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## Functional Quality Assurance – A Cx Method for Innovative Systems

Lately accomplished operation analysis in many buildings revealed an energy saving potential of 5 to 20 percent. Not only buildings that are in operation for many years are affected, also just recently completed buildings do not always meet the design requirements. HVAC systems are often not well dimensioned or lag behind a better possible performance because of insufficient adjustment and calibration. Due to changes in needs and use during occupancy the performance loss may continually proceed. Like in other fields of engineering also in building services a quality assurance is the key to success. Because of its primal reference to the function of involved systems the presented approach is called Functional Quality Assurance (FQA).

The FQA method is widely based on the Cx process. But FQA not only projects and adapts the commissioning idea onto German circumstances, it also consequently extends its influence on the design and the operation of a building. For the common German project schedule FQA is described as a new integrative task across all building trades. FQA is put into practice by the FQA manager – a new role in the project with special focus on functional aspects. FQA expands to all project phases from early design start to construction and finally to building operation. The FQA process is enhanced by the integration of simulation software and newly developed visualization tools for graphic operation patterns and BMS data.

During design FQA acts as an *operation prognostic method* that serves to dimension systems properly and to formulate functional and other specific requirements in tender documents for involving building services contractors into a complete FQA context. During construction FQA attends the testing and balancing phase (TAB) and applies the cognitions of operation prognostics in a *first step of diagnostics* for the verification and evaluation of system performance with functionality specs in the regular acceptance phase. To achieve the best performance output and sustainability in complex and innovative systems an *additional FQA TAB phase* starting with occupancy is introduced. Due to dynamic performance tests the parameter settings and system efficiency are optimized for matching the climatic conditions of a whole year and real occupancy load conditions. The FQA TAB is the *second step of operation diagnostic process* and leads to the final FQA acceptance for selected building services.

FQA does not end with occupancy or system acceptance. It is transferred into the ongoing building operation by applying proactive and *periodic FQA activities*. This will contribute to a sustainable preservation of an optimum of technical equipment performance in terms of better occupants comfort, energy efficiency and higher plant availability with less technical failures and lower operation costs.

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The presentation shows the methodology of FQA and comments on the schedule, tasks, applied tools and benefits.