



Annex 61 Business and Technical Concepts for Deep Energy Retrofits of Public Buildings

# Product Delivery Quality Assurance Process (PDQA) for Deep Energy Retrofit (DER)

International Energy Agency

## Deep Energy Retrofit

A Prescriptive Guide to Achieve Significant Energy Use Reduction with Major Renovation Projects  
Annex 61, Subtask A



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# **PDQA**

- A Deep Energy Retrofit (DER) building project must be properly implemented through all phases in order to accomplish the goals and required performance levels of the owner.
- PDQA supplements procedures addressed in current standards and guides which specifically address DER, sustainability, and energy conservation in buildings:
  - NIBS
  - ASTM
  - ASHRAE Guideline 0

# 8 Phases of Construction Project

- Predesign
- Design Procurement
- Design
- Construction Procurement
- Preconstruction
- Construction
- Acceptance
- Post Occupancy Evaluation

# Statement of Work (SOW) or Owner's Project Requirements Document (OPR)

- Formulation of detailed definition of project requirements and criteria, in SOW or OPR is important to establish the basis for the design of the building, against which tenders (i.e., bids) will be made for both design and construction services. Acceptance of these criteria indicate verification of understanding of the criteria by those proposing to provide design or construction services.
- Specification of areas of major concern to be addressed and checked during the entire design construct, commissioning, and post-occupancy phases
- Clear delineation of the responsibilities and qualifications of stakeholders in this process.
- Defining the owner's project requirements and criteria through the SOW/OPR process, the methodology for validating that both the design and construction will deliver the desired results must be considered and identified within the project contract documents for each step of the process.

# Energy Related Parameters to be Included in the SOW/OPR

- Energy Targets: Site energy EUI, Primary energy EUI, KWh/m<sup>2</sup> yr [kBtu/ft<sup>2</sup> yr],
- Maximum Thermal conductivity of the building envelope: walls assembly (above and below grade), roof assembly, slabs, window assembly, opaque doors, skylight (See Tech Guide Tables)
- Thermal bridges – requirement to “design the building envelope to reduce losses from thermal bridging by applying external continuous insulation and aligning all insulating elements, i.e., the continuous wall insulation, insulated glazing, and insulated doors from top of footing to bottom of roof deck.
- Maximum Building envelope air tightness (e.g., 0.15 cfm/ft<sup>2</sup> at 75Pa)
- Mold and mildew prevention strategies

# Energy Related Parameters to be Included in the SOW/OPR (Cont)

- Minimum HVAC systems equipment efficiencies
- Minimum heat recovery equipment efficiency
- Requirement to use DOAS
- Maximum duct and plenum air leakage
- Requirements to minimum ducts and pipes insulation and requirements to insulation materials and systems
- Requirements to Lighting systems: illumination levels, controllability, zoning, max LPD
- Requirements to IAQ and thermal comfort
- Requirements to efficiency of electric equipment and appliances

# Examples of Test Procedures to be Included in the SOW/OPR

- Understanding OPR requirements: the bidder shall present a review of the energy requirements for the project to include site and source energy targets; energy calculation and modeling methodologies; and any conflicts or questions from the scope and provide a preliminary results of modeling analysis using simulation program allowing for monthly analysis
- Simulation results of the renovated building concept at 65% design
- Design review and manufacturers specifications of equipment and products used
- Design review, air leakage test and IR tests for air tightness
- Design review with calculation of thermal bridges and IR tests for thermal bridges
- Duct pressure test according to ANSI/SMACNA 016-2012 And the whole system test according to the ASHRAE Std 215.
- Post-occupancy tests of IAQ and thermal comfort

# Need Help

- Owners requirements to HVAC and Lighting systems
- Post occupancy evaluation
- Test procedures
  - Energy targets: when (design or one year post occupancy data?)
  - Specification of materials and equipment (design review, construction side)
  - Thermal bridges (calculation during design, IR: when and how)
  - HVAC system commissioning
  - Lighting systems (design, post occupancy)
  - IAQ, Thermal comfort

Thank you