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# **OPR, BOD, Systems Manual**

Expensive, Useless Encumbrances

Or Valuable, Cost Effective Tools

**It's Up to You**

Kent Barber, P.E.



Keithly Barber Associates

*Solutions for Better Buildings*



# OPR, BOD & Systems Manual

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- Owner's Project Requirements (OPR)
- Basis of Design (BOD)
- Systems Manual (SM)



# OPR, BOD & Systems Manual

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What are they, anyway?



# OPR, BOD & Systems Manual

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## In a Nutshell:

- Owner's Project Requirements (OPR) – documents:
  - Owner's functional requirements
  - Associated success criteria
- Basis of Design (BOD) – documents:
  - Concepts on which systems are based
  - Rational & methodology
  - How the design satisfies the OPR
- Systems Manual – documents:
  - Information to help understand and operate systems
  - Goes beyond equipment O & M



# OPR, BOD & Systems Manual

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Why do we need a discussion about cost effective use?



# OPR, BOD & Systems Manual

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- Promoted by ASHRAE for years
- Experienced users know the value



# OPR, BOD & Systems Manual

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- More recently required by such programs as USGBC LEED
- New LEED project teams may lack experience with Cx and these documents



# OPR, BOD & Systems Manual

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**Received differently by  
different project teams  
depending on past  
experience**



# OPR, BOD & Systems Manual

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## Typical 1<sup>st</sup> time reactions:

- More work - who's going to do it?
- Added cost - how do we pay for it?
- Takes time - how will we fit it into the project schedule?

# OPR, BOD & Systems Manual

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**Typical 1<sup>st</sup> time reactions:**



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**Teams experienced with proper  
use :**





# OPR, BOD & Systems Manual

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## **Teams experienced with proper use view them as:**

- Key documents for successful project design, construction & Cx
- Cost effective – improve project efficiency
- Valuable documentation regarding functional intent, for the life of the building



# OPR, BOD & Systems Manual

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How do I make them work  
cost effectively for my  
projects?



# OPR, BOD & Systems Manual

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- Understanding the documents is the key to cost effective projects and commissioning

Let's start to understand →



# OPR, BOD & Systems Manual

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What do these documents  
have in common?



# OPR, BOD, SM What they have in common

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- **All consist of work provided primarily by parties other than the Commissioning Authority (CxA)**
  - AE scopes of work must support the effort
  - Owner's staff has to be prepared for scheduling & participating in development
  - Not necessarily a substantial increase in fees or schedule – more a matter of awareness and developing the documents as a part of already being done



# OPR, BOD, SM What they have in common

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- **The documents give rise to and build on one another**
  - OPR is the foundation of the BOD
  - Systems manual includes the OPR & BOD
    - As well as documentation provided by the project team



# OPR, BOD & Systems Manual

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Now we know what they have in common

Let's look at their specifics



# OPR, BOD & Systems Manual

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What's an OPR?



## OPR – bottom line

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- Describes the Owner's functional requirements & the associated success criteria
- Embodies the criteria by which the success of the project will be judged relative to meeting the Owner's needs



# OPR

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- OPR is a living document
  - As questions arise during design, the OPR is looked to for the answer
  - If the answer is not in the OPR it may be necessary to modify it in order to document the answer



# OPR

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- **Owners Project Requirements**
  - ASHRAE Guidelines 0 & 1- 2007
  - LEED NC 2.2
  
- **Formerly the Design Intent**
  - ASHRAE Guideline 1- 96
  - LEED NC 2.1



OPR

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**Who develops, owns and maintains the OPR?**



# OPR

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- The Owner owns the document
- Development & updates may be:
  - Performed by the Owner
    - Often Facilitated, by the CxA or AE.
  - Or, performed by the CxA or AE with owner input & review.



# OPR

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- LEED Requirement:
  - Owner Develops OPR
  - CxA reviews the OPR
  - AE & CxA facilitation is not in conflict



# OPR, BOD & Systems Manual

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What's the BOD,  
& who develops and  
maintains it?



# BOD

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- **Described in**
  - ASHRAE Guidelines 0 & 1
  - Required for & LEED projects



## BOD

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- The design team develops the BOD from/based on the OPR
- BOD is the design team's opportunity to verify their understanding of the OPR and describe how they intend to achieve its goals with the design



# BOD

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- BOD Documents:
  - Concepts,
  - Design Assumptions,
  - Important calculations,
  - Decisions,
  - Product selections,
  - Rationale
  - And other applicable regulations, standards and guidelines

Used to satisfy the OPR



# OPR, BOD & Systems Manual

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What's a Systems Manual?



# Systems Manual – General Concepts

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- More recent concept than OPR & BOD
- Systems Manuals are described in:
  - ASHRAE Guideline 0
  - Required for LEED Enhanced Cx Credits



# Systems Manual – General Concepts

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- Document lives & evolves throughout the building's life:
- Focuses on operation of systems, particularly interactions between the equipment & systems, rather than maintaining the equipment.
- Intended for
  - Facilities & operating staff
  - Future designers of revisions, retrofits & remodels



# Systems Manual – General Concepts

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- Intended to document:
  - Information required to understand and optimally operate systems
  - The functional intent and basis of design of the as-built systems
  - The fundamental configuration, sequences of operation and operating characteristics of the systems
  - Guidelines for verifying that the systems continue to fulfill the facility's functional needs



# **Systems Manual – LEED Content**

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The CxA compiles the  
document



# **Systems Manual – LEED Content**

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Typical Content  
LEED SM Requirements



# Systems Manual – LEED Content

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- Content by parties other than the CxA :
  - OPR – by Owner
  - BOD – by design team
  - As-built 1-line system schematics –
    - By design team or contractor
    - Contained in some BODs



# Systems Manual – LEED Content

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- Content by parties other than the CxA :
  - As-built controls – by contractor
    - Drawings, sequences, setpoints, recalibration schedule
  - Maintenance schedule
    - May be in O&Ms



# Systems Manual – LEED Content

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- Content by the CxA :
  - Recommended re-Cx schedule
    - Good location for energy tracking recommendations



# Systems Manual – LEED Content

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- Integrated systems description:
  - LEED requirement – “*operating instructions for integrated building systems*”
  - Key Interactive Operating Features and Characteristics
    - Often discovered during Cx
  - Sometimes includes
    - Energy Saving Strategies
    - Impact of setpoint changes



# Systems Manual – LEED Content

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- Integrated systems description a key component
- Authored by:
  - Often by CxA
  - Engaged design engineer could provide



# OPR, BOD, SM Cost Effective Use

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So...

How do I cost effectively  
incorporate the OPR, BOD &  
SM them into my projects?



# **OPR, BOD, SM Cost Effective Use**

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Cost Effective OPR



## OPR – cost effective use

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### **Begin the OPR early –**

- Develop the OPR at programming phase
- Base the project on the OPR – don't develop it after the project's been designed



## OPR – cost effective use

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- **Importance ≠ length and complexity**
  - Be concise
  - Don't be strictly bound to following a sample document
    - If it's important put it in
    - If you don't know what to say, consider leaving it out



# **BOD – cost effective use**

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Cost Effective BOD



## BOD – cost effective use

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- Begin the BOD early –
  - achieve Owner's approval on concepts before designing specifics



## BOD – cost effective use

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- **Use the BOD as a tool, not just a record**
  - Develop it as the project evolves –
  - Outline the direction to be taken as a common understanding for the entire team
  - Obtain Owner's approval before investing development time
  - Base the design & CDs on the BOD – don't develop it after the project's been designed



## BOD – cost effective use

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- **Importance ≠ length and complexity**
  - Be concise
  - Don't be strictly bound to following a sample document
    - If it's important put it in
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## BOD – cost effective use

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- **Pictures can be worth many words – where possible:**
  - Use system 1-line diagrams
  - Present data in tables



# BOD – cost effective use

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## ○ **Leverage BOD efforts**

- Use system 1-line diagrams that will also be useful on the design drawings & CDs
- For descriptions of operation, describe the basic concepts early on, followed by detailed sequences of operation (developed as the design evolves) which will also be used on the design drawings & CDs to provide the contractor with a detailed understanding control programming goals and requirements



# **Systems Manual – cost effective use**

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## **Cost Effective Systems Manual**



# Systems Manual – cost effective use

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- **Develop the document as the project evolves**
  - Most of the contents provide value to the project before the manual is compiled.
  - Develop and use these documents as they are intended –developing them just for the systems manual, diminishes their value



# **OPR, BOD, SM Cost Effective Use**

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2 Valuable Concepts



## OPR, BOD, SM Cost Effective Use

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- The fundamental goal of Building Cx is
  - To confirm to confirm that systems satisfy the owner's functional requirements



# OPR, BOD, SM Cost Effective Use

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- Commissioning is a designed process
- Antoine De Saint-Exupery: *"You know you've achieved perfection in design, not when you have nothing more to add, but when you have nothing more to take away."*



# OPR, BOD & Systems Manual

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- Key Cx Documentation
- Valuable Long-Term Building Documentation
- Contribute to project efficiency and cost effectiveness



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