



Ensuring sustained user quality in buildings

Success contracting with functional tendering of the building services equipment guarantees quality for 15 years



Until now, buildings regularly require more energy and provide less user quality in practice than was to be expected from the installed technology during the planning. That has structural reasons. The naerco research project has investigated this aspect and developed the success contracting concept: pre-defined energy and quality parameters are contracted out as part of a function-based tender. A contractor guarantees their realisation for 15 years. The contractual process also includes continual control of the agreed values and a bonus-malus system.

New or fully refurbished buildings also provide no guarantee for smooth running building services equipment. The energy consumption and costs can be greater than expected and users complain that the rooms are too warm or too cold. Contracting out and commissioning new constructions does not automatically lead to the desired quality, since modern building services equipment is complex and needs to be seen as a whole. That already begins with the construction phase. Only accompanying quality assurance can prevent serious functional defects from occurring that are difficult to detect during the acceptance process. This continues during the operating phase where the costs over the years can amount to five to ten times the original investment. Until now, the standard tenders from public clients have included neither professional quality assurance during the construction phase nor reliable quality control during the operating phase, which is why construction firms do not offer them.

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Success contracting is a new approach for improving the quality of the building services equipment through a modified tendering process. Here the legally existing possibility for having a function-based tender instead of a component-based tender is used in different trades. A new aspect particular to success contracting is that a shared goal regarding the user quality is defined between all parties and the contractor bears responsibility for the results during the entire contractual period (for example 15 years). Guarantee values for the energy consumption, CO₂ emissions and the quality of the light, air and thermal comfort are agreed for the entire system. There is also an obligation to provide permanent quality assurance and to remedy defects. This is combined with a bonus-malus system with high penalties. This means that it is not worthwhile factoring in compensation payments into the bid calculation as a pre-emptive measure should guarantee targets be continually missed. Right from the beginning the calculation needs to adopt realistic approaches for the operational management and maintenance. A pilot project to test out success contracting for the first time is currently running in Marktobendorf in Bavaria. A contract with a service provider as contractor has been running since 2010. The construction measures are still ongoing.

How success contracting works

The client or its planning office define refurbishment goals and produce a detailed preliminary design, the reference system, with which the goals can be achieved. The system configuration is based on standard technology and therefore does not differ from usual tenders. The innovative aspect is the implementation and permanent control of the target values, whereby the reference system provides the basis. As part of a function-based tender to be awarded to a service provider, the target values for the user comfort and costs are defined with limit values for the maximum energy consumption and the CO₂ emissions. Dumping offers with insufficient technology or performance therefore do not have a chance.

The bidders check the documents and confirm that the defined qualities can be achieved with the reference system. They can adopt the reference system for their bid or attempt to achieve the guarantee values with a technically equal but economically cheaper alternative concept. They then produce an offer for planning, constructing, operating and maintaining and servicing the systems. As part of this bid they undertake to maintain the guarantee values during the entire contractual period and to rectify any faults immediately. The guarantee always applies to the entire system and not just to the newly installed components.

After the tendering process, the contract is awarded in accordance with the German Construction Contract Procedures (VOB), Part A § 3a. The tender is awarded to the bidder with the cheapest bid, which is determined based on the net present value (for investment, running costs and the expected energy costs), the environmental friendliness and the likelihood that the required guarantee values can be achieved and maintained in the long term. The research project has developed model processes for this purpose.

The most economic bidder is then contracted with the detailed planning, installation and operational management for the entire running period of the systems. The client checks the guarantee values at intervals to



Fig. 1 The construction measures at Marktobendorf Secondary School: The two new parts are marked in red, while the existing buildings undergoing refurbishment are marked in yellow. The existing atrium building is being supplemented with a recreation hall on the courtyard side. The new extension creates a second courtyard as a playground. The newly gained space enables the school to improve the infrastructure for all-day schooling and to restructure the specialist rooms in a sensible manner. Source: Löhle Architekten

The new building services equipment at a glance

Energy supply	Heat: Up to approx. 60% from the Marktobendorf district heating network and approx. 40% from the school's own biomethane-based CHP plant. Electricity: Up to 45% from the school's own CHP plant and 55% from the general grid.
Ventilation	Central and decentralised ventilation systems with heat (80%) and moisture recovery (70%) via a rotary heat exchanger. The ventilation systems are designed for a CO ₂ content of 500 ppm above the concentration in the outdoor air. Night ventilation is also planned.
Measurement and control technology	demand-oriented individual room control for heating, ventilation and lighting. Central building control technology continually records the building and system data, CO ₂ concentration and indoor temperature. The radiators are equipped with automatic zone control systems.

Fig. 2 The Marktobendorf Secondary School is undergoing complete refurbishment. Source: www.enob.info

ensure that they are maintained, whereby it should also involve the building users in the continual monitoring. The bonus-malus system and the quality assurance accompanying the construction process, whose additional costs are accepted by the client, mean that there should be sufficient incentives to ensure that fault prevention and quality assurance measures are actually carried out. Examples include hydraulically balancing the radiators and monitoring the night setback.

The pilot project

At the local secondary school in Marktobendorf, the existing buildings were anyway due to be refurbished along with a new extension building. These construction measures served as the pilot project. The contract for refurbishing the building envelope was awarded in a conventional manner whereas the building services equipment was tendered out using success contracting. The first tendering procedure in 2009 did not produce any rateable bids. As a result of the second call for tenders a contract was concluded with a facility service provider, WISAG Gebäude- und Industrieservice Bayern GmbH & Co KG. The construction measures began in 2010.



Success contracting – The principle

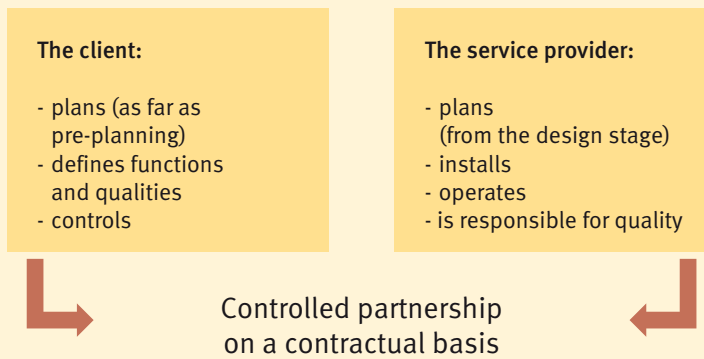


Fig. 3 The allocation of tasks with success contracting
Source: B.A.U.M. e.V.

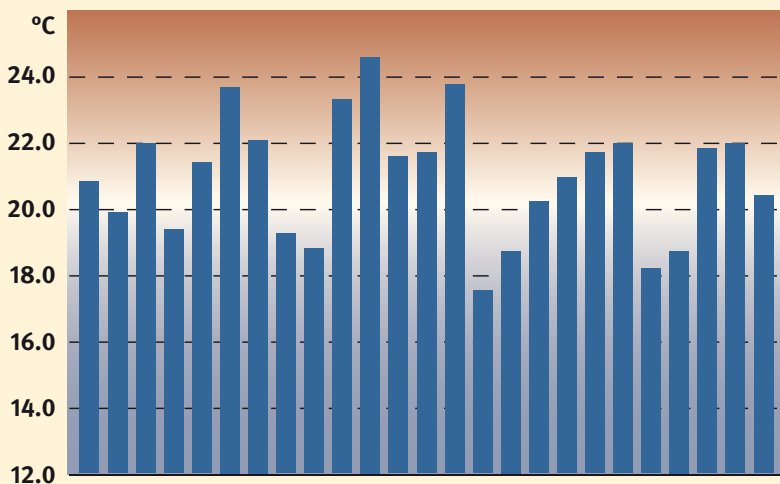


Fig. 4 One of the findings of the Energie-AG: The average morning temperatures in 25 rooms in a standard school (taking solar irradiation into account) reveal the frequency with which the pre-set temperature of 20 °C was exceeded or not reached.
Source: www.energieteam-bvsg.de

The pre-planning carried out by the Kempten building authorities provided a solid basis for the tendering procedure. Based on the experience gained so far in Marktoberdorf, the concept has proved its worth in principle and is suitable for tendering procedures elsewhere. The requirements for communication between all those involved are higher than with conventional procedures and in the pilot project it took some time until the basis for this were established. This will be offset, on the other hand, by the reduced communicative burden during operation because the contractor assumes responsibility for the entire system. The agreed, easy-to-control guarantee values will also provide relief in future, since the comparatively long construction period caused by the ongoing school operation has cost considerable time and effort. Success contracting does not provide a short-term instrument for saving costs because realistic approaches for ensuring the maintenance and operation need to be accounted for in the calculation. This means, however, that the concept contributes to ensuring budgetary honesty because all the consequential costs for a measure are transparent at the time a decision is made. Cost savings are nevertheless probable in the long term as a result of the greater energy efficiency and the improved maintenance of the systems

It began with a school club

The work that has now been incorporated in the success contracting concept originated around 15 years ago in the “Energie-AG” (Working Group on Energy) at the Bertha-von-Suttner Secondary School in Neu-Ulm. Based on an energy saving project, the school pupils discovered that many classrooms in their recently renovated school were either fundamentally too warm or too cool, and the night setback did not function. A scientifically supported measurement campaign organised by the group at 70 other schools in Bavaria confirmed that this occurred at 95% of the schools and was not a one-off phenomenon. The faulty building services equipment was evidently a structural problem.

The Energie-AG has won several environmental prizes for its work and has published its results on the internet. As a consequence the “naerco” research project was launched (Nachhaltiges ErfolgsContracting (Sustainable Success Contracting)). The sociological research accompanying the project has drawn on the Energie-AG’s results and produced a study that provides a detailed investigation of the structural problems posed for public authority clients when inviting tenders for building services equipment. Naerco is working with B.A.U.M. e. V., various universities, the Bavarian state government and the energy research department at the German Federal Ministry of Economics and Technology.

over the years. However, it will only be possible to judge this once the monitoring has been completed.

The construction measures

Three older buildings with their systems are being refurbished to the 3-Litre-House standard and a new extension building is being constructed to the Passive House standard. The aim of the refurbishment is to reduce the previous heating energy consumption by 50%, whereby a considerable contribution shall be made by the new building services equipment (Fig. 2).

The “Naerco-Energie” process, a calculation procedure based on DIN 18599, was developed to determine the guarantee values for the energy consumption and CO₂ emissions. A one-year programme to monitor the buildings will begin in 2013, which will be carried out by the Ulm and Nuremberg universities of applied science and is being funded by the German Federal Ministry of Economics and Technology. This is intended to evaluate the “Naerco-Energie” process and to determine and assess the risks for the contractor in the ongoing pilot project. Based on this, the contracting agreement at the beginning of the pilot project will be slightly adjusted if required. In addition, the ventilation concept will be checked and possibly changed.

The supplementary “Energy Partnership” environmental education project has been running at the school since 2012. As part of this project, a concept is being developed, implemented and monitored for a year with the aim of motivating school authorities, contractors and pupils to work closely together as part of a contractually secured collaboration.



Promoting energy efficiency through contracting

Success contracting is an innovative approach for enabling optimised building operation in the long term. However, there are also other approaches available for achieving this goal. The “energy-oriented operation optimisation” (EnBop) research area, which forms part of the “Energy-optimised Construction” (EnOB) research initiative, is also focusing on this aspect. Both private and public institutions frequently do not have the funds available to them to make the necessary investments in efficiency technologies. This means that potential economic savings remain untapped. One alternative would be to opt for one of the contracting models already available on the market, in which tasks concerned with providing or supplying energy are contractually outsourced to a service provider. The various contracting models are not opposing versions but are intended for different application areas. The most frequent model is energy supply contracting. If a property owner requires, for example, a new boiler, then he does not buy this himself but commissions a service provider. This contractor finances and installs the new plant. The property owner is invoiced based on the heat used, whereby guarantees for energy consumption and room comfort are not possible.

The most well known model is savings contracting. This is concerned with the cost-neutral renovation of properties and building services equipment and thus with increasing the energy efficiency. Here the contractor only carries out investments that it can refinance from the energy cost savings and guarantees these offered savings. In contrast to success contracting, the service provider is only responsible for its own installations and not for the overall system. The operational management also does not form part of the contractual remit and there is not usually an obligation to remedy faults immediately.

A common feature of all standard contracting versions is that they are always limited to just parts of the installation and operation. That is different with success contracting: it has been conceived for installing and operating building services equipment as part of comprehensive renovations and thus enables guarantees to be made for the overall system.

Project participants

- » **The naerco research project** is a joint research initiative under the auspices of the German Association of Environmental Management (B.A.U.M.), Hamburg, in cooperation with the universities of applied science in Nuremberg and Ulm
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Links and literature (in German)

- » www.naerco.de | www.enob.info | www.gymnasium-marktoberdorf.de | www.eneff-schule.de | www.energieteam-bvsg.de

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