the project until the detailed planning phase. The following issues have been taken into account:

- Suitability for ID;
- Aim of the project to achieve an energy performance close to NZEB;
- Possibility to influence the design process from the beginning;
- Replication potential;
- Size: large projects with a complex design process rather than small projects with simple design processes.

Reports from all demonstration projects can be found at <u>www.integrateddesign.eu/pilot-projects/index.php</u>. These ID projects were carried out in Austria, Greece, Italy, Latvia, Norway, Poland, Slovakia, Slovenia, Sweden and UK. Predominantly service buildings have been accompanied, but also educational institutions, hotels, cultural/arts centres and apartment buildings (see Figure 6).

Real MaTrID pilot projects in m ² per country and building category						
	refurbishment new construction SFH/MFH NRB SFH/MFH NRB		Sum	No. of pilot projects		
Austria				107000	107000	2
Greece		1680		4477	6157	3
Italy			148		148	1
Portugal					0	0
Norway		35000		28780	63780	5
Sweden			12000	4740	16740	3
Slovenia				12000	12000	1
Slovakia	1758		26985		28743	2
Poland	137			8811	8948	2
Lativa	4285				4285	2
UK				8600	8600	3
Sum	6180	36680	39133	174408	256401	24

Figure 6: Real MaTrID pilot projects gross floor area in m² per country and building category (single/multifamily houses; non-residential building).





5.1 Hotels

Hotel in Milos, Greece

Owner: MILOS COVE SA Location: Milos island, Greece Type of the building: five star hotel Gross floor space: 3,800 m2 Investment costs: 4.5 million € Year of completion: to be completed 2016

The construction of a hotel in a coastal area with an archaeological interest which should also have a high energy and environmental performance preserving at the same time the local biodiversity was a major challenge for the design process.



Figure 7: Hotel in Milos (Source: ALD Architects).

The owner in cooperation with the architect, the engineers and the consultants adopted the ID principles from the early stages of the process.

About the ID process: The multidisciplinary team was consisted from the very early phases of the project and this helped to developing good cooperation between the members. Identifying, stating and overcoming problems is a major challenge in the ID processes. The basic steps that are followed are these:

- Kick off meeting with multidisciplinary design team, discussion of needs and demands. Assessment of the current situation by performing reports. Definition of project goals.
- Workshops and meeting between architect, engineers and consultant to propose improvement solutions.
- Meetings with developer to present and discuss the concepts.

Lessons learned from ID process: The agreement of the owner and the design team for proceeding with ID from the early design phase is crucial. The new approaches have to be introduced, defined and incorporated as soon as possible and this demands willingness and good cooperation between the team members. At first the team was sceptical about the procedure, but the positive results and the facilitation of problem solving convinced them about the procedure and the investment.

More information about the project: National and Kapodistrian University of Athens (U.o.A) Theoni Karlessi, <u>karlessith@phys.uoa.gr</u>.





Hotel in Zakopane, Poland

Owner: Qualia Development Location: Zakopane/Poland Type of the building: hotel Gross floor space in: 8,811 m² Year of completion: 2015



Figure 8: Qualia Development sp. z o.o. Biprowłók sp. z o.o.© Hotel Golden Tulip Zakopane

Achievements: The designed new hotel building will replace an existing old hotel. The design was optimized in order to decrease energy consumption and total operational cost. The most innovative features that occurred during this building design process were: feasibility study on building construction and HVAC systems, analysis on life cycle cost and energy efficiency of different external envelopes, heating, cooling and lighting system and energy sources. The ID process was applied in order to achieve those goals.

About the ID process: In the first place when an investor decided to design Golden Tulip Zakopane Hotel the meeting with ID facilitator has been organized. During the meeting investor described his goals in regards to the building and ID facilitator showed the benefits of using ID process. It was decided to use integrated design in the project. The same design team has been working during the whole process starting from design concept up to building documentation. The design team consists of architects, HVAC engineers, investor, energy consultant and ID facilitator. The close cooperation (every two weeks meetings and close cooperation using email and telephone consultation) within design team allowed to increase the effectiveness of the design phase.

Lessons learned from ID process: The most important in using Integrated Design procedure is awareness of the developer/client. In the first step it was useful to present to the client the opportunities and advantages of applying ID process. In such way the cooperation between client, design team and facilitator is much easier and much more analysis on the concept stage can be done. Very important is also good communication within the design team.

More information about the project: Narodowa Agencja Poszanowania Energii (NAPE), Jerzy Kwiatkowski, <u>ikwiatkowski@nape.pl</u>, <u>www.qualia.pl</u>.





5.2 Office Buildings

Service Building, Vienna, Austria

Before initiating the design phase, a "moodboard" was developed together M.O.O.CON by capturing the corporate identity in images which serve as a significant source of inspiration for architects. The Wiener Netze was perceived as: trust worthy, reliable, honest, assertive, practical, tolerant, cooperative. The new building should represent these characteristics in front of clients and the surroundings. To comply with these requirements an anonymous, two-stage competition for general planners was organized in Europe. Since the company's core business is energy supply, the project shall be exemplary without the employees losing their comfort. The target was to build an energy efficient building and to apply renewable energies wisely as well as to make users aware of their usage patterns. Some more details on the project and on the ID process.

- Type of the building: service building
- Gross floor space: 93,000 m²
- Staff: 1,400
- To be completed: 2016
- The administrative building is the biggest building with passive house quality in Europe.
- 50-60% of the energy used comes from renewable energy sources.
- Special emphasize was given to life cycle costs. The method <u>www.lzk-tool.at</u> revealed a high degree of accuracy since the investment costs for the winning project calculated before the competition still remained the same during the final design phase. The LCA helped choosing the right building materials.
- The design team was not composed by the same people during the whole process but the core team accompanied the project through the entire process.
- The multidisciplinary team increased the effectiveness of the design phase. Thanks to their expertise they were able to make decisions very quickly.
- The team created interfaces between individuals and activities in order to avoid problems during the process. Experts, decision makers, responsible for user matters as well as appraisers and civil engineers supported the core team in every phase of the project. The design of the detailed engineering serves as a good example. First a pool of user representatives and appraisers was established. Then regular weekly

were meetings held and suitable people from the pool were chosen to share their user or expert perspective and to help with the detailed engineering. This way high user satisfaction could be ensured.



Figure 9: Smart Campus (Source: Holzbauer und Partner ZT – GmbH).

More information about the life cycle cost approach: e7 Energie Markt Analyse GmbH, Gerhard Hofer, <u>gerhard.hofer@e-sieben.at</u>, <u>www.e-sieben.at</u>





Office Building, Sandvika, Norway

Owner: Entra Eiendom Location: Kjørboveien 20, Sandvika, Norway Type of the building: Office building Gross floor space: 5,180 m² Investment costs: 14 million € Year of completion: 2014



Figure 10: © Snøhetta architects.

Achievements: Powerhouse Kjørbo is the first rehabilitated energy positive office building in the world. A "Powerhouse" is defined as a building that during its lifecycle produces more renewable energy than it consumes for the production of building materials, construction, operation and demolition of the building. The building has obtained energy label A, has energy properties better than the Norwegian passive house standard NS 3701 and is classified BREEAM Outstanding in the design phase.

About the ID process: Powerhouse is a collaborative project on the commercial development of energy-positive buildings. The multidisciplinary team comprised:

- Representatives for the owner
- ID facilitator
- Head of design management
- Architect
- Structural engineer
- Energy consultant
 - PV
 - Energy consultant
 - Contractor (Norsk Hydro with knowledge on PV)
- HVAC consultant
- SINTEF with special competences
- Acoustic consultant
- Fire consultant
- Electricity consultant
- Contractor (Skanska)

All stakeholders were involved in the project from the early stages and formed a partnership. Sapa and Asplan Viak were not a part of the project before the feasibility study, but joined in the design phase. Asplan Viak provided multi-disciplinary consulting in the project and also represents the user (tenant).





The design process was a combination of discussion in a large group, with all members present, and discussions in smaller subtask groups. The larger group included up to approximately 20 persons, and the smaller subtask group's 3-6 persons. The themes of the subtask were:

- Thermal energy supply system
- Photovoltaics
- Ventilations strategy
- Embodied energy
- Daylight studies
- Buildings envelope opaque walls

The workshops were whole day meetings. During the workshop, the working method altered between discussions in the large group and discussions in the smaller subtask groups.

The themes for the subtasks were specific technical, whereas and the theme of the group. The themes in of the large group discussions whereas to coordinate and compromise functional needs and demands from the subtasks. Additionally, the ID-facilitator discussed all proposals, and ensured that they would not violate the project objectives.

Lessons learned from ID process: The energy target was the main project goal. All project stakeholders worked towards this goal, thus in some occasion's the energy solutions were prioritized before architectural solutions and economy. Summing up the lessons learned:

- 1. Work in a multi-disciplinary team is a complex activity. Communication is perceived as an easy task, but it's a much more difficult pursuit in practice. Challenges related to multi-disciplinary communication can be solved through good planning and setting aside enough time for meetings/workshops and clarification process.
- 2. Quality and degree of precision in the initial concept stage (feasibility study) is invaluable. Good quality of feasibility study can contribute to a more cost-efficient process at the later stages.
- 3. All design team members should take part of most discussions because they have to know how hard the process is to find the best solution. If they haven't participated, they tend to be less flexible in finding holistic solutions. It's important to be a part of the process in order to be motivated to change attitude. And it might end up being most cost efficient.
- 4. The initial phase should be longer and the stage model has to be challenged. It's important to give time to the process; the client developer has to accept/ acknowledge this. But from a developer perspective it is crucial: Milestones represent designs that are well documented in order to secure confidence in decisions made (reducing economical risk).

More information about the project: Asplan Viak AS, Arne Førland-Larsen, <u>Arne.forlandlarsen@asplanviak.no</u>, <u>http://www.powerhouse.no</u>







Business building, Šentjernej, Slovenia

Owner: Kobra Team d.o.o. Location: Šentjernej, Slovenia Type of the building: Business building Gross floor space: 1,300m² Investment costs: 2 million € Year of completion: 2011



Figure 11: © Protim Ržišnik Perc

Achievements: After 29 years of Kobra Team's activity on the market the inspiration was to undertake a construction of a contemporary business building. With the help of the architects, the company's own interest and knowledge of the up-to-date technology as well as a good team of contactors, a contemporary plus energy business building was constructed, which is exploiting almost all natural energy sources. The basic principle was to use as many renewable energy sources as possible. Of those the solutions on the building use mainly the advantages of geothermal and solar energy. All renewable energy sources are hydraulically interlinked through a reversible heat pump, which in addition to heating the building and its sanitary water also enables passive and active cooling of the building. EU Commendation on Green Building ID Awards 2014.

About the ID process: The planning process followed the principles of integrated design. Designers from all fields of expertise exercise day-to-day harmonization and cooperate closely with the investor, end users as well as technical solution providers and contractors. Already in the phase of concept design which is in the process of integrated design more comprehensive and time consuming, all functional details, technical solutions, key construction principles and material are determined as well as the specific and detailed investment frame set. The investment frame was set based also on the comparable assessment of life cycle costs for the building and built-in devices (LCA and LCCA principles).

Lessons learned from ID process: Integrated design relies on the interdisciplinary and collaborative efforts of all parties involved not only at the concept and design stages, but also at the construction and facility use stage. Successful interdisciplinary cooperation hinges on effective project organization and management of all processes. Especially critical is the timely consultation with the appropriate expert and the active involvement of the end users.

More information about the project: Kobra Team d.o.o., Branko Kovačič, <u>brane@kobra.si</u> Gradbeni inštitut ZRMK, d.o.o. Marjana Šijanec Zavrl, <u>marjana.sijanec@gi-zrmk.si</u>





5.3 Residential Buildings

Residential Building, Bratislava, Slovakia

Owner: Fredriksson s.r.o, Bratislava, Slovakia Location: Bratislava, Slovakia Type of the building: residential Gross floor space: 24,190 m² Investment costs: 16 million € Year of completion: 2017



Figure 12: © iEPD (Institute for Energy Passive Houses)

Achievements: The most innovative features of the project are mainly the high energy efficient central ventilation system, energy efficient summer pre-cooling system, ultra-low energy standard with passive house components, water retention management and e-mobility & bicycle friendly design. In the current I. phase of the project (45 flats), the developer target is "ultra-low energy standard" in the energy class A (according to the current Slovak legislation). Legal requirements for new buildings in Slovakia are currently settled on energy class B.

About the ID process: The cooperation within the design team of Petržalské dvory project, has been intensive as well as interesting. The typical example can be seen between architect and structural engineer, in the process of thermal bridges elimination. It resulted to the implementation of thermally split balconies and minimization of linear thermal bridges. Further creative cooperation between architect and cost specialist, led to minimization of extra costs for splitting elements by smart facade geometry design.

Further, the interaction between architect, developer and risk manager needed to be mentioned. The complete redesign of the project phasing can be seen as the result of this cooperation. Useful was also the interaction between architect and HVAC engineer in case of ventilation system design.

Lessons learned from ID process:

- ID is an ideal approach to achieve very high cost efficiency (minimizing the extracosts related with higher energy efficiency)
- creative co-operation between members of the design team (architect and other specialists) could lead not only to innovative technical solutions, but also to innovative architectural elements
- important focus on the communication and co-operation skills





 importance of the early involvement of real-state & bank expert for early set-up of the project phasing and optimal design process (each project phase need to be selfsufficient with access, car-parking possibilities, infrastructure and energy connections, etc.)

More information about the project: Slovak Innovation and Energy agency (SIEA), Eduard Jambor, <u>eduard.jambor@siea.gov.sk</u>, <u>www.petrzalskedvory.sk</u>

Apartment building, Cēsis city, Latvia

Owner: flat owners Location: Cēsis city, Latvia Type of the building: Residential apartment building Gross floor space: 2437.6 m² Investment costs: 260,489 € Year of completion: 2014



Figure 13: © Ekodoma Ltd.

Achievements: Majority of the renovation works were carried out in the summer. It was ensured, that the building façade interactions with surrounding environment was as low as possible. During the building renovation, it was essential to allow building inhabitants to freely access and use the building. Before renovation building represented typical soviet period buildings. Such building represent the biggest share of all building stock not only in Latvia but also in other east European countries. The aim of the renovation is not only to ensure comfortable indoor climate and decrease energy consumption, modernize other engineering systems but also significantly improve building renovation costs and implement the project. Beside energy efficiency measures during the project design phase it is planned to refurbish and repainted, the balconies, cold water supply system and all staircases.

About the ID process: The work of the team has been lead by ESCO company project manager who is specialized in building renovation projects. The team consisted from different engineers, energy auditors, engineering consultants to develop building renovation alternatives (Ekodoma). During the design phase work team didn't change. Already after the





tendering process when constructions works have begun the construction company joined the team. The manager from ESCO was organizing and managing whole design process.

Lessons learned from ID process: One of the main challenges during renovation was to ensure that building can operate during renovation process. The refurbishment scenario chosen: to avoid internal works as possible to allow operating during renovation works. It's planned that new ventilation system ducts will be placed along the façade in the insulation layer. The work of the team has been led by an ESCO company project manager who is specialized in building renovation projects. The team consisted from different engineers, energy auditors, engineering consultants to develop building renovation alternatives (Ekodoma). During the design phase work team didn't change. Already after the tendering process when constructions works have begun the construction company joined the team. The manager from ESCO company was organizing and managing whole design process.

More information about the project: SIA "Ekodoma" (EKODOMA), Agris Kamenders, <u>Agris@ekodoma.lv</u>, <u>http://tinyurl.com/pmrf4dc</u>





5.4 Mixed type buildings

Residential and Commercial Building, Gothenburg, Sweden

Owner: Älvstranden Utveckling AB, Skanska Nya Hem Location: Gothenburg Type of the building: Residential and Commercial Gross floor space: 8,000 m² + 8,000 m² Investment costs: 24 million € + 24 million € Year of completion: 2015



Figure 14: © Berg C.F. Moller Architects

Achievements: The site where the project is planned to be built is owned by the municipality. The municipal company Älvstranden has developed a model for how the planning and design of the site should be. The project Lindholmshamnen consist of four developing companies Älvstranden Utveckling AB, Skanska, PEAB and HSB. The Energy goals are set in the consortium contract and the common solutions e.g. the choice of district heating, locally common heat storage or property-specific solutions.

About the ID process: The ID Facilitator has worked with the Design Team to ensure that all issues are discussed from an energy perspective, so that the choice of solution is based on facts and not just opinions. During the planning phases the project had a parallel assignment where four companies were invited to present their ideas on sustainable and energy efficient construction. The ID Facilitator role was to evaluate their proposals and come up with a proposal for further work. ID Facilitator has also worked with evaluate what kind of energy supply the site should have. Comprising contact with the district heating company Göteborg Energi and also detail planning for solar panels (PV).

Lessons learned from ID process: The market for zero and low energy buildings is growing. Public developers and major construction companies are showing the way. However the energy issue is not the number one priority in a construction project, but one of several important issues that must be dealt with. Many conditions for the possibility of building NZEB or even + NZEB given already in the process of zoning planning by local authorities. Therefore, it is important to planners in local authority to become aware that they can create the prerequisite for an area can be built with NZEB or even + NZEB in a cost effectively way.

More information about the project: Ronnie Hollsten, Hifab AB, <u>Ronnie.Hollsten@hifab.se</u>, <u>www.hifab.se</u>





5.5 Childcare and School

Childcare Centre, Cologno Monzese, Italy

Owner: Municipality of Cologno Monzese Location: Cologno Monzese – Italy Type of the building: Kindergarten Gross floor space: 580 m² Year of completion: 2010 Investment costs: ~ 500,000 €



Figure 15: © Comune di Cologno Monzese.

Achievements:

- The building achieves the A+ class according to the energy certification protocol defined by the regional law DGR VIII 5018:2007
- Thanks to this intervention, the Municipality of Cologno Monzese has been rewarded with the European GreenBuilding Partnership,
- This building won the 2010 European Green- Building Award in the category Best New Projects,
- This intervention has been mentioned among the best projects of the competition Premio all'innovazione amica dell'Ambiente 2009,
- North facing skylights effectively and pleasantly illuminate indoor environments,
- A ground water heat pump is used to efficiently generate heat,
- A mechanical ventilation system coupled with a high efficiency heat recovery unit provides a good indoor air quality by saving a great amount of energy for heating,
- Electricity produced by a PV array with an area of 110 m2 covers most of the electricity demand of the whole building.

About the ID process: A strict collaboration among all designers throughout the whole design process and construction development allowed to achieve an ambitious energy target and realize a high-performance public facility that provides a comfortable environment for children and teachers, by using little energy and having a reduced impact on the environment.

More information about the project: Comune di Cologno Monzese, arch. Lorenzo Iachelini, <u>urp@comune.colognomonzese.mi.it</u>.





Primary School, Pontprennau, Cardiff, Wales



Figure 16: © Cardiff Council

Owner: Cardiff Council Location: Pontprennau, Cardiff, Wales Type of the building: School Gross floor space: 2,250 m² Investment costs: 8.16 million € Year of completion: 2016 Achievements: This project is using an existing building, renovating it from its existing purpose, and incorporating it into a new-build, adjoining school. The project benefits from the life cycle costing of the reuse of an existing building alongside the addition of a low-energy school.

The project depends upon the on-going input of the surrounding citizens who will benefit the most from the school.

About the ID process: The design team consulted multiple companies and design boards throughout the design process. Mechanical and Electrical engineers were brought in early on the project, multiple renewable energy supply systems were investigated for their applicability, and the design team approached the Design Commission for Wales twice for advice and opinions on their three designs. The ID facilitator ensured all reports were pertinent, conducted workshops for the project, and will assist the contractors with ensuring the design aspirations are delivered throughout the construction phase.

Lessons learned from ID process: The client in this instance was wholly separated from the tenant and the energy management department within the council, a situation which complicated and limited the design outcome. In light of this, we have learned an opportunity exists within local councils to break down barriers between the different project silos which define the 'business as usual' design process.

More information about the project: Building Research Establishment Ltd (BRE), Andy Sutton <u>SuttonA@bre.co.uk</u>, <u>www.bre.co.uk/matrid</u>.





6 GreenBuilding Integrated Design Award

The European GreenBuilding Integrated Design Award intended to provide European visibility to outstanding integrated design processes. With this award the importance for the application of integrated design was highlighted. Integrated design is a proven method of achieving high-performance buildings that meet the client brief, without sacrificing architectural quality or causing excessive costs.

The Award 2014 was granted at the IEECB conference (Improving Energy Efficiency in Commercial Buildings) in Frankfurt. It was developed by the eERG, e7 and GreenBuilding. A special *application guideline* and *GB ID Questionnaire* was developed in order to apply for the award. Also two press releases were sent by each project partner. The first press release has been published in order to announce the Award. A second one has been published in order to publish the results. Nine objects succeeded to register for GB and upload all required information in time. In Figure 17**Fehler! Verweisquelle konnte nicht gefunden werden.** the applicants and the GB ID Award visual identity can be found.

The Award 2014 is obtained by **Wirtschaftsagentur Wien** and **ATP architects engineers** with the building **aspern IQ** in Vienna. The building shows an excellent performance while combining high energy efficiency with reasonable costs. The proactive support of the client has clearly helped to achieve the design targets.

Commendations for two further processes: Kobra Team d.o.o. and **Protim Ržišnik Perc d.o.o.** demonstrated with the **Plus Energy Business Building Kobra** in Slovenia, that the definition of clear target criteria during the very early planning phase leads to a high quality result. For the **Municipality of Evrotas** in Greece the application of an integrated design process was a novelty. Together with the **National and Kapodistrian University of Athens** the **Bassourakos Building-Cultural Center** could be realised. The experiences from this collaborative process will be used in further projects.

More information on the GB ID Award and its applicants can be found at <u>www.integrateddesign.eu/toolkits/ID_award.php</u>.



Figure 17: Visual identity of the GB ID Award 2014.





7 Policy Recommendations

Capacity building through building programmes and regional activities

- Information and education activities for clients and project developers: We see a need for educational and information activities towards potential clients and construction project developers. The ID process offers clear advantages to clients, but these advantages are hardly known. Furthermore about the advantages of using the ID process in conjunction with planning. With a higher level of understanding of the benefits using ID, clients and the project developers will require ID as standard approach and give the design team the mandate required to fully succeed.
- Information and education activities for design team: Furthermore educational activities need to be directed to members of design teams, e.g. architects, engineers, project manager, facility manager and future buildings users. Focus in these activities should be on how ID functions in design practice. In addition, educational activities for designers need to underline the advantages from a designer's perspective and these advantages differ from the ones from a client's perspective.
- Policies to be adopted: Educational activities are seen as cornerstone for any policies in the construction field. Existing and newly developed programmes frequently regional and local programmes need to put a clearer focus on the quality of the design process with ID as a guiding principle because it is the process that determines the quality of the outcome. The MaTrID project has developed a guideline that can set the basis for any kind of educational activity in this field (Nordby, 2013).

Environmental certification schemes

 Environmental certifications schemes (EAS) have shown to be a very powerful tool to promote buildings with high environmental performance targets. ID is a very powerful tool to achieve these targets. The knowledge and interest regarding ID will definitely increase, if ID could be promoted and rewarded with specific credits in existing environmental certification schemes.





- Incorporating ID in environmental certification schemes: We recommend incorporating ID as a separate quality criterion in a given EAS framework. The fulfilment of this criterion is benchmarked along the characteristic of ID steps (compare ID Process Guide, Nordby, 2013). This would create a solid framework upon which designers, engineers, contractors and project managers could structure a design process, and demonstrate their application of ID within a project.
- Policies to be adopted: Usually public authorities have no direct influence on EAS because the most powerful ones have been developed and are self-regulated by construction market. Nevertheless public authorities are able to promote the incorporation of ID into EAS in an indirect way: They can, for example, assign an analysis on different options how to incorporate ID into EAS including a survey among market actors. Or they can develop an ID-specific evaluation scheme to be applied under public procurement (compare the following item) which then can be easily transferred into the broader context of an EAS.

Incorporation of ID in public procurement schemes

- In general, public procurement procedures are one of the most powerful instruments that public authorities have to achieve specific policy targets. This is also true with respect to the promotion of ID.
- Integrating ID into public procurement procedures: Public tenders include a series of requirements that need to be fulfilled by the bidders. If the public authority asks for an ID approach to be implemented during the assignment, this requirements needs to transferred into clearly defined and traceable criteria (a) at the level of the qualification of the bidder as well as (b) with regard to the service offered. The MaTrID ID Process Guide (Nordby, 2013) gives good guidance in defining these criteria, which should become part of standard terms of reference for public construction projects. Furthermore, the required use of ID needs to be reflected in the remuneration model (compare Leutgöb and Kamenders, 2014).
- Policies to be adopted: In a first step the integration of ID as a requirement in public procurement procedures can be tested in pilot projects. Based on the experiences gained a standard can be developed. Pilot projects across Europe can be found at <u>www.integrateddesign.eu/pilot-projects/index.php</u>.





Integrating ID in public support schemes

- Similar to public procurement procedures financial subsidies and support programmes are an important leverage for policy makers to promote ID and NZEB. Currently, public support schemes refer to outcomes (e.g. energy performance of the building; specific technical parameters), but they do not refer to the design process as such.
- Integrating ID into public support schemes: When integrating ID into public support schemes, funding authorities face similar challenges as with regard to the Incorporation of ID in public procurement schemes. The funding authority needs to define clear and traceable criteria which can be easily checked. Furthermore we have to take into account that a funding authority administering public subsidy schemes has no direct insight into the design process and will thus have difficulties to check whether a specific ID-related criterion is fulfilled or not.
- Policies to be adopted: The MaTrID team thinks that the integration of ID in public support schemes is rather difficult to be implemented as stand-alone instrument. If an EAS has already incorporated ID (compare separate recommendation above) a subsidy scheme could then be linked to this instrument of certification and quality control.

The role of professional associations

- Generally, professional associations play an important role as catalyst for innovation and quality standards in the branch of architects and designers. More particularly, in most countries professional associations have major influence on **remuneration models** to be applied in this field. It is therefore very helpful if IDfriendly remuneration models (compare Leutgöb and Kamenders, 2014) are supported by professional associations.
- In addition, the professional associations can arrange trainings and seminars for their respective networks and among their members. Most likely, educational activities in cooperation with associations will be more successful.
- Policies to be adopted: Usually the direct influence of public authorities on professional associations is very limited. However, ID-friendly remuneration models can be promoted by test cases implemented in the sphere of public construction.





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