



# Best Practices

Produced By: P | E | C | I

**OPR, BOD, Systems Manual**  
Expensive, Useless Encumbrances  
Or Valuable, Cost Effective Tools  
**It's Up to You**

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*Solutions for Better Buildings*

# OPR, BOD & Systems Manual

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

What are they, anyway?

# OPR, BOD & Systems Manual

## 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

Why do we need a discussion about cost effective use?

# OPR, BOD & Systems Manual

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

# OPR, BOD & Systems Manual

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

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

## **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?

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



# OPR, BOD & Systems Manual

**Teams experienced with proper use :**



# OPR, BOD & Systems Manual

## **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

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

# OPR, BOD & Systems Manual

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

Let's start to understand →

# OPR, BOD & Systems Manual

What do these documents have in common?

# OPR, BOD, SM What they have in common

- **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

- **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

Now we know what they have in common

Let's look at their specifics

**What's an OPR?**

# OPR – bottom line

- 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

- 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

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

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

# OPR

- 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

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

# OPR, BOD & Systems Manual

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

# BOD

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

# BOD

- 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

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

Used to satisfy the OPR

**What's a Systems Manual?**

# Systems Manual – General Concepts

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

# Systems Manual – General Concepts

- 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

- **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

The CxA compiles the document

# Systems Manual – LEED Content

Typical Content  
LEED SM Requirements

# Systems Manual – LEED Content

- 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

- 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

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

# Systems Manual – LEED Content

- 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

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

# OPR, BOD, SM Cost Effective Use

So...

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

# OPR, BOD, SM Cost Effective Use

**Cost Effective OPR**

# OPR – cost effective use

## **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

- **Importance  $\neq$  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

**Cost Effective BOD**

# BOD – cost effective use

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

# BOD – cost effective use

- **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

- **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

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

# BOD – cost effective use

- **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

## Cost Effective Systems Manual

# System Manual – cost effective use

- **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

**2 Valuable Concepts**

# OPR, BOD, SM Cost Effective Use

- 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

- 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

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



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