

## **Sustainable building of a holiday care residence: a pilot project combining the comfort of a hotel with the facilities of a care residence**

Boehme, L.<sup>1</sup>; Vanneste, Ph.<sup>2</sup>; Staelens, K<sup>2</sup>; Gantois, T.<sup>3</sup>

<sup>1</sup> KU Leuven Technology Campus Ostend, Ostend, Belgium, [luc.boehme@kuleuven.be](mailto:luc.boehme@kuleuven.be)

<sup>2</sup> Mariasteen Shelterd Workplace, Gits, Belgium, [philip.vanneste@gidts.be](mailto:philip.vanneste@gidts.be) ,  
[koen.staelens@gidts.be](mailto:koen.staelens@gidts.be)

<sup>3</sup> DERTIEN12 – Architects, Bruges, Belgium, [tom@dertien12.be](mailto:tom@dertien12.be)

**Abstract:** *Sustainability seeks to bring together three dimensions: social, environmental and economic. This paper describes ‘Middelpunt’ where these dimensions of sustainability have been taken into account. This case provides an answer to the challenges which are posed to achieve a decent ‘holiday care residence’ in a sustainable way by combining the comfort of a hotel with the facilities of a care residence, by reducing the environmental impact and with considerations made for an economic and social sound operational model. Sustainability aspects are found in the heating and cooling techniques, reducing the energy demand for the indoor climate. The choice for the materials indoors and outdoors was made with regard to the perception of the guests and of the maintenance of the building. The financial creativity and input has led to a social investment partnership. ‘Middelpunt’ is accessible for disabled residents, and creates jobs for socially vulnerable people.*

***Holiday residence, care residence, accessibility, energy saving***

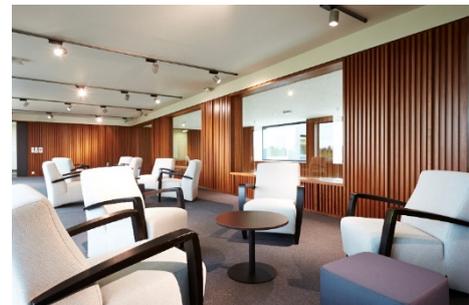
### **Pilot Project for a holiday care residence**

In general, sustainability seeks to bring together three dimensions: social, environmental and economic. These three dimensions are often referred to as the three P's: People - Planet - Profit. Economic interests define the framework for entrepreneurship and employment, environmental aspects determine the choices made in sustainable building and the social dimension influences interactions between institutions/companies and people, objectives and welfare. The three themes are part of one coherent set with a high mutual integration and interaction. [1] This paper describes a case, the Pilot Project “Middelpunt”, where an effort was made to take into account the three dimensions of sustainability.

Along the Belgian coast there are many hotels, expensive and less expensive, some with beautiful architecture, others terribly ugly. Everyone will find something to their liking, according to their needs and their own purse. Or almost everyone. One hotel located in the municipality Middelkerke, stands out: with a wink to the name of the municipality this hotel was called "Middelpunt" (in English: ‘Midpoint’). And there's more to this name: in this hotel, a person with a need for care stands in the center, in the midpoint. Thus, guests with an impairment and/or anyone who requires any level of care, are given the opportunity to fully enjoy a relaxing and pleasant stay in a worry free way at the Belgian coast. (Figure 1).

Middelpunt is a very 'open' holiday residence that focuses on a lot of different groups, each with its own needs and expectations. For each guest, the appropriate accommodation is provided so that he or she, individually or in group, can spend his or her vacation in an optimal way.

The holiday residence is divided into two wings which are connected by connecting common areas such as the restaurant, physiotherapy room, reception, lounge, relaxation room, garden. In total there are 44 rooms available. There are double rooms, family rooms and group rooms. One half of the building contains 24 accessible rooms equipped for a wide audience. Here emphasis is on 'tourism for all', which means that anyone who wishes to come to the Belgian coast on holiday but for whom the existing holiday offers are not accessible (e.g. due to having a disability), is welcome in Middelpunt. This can include vacation for couples or families of which one member has a disability, but can also include groups of people with disabilities. There is no strict definition of the target group. All rooms are equipped with two in height adjustable beds and an emergency call system, and features an adapted bathroom with shower and wheelchair accessible sink. (Figure 2). The rooms are equipped with TV, free internet and a private balcony. The other wing is provided for tourism for people with a degenerative disease such as Amyotrophic Lateral Sclerosis (ALS) and Multiple Sclerosis (MS). On top of the usual equipment, these 20 rooms are equipped with the necessary technical infrastructure. Five rooms have following extras: a patient lift fixed on the ceiling and automatic doors. These rooms are equipped to host people with the highest health care needs. Here too, obviously all hotel comforts is present.



*Figure 1: Middelpunt*

*Figure 2: Guestroom*

*Figure 3: Lounge*

### **The Social dimension - Guarantees for a carefree holiday**

To ensure the proper care Middelpunt works together with partners, such as home nursing services, therapists, and GPs. But Middelpunt is more than care and support, it is above all about enjoying a real vacation. It has invested in a wellness area with a Parkerbad, customized lighting and music for the guests who would otherwise have no chance to go to such wellness centers. Especially for people with a muscular disease this is important. [1] Nearby there is an accessible pool and also an easily accessible beach.

Investing in sustainability also means investing in quality of life and freedom of choice of people. A lot of the target public may otherwise rarely or never go on holiday. For themselves but also for their families is often heavy to cope. Day in day out throughout the year their



families or carers have to give assistance. In addition to the practical concerns it is not evident to cope emotionally. For them Middelpunt is a place where they can forget their daily worries and fully enjoy vacation. The hotel staff and volunteers assist them so that they can take some time free for themselves, something which is otherwise rarely possible.

The whole project radiates openness and invites for contact. The hotel is built around a patio where people can quietly read a book or have a chat. Large windows complete the hallways and bright areas allow the guests to look beyond their own hallway and room. The corridors of the complex were designed in order to avoid a 'Hospital feeling'. Thus, the patio is visible from as many viewpoints as possible. Especially on summer days, the patio becomes the beating heart of the building. The patio is decorated with some trees, some greenery and a fountain that contributes to a pleasant atmosphere. This patio connects to both the entrance and the restaurant, and a covered terrace and a petanque court located behind the restaurant.

The perception in the building is supported by the variation in the finishing of the common areas. To create different moods, different materials were used. In the lounge, for example, the feeling of a pub or café was awakened by choosing wooden wall coverings, carpets and upholstered furniture. (Figure 3). On the east side of the building several multipurpose areas are provided, which can serve as a classroom or meeting rooms for groups.

### **The environmental dimension – A sustainable building**

All around the building it was the matter to create an enjoyable surrounding. Obviously the sustainability of the building is a priority. To ensure a basic heating in winter and an excellent cooling in the summer without need for an energy-consuming air conditioning, a heating system with concrete core activation (CCA) was installed. (Figure 4 & 5). The outer shell of the building is well insulated. Because of the maritime climate cleaved concrete blocks were used on the ground floorlevel and flamed basalt stone on the upper floors. Red brick is admittedly a cheaper solution, but in these circumstances is not the best choice. Natural stone requires less maintenance during its lifetime. The aluminum in the construction was provided with a special coating and subjected to a pre-anodization in order to resist to the aggressive salts.

Obviously, accessibility is one of the highlight that was taken into account in the architecture of the holiday residence Middelpunt. Many of the visitors are in fact immobile and move around in a wheel chair. This fact was to taken into account in different ways: a double lift was fitted to make sure that many people can exchange floor simultaneously, and each room features a private terrace with a balustrade height of 55 centimeters, with an additional steel handrail on top. That way people can enjoy the view while sitting in a wheel chair. The high-care-wing has an ongoing, common terrace with a clear social function. According to the experts, it is important that patients can meet many fellow patients.

It is not the first time that the architects of "Dertien12 " design a project in the healthcare sector, but this 'holiday care residence' is special in our country. In Belgium, the so-called 'holiday care residence' are not yet known, but in the Netherlands [2] [3] [4] and Switzerland

they exist. This is the first experience with such accommodation in Flanders, in Belgium. Middelpunt in Middelkerke stands therefor as a pilot project for holiday care residences in Belgium. The demand for these centers begins to rise, and will continue to rise with an increasing aging population. [5]



*Figure 4: Tubing for Concrete Core Activation*

*Figure 5: Geothermal installation*

*Figure 6: Solar Boiler on the roof*

### **Sustainable energy consumption**

The design of the building was to obtain a compact building with a performant outer envelope to minimize energy losses by transmission. The size and position of the windows was determined in function of thermal losses, daylighting, and overheating in the summer. For the carpentry was chosen for an aluminum 3-chamber profile. Together with the selection of the glazing (U-value  $1.1 \text{ W} / \text{m}^2 \text{ K}$ ), this has a great impact on the final energy efficiency of the building. The room temperature is  $22^\circ \text{C}$  when heated at outdoor temperature of  $-8^\circ \text{C}$  and the temperature at cooling is  $26^\circ \text{C}$  at outdoor temperature of  $+32^\circ \text{C}$ . The relative humidity in the premises is not specifically controlled. The air quality achieves an acceptable air quality IDA 3 ( $22\text{-}26 \text{ m}^3 / \text{h} / \text{person}$ ) according to the European Standard EN 13779, (2007) “Ventilation for non-residential buildings — Performance requirements for ventilation and room-conditioning systems”.

Low-temperature heating makes it possible to make use of a heat pump combined with storage of cold and heat. Geothermal energy was selected with a closed-bottom-water heat exchanger, with the use of a secondary transport medium, water or glycol, which is cooled or heated by the subsoil, in combination with a heat pump. The heating is achieved by a geothermal heat pump with vertical heat exchangers. In winter, heat is retrieved while in summer especially coolness is extracted from the subsoil. The heating efficiency is similar to these of the best available techniques currently on the market. The advantage on basis of cooling is decisive because the cooling is virtually cost-free during two thirds of the cooling season, this represents considerable cost saving compared to conventional cooling. In winter, heat pumps are needed, in conjunction with gas-boilers. The efficiency of the heating is similar to the techniques currently in use. The system is technically set on point, it is internationally tested and already used system, and has been used in smaller scaled projects. The system is simple, aesthetically integrated and has an extremely low environmental impact.

In rooms with different demand for temperatures or rooms with different cooling and heating loads, heating with radiators or convectors provide a higher comfort. In this way, any room can be arranged separately. The additional heat is produced by a condensing gas boiler (HR-TOP), fitted with a modulating burner control. This results in energy savings by automatically adjusting the power to the demand for energy. The heat is provided by a dynamic boiler temperature which, depending on the calculated temperature load, adjusts the inlet temperature and/or turns it on and off.

There are several circuits provided, according to orientation, occupation and situation in the building. The central automatic control of the HVAC system is based on a Direct Digital Controller so that energy and comfort management can be done in simple manner. The controller is equipped with an error messenger via modem. Each circuit is equipped with a weather-dependent control so that the inlet temperature to the radiators is adjusted depending on the outdoor temperature. The distribution is done at low temperature regime 70/50 °C. In these weather-dependent circuits the pumps are switched off with the eco-function, for circuits with a three-way valve the pumps are additionally switched off with a closed three-way valve. A general night reduction is applied to the primary control with an indoor sensor. The fine adjustment is obtained per room by fitting a thermostatic valve. For circuits with variable flow, the pumps are equipped with a speed control. The main distribution is done via the cellars, crawl spaces, technical ducts and dividing collectors to the radiators in the rooms.

For room heating a combination of CCA with convectors or steel radiators for fine adjustment is used. The heating power is determined by a system 70/50 °C according to EN 422-1 (2003), “Radiators and Convectors – Part 1: Technical specifications and requirements”. The temperature of the premises is as shown in Table 1.

*Table 1: Room temperatures*

<b>Room type</b>	<b>Temperature [°C]</b>
Residence room, individual room	22
Bathrooms	24
Offices, meeting rooms	20
Hallways, stairwells, storerooms	16
Technical facilities, storage facilities	5

The CCA is used both for heating and cooling. The system provides the base for heating in the winter and cooling in the summer, and is optimally used by means of the use of low temperatures. The technique with integrated water-pipes in the floor, keeps the rooms in an active manner in a constant basic temperature. This increases greatly the comfort in winter and summer time. As the sensed temperature is a combination of radiation and air temperature, this system can achieve a constant comfort, at a lower air temperature, which has a favorable effect on the energy consumption. In order for the floors to serve as a heat radiating surface in the summer, they are not finished with a raised floor or a suspended ceiling on the places where this CCA is provided.



Energy saving was also accounted for in the production of hot water. A solar boiler installation on the roof (Figure 6) preheats the hot water production which is then further heated by two sealed gas water heaters with a buffertank and with a circulation pipe. To comply with the Legionella decree, the return temperature of the hot water is never lower than 55 ° C. The lengths of the branches without circulation are limited to the maximum length allowed.

The solar boiler is calculated for a hot water consumption of 50 liters per day per room. There are 81 m<sup>2</sup> solar panels installed oriented to the south. The payback time is expected in about 10 years, taking into account the subsidies from the Flemish Region and the operator and in function of the hot water consumption. An increase in fuel costs (gas and electricity) of 5% per year was taken into account.

All rooms are equipped with mechanical ventilation according to the standard EN 13779. The indoor air quality meets IDA3. With this quality, the difference in concentration of CO<sub>2</sub> between the inside and the outside air is kept between 600 and 1000 ppm. The aircirculation is calculated as 22-26 m<sup>3</sup>/h/person. In all areas airgroups are provided to supply preheating of injected air and extract consumed air. Where it is cost effective, heat recovery is applied on air groups.

### **The economic dimension – Sustainable exploitation of Middelpunt**

The total investment for Middelpunt was € 7,426,800.00. To make this investment financially viable and sustainable, the non-profit organisation “Dienstencentrum GID(t)S” – “Mariasteen vzw” who was going to build the holiday care residence, looked for several possibilities and interested investors. After a long and careful search, “ADMB Group” was found to be an important investment partner. “ADMB Group” is an HR services group. “ADMB Group” supports businesses, entrepreneurs and non-profit organizations in various fields of social legislation personnel management. The partners of “Dienstencentrum GID(t)S” and “ADMB Group” worked out a technical concept allowing various non-profit organisations related to the Dienstencentrum GID(t)S to invest in an attractive project with a social dimension. From a study by the directors of “ADMB Group” and “Dienstencentrum GID(t)S”, it was decided that a technical investment structure with real estate certificates could offer a sustainable economical solution to finance the project. Thanks to this financial construction, the investment in infrastructure for a social project was interesting enough for the several investors. For this purpose a partnership “ADMB Social Invest Middelpunt” was formed. Through their network of investors, the shareholders of this partnership found the amount of money to provide for the CASCO (wind and waterproof) for Middelpunt. The cost to build the CASCO was € 4,940,000.00. “ADMB Social Invest Middelpunt” then leased the building for 27 years to the association “Mariasteen vzw” who is now the operator of the building. Besides CASCO there are funds necessary to get the Center project completely finished:



- Real Estate Certificates CASCO “ADMB Social Invest Middelpunt”: € 4,731,520.00
- Capital Subsidy Tourism Flanders: € 500,000.00
- Capital Subsidy Province of West Flanders: € 720,000.00
- Investment by Mariasteen vzw: € 1,475,280.00

Based on the calculations and the offsetting of subsidies, occupancy parameters and objectives, the cost and rental price per room were determined. Simulations showed that a sustainable business is achievable with an occupancy rate of 60% over the entire year. In this way, the Project “Middelpunt” realized sustainable tourism for people with disabilities by people with disabilities.

For the operation of Middelpunt a choice was made to divide the holiday residence into two wings which are connected by joined common areas such as the reception, the restaurant, physiotherapy room, the lounge, the relaxation room and the garden, as described earlier.

The holiday care residence is run by “Mariasteen vzw”, a leading sheltered workshop in the heart of West Flanders, a part of “Dienstencentrum GID(t)S”, a center with a diverse and professional offer for people with disabilities. Since 1963 “Mariasteen vzw” offers sustainable and remunerative employment to persons with disabilities. In “Middelpunt” people with a labor restrictions do the reception, do the maintenance, work in the kitchen, in short: they make sure the guests have a good time in the hotel.

### **Conclusion**

In “Middelpunt” a real effort has been made to bring together the three dimensions of sustainability: social, environmental and economic. This was done in providing a carefree holiday for disabled people and providing employment for people who otherwise have trouble finding a fitting job. The holiday care residence itself was designed to be a sustainable building and to pay for this a sustainable financial investment plan was developed.

### **References**

- [1] Wauters, L. M. (2007) *Verpleeghuis VS Zorghotel*, Erasmus Universiteit Rotterdam
- [2] Gemeente Nijmegen (2008) *Hotelonderzoek 2008 - De ontwikkelingen op de Nijmeegse hotelmarkt*, Gemeente Nijmegen.
- [3] Van Rossum, H. en Bergvelt, D. (2011) *Het Tweede Begin*, RIGO Research en Advies BV, Amsterdam.
- [4] Weening, H. et al, (2005) *Nieuwe vormen van samenwerken in wonen, zorg en dienstverlening*, Delft, Eburon.
- [5] Van Malleghem, J. (2013) *Het aanbieden van relaxatietechnieken binnen de ergotherapeutische interventie bij zorgbehoevende cliënten met multiple sclerose of amyotrofe laterale sclerose*, HoWest, Kortrijk.