

(This annex is not a mandatory part of the referring ASHRAE SSPC 300 standard or guideline. It is merely informative and does not contain requirements necessary for conformance to the standard or guideline.)

(The following informative annex is provided to illustrate, explain, or support the ASHRAE SSPC 300 commissioning process. The information presented herein represents consensus good practice but does not contain mandatory commissioning process provisions. This informative annex supports more than one ASHRAE SSPC 300 commissioning standard or guideline and is not intended to serve as a standalone document. See the referring ASHRAE SSPC 300 standard or guideline for mandatory commissioning process requirements and guidance.)

## ASHRAE SSPC 300 INFORMATIVE ANNEX 04—OWNER'S PROJECT REQUIREMENTS AND CURRENT FACILITY REQUIREMENTS

This informative annex provides an example of how to create an OPR (Owner's Project Requirements)/CFR (Current Facility Requirements), tailored to a specific project.

The OPR or CFR are developed and defined in the beginning of the project delivery process in the predesign or planning phase. Information about the project is gathered, including program requirements, community context, codes and regulations, site and climate, facility context and function, facility technology, sustainability, cost, schedule, and the client's (including Owner, occupants, operators, and maintenance personnel) needs and capabilities. The OPR/CFR provides the basis from which project success is evaluated in achieving a project's documented goals and objectives. For projects involving design and construction activities, this evaluation occurs at defined stages of design, construction, acceptance, and operational phases as decisions are made. For existing buildings with no design and construction phases, evaluation is ongoing through assessment, investigation, implementation, and handoff phases. The implementation of effective Cx depends on a clear, concise, and comprehensive OPR/CFR document, which includes information to guide the Project Team's decisions and execution of the new or existing building commissioning process. The OPR/CFR is often developed in an OPR/CFR workshop that is described for new buildings in ASHRAE Guideline 0 or for existing buildings in ASHRAE Guideline 0.2.

The Owner is encouraged to provide a minimum of five participants that equally represent the various groups associated with the Owner's project. The contributions of the participants allow their voices to be heard, leading to understanding and acceptance of the final project.

The OPR/CFR is considered the heart and soul of the Cx. When the OPR/CFR is not developed, the Owner and Project Team (which can include designer, contractors, occupants, and operation and maintenance (O&M) personnel) each interpret the project requirements, including their individual responsibilities, from the standpoint of their own specific needs. This often creates a range of various views of the project's needs. The OPR/CFR reflects the actual needs of the Owner, the users or occupants, service and operating units, and sometimes the community. Developing the OPR/CFR is one of the most difficult and important aspects for successful implementation of the Cx.

The following sections detail an example format to follow in developing the OPR/CFR and a discussion of how to obtain the required information. Note that, historically, the OPR/CFR has often been referred to as "design intent" for new buildings or additions or as "project intent" for new and existing building projects.

### 04.1 Format

Key sections of the OPR document are as follows:

- a. **Background.** A narrative description to provide context about the project.
- b. **Objectives.** For any project, there are goals that must be achieved for the project to be successful. Goals can range from first cost to time schedule to life-cycle cost. Regardless of which goals are identified, they must be summarized up front to ensure everyone understands the goals.
- c. **Green Building Concepts.** This is an optional section for Owners who wish to focus on the sustainability aspects of their building.
- d. **Functional Uses and Requirements.** In addition to general documentation produced by the architect on functional uses of the building (office, storage, kitchen, etc.), the specific requirements for each functional

area must be documented. This can include such items as security, safety, comfort, energy, maintainability, and indoor air quality.

- e. **Lifespan, Cost, and Quality.** It is important to clearly document the Owner's expectations for lifespan of materials, cost of construction, and the level of quality desired. By providing this information, unrealistic expectations are identified and eliminated.
- f. **Performance Criteria.** Often the most difficult to define. Performance criteria details minimum acceptable performance benchmarks for various aspects of the facility.
- g. **Maintenance Requirements.** The maintenance requirements are a mixture of the level of knowledge of the current O&M staff (what can they maintain) and the expected complexity of the proposed systems (what they can learn). If there is a significant gap between the two, no matter how well the building is constructed, it may not be maintained or operated properly.

The following are examples of OPR elements that are common to most of the technical Cx resources topics:

- a. **Benchmarks for Performance.** Specific criteria for the functional use of each space, assembly, and system must be defined. These include temperature, humidity, airflow, light levels, noise, durability, aesthetics (materials and colors), service life, reliability, redundancy, and the like. Typically, upper and lower limits are provided for general spaces, with exceptions noted as required.
- b. **Problems to Avoid/Lessons Learned.** Because occupant/user/operator complaints are common, it is important to identify and document those problems that have caused complaints in the past. If these problems are not documented and the situation recurs, the occupants often consider the entire project to be a failure.
- c. **Specific Occupant Requirements.** Specific items that are deemed important to the various occupants in a building must be identified and documented. In speculative-built buildings, this section would detail the limits to which occupants can make use of their spaces. For example, a chemical laboratory cannot be put in a space designed and constructed for general office use without significant changes to the systems and possibly to the building as a whole.

## 04.2 Obtaining the Information

While it may be easy to obtain the basic information related to development of the OPR, it is difficult to obtain quality information that the Owner, O&M staff, service contractors, customers (e.g., students, patients, retail customers, renters), visitors, subtenants, occupants, and the community all agree upon. In quality-based processes, it is critical that input be obtained from all the users (the various user groups) and that the consensus of and differences between the groups are documented. There usually are requirements for which users do not all agree. These must be documented as unresolved items. Normally, the Owner will make final decisions on what the priority order of OPR will be. However, the Owner and the rest of the Commissioning Provider (CxP) Team must be aware of all requirements so that the final product will include as many individual group requirements as are deemed appropriate and within the budget.

A simple, three-step process is recommended for developing the OPR:

- a. OPR/CFR workshop
- b. OPR/CFR documentation (report)
- c. Project team approval of the OPR/CFR

## 04.3 OPR Workshop

There are multiple ways that stakeholders can add information to an OPR or CFR. Traditionally, this was done in a workshop where stakeholders were physically present to discuss and agree on elements of the OPR/CFR. This required all stakeholders to be present at the same time for one or more such sessions, presenting obvious scheduling difficulties.

With the advent of electronic cloud file hosting and electronic meetings, this has opened up new possibilities for collecting OPR- and CFR-related information. Many possible variations of the use of such tools are possible. A few examples are shown below:

- a. **Cloud-Based Document Editing**

1. In cooperation with and with the assistance of the CxP, the Owner creates a cloud-based OPR/CFR document and grants editing rights to all stakeholders.
  2. Each stakeholder is invited to add comments in sections related to their expertise. This relieves stakeholders from commenting on the entire document. (**Example:** A building maintenance technician may be asked to comment on procedures for supplying consumables and desired access but would not have to read or edit sections related to energy modeling.)
  3. The Owner and CxP could also decide to publish the OPR/CFR in sections and make the various sections accessible to specific commenters for this purpose.
  4. Documents can be posted for finite time periods, allowing each stakeholder to provide input, but also making the process manageable by setting deadlines as part of an overall scheduling mechanism.
- b. **Meetings**
1. Meetings to discuss the OPR/CFR can be held in person or virtually. Both should be acceptable unless specific project partners do not have access to electronic communication tools, or do not have internet connections that make conferencing possible (limited bandwidth locations).
  2. Electronic platforms that allow automating scheduling of a large number of stakeholders are now available online in free and paid versions, and these significantly accelerate and simplify the process of getting meetings set up.
  3. Electronic meetings introduce a higher level of flexibility; it is simpler to schedule meetings since stakeholder transportation to a physical location is no longer required. It is also possible to schedule different groups in subsequent meetings, so that time is used more efficiently for each stakeholder. For example:
    - i. An OPR/CFR meeting on Thursday: split into five virtual sessions of forty-five minutes each (such as building use and maintenance, main mechanical, electrical, security, and telecom systems in one session each).
    - ii. The five sessions can be scheduled as immediately consecutive or not, with only relevant stakeholders invited to each session. All stakeholders can join each session but are not required to.
    - iii. Sessions can be recorded for the benefit of those who could not be present. Many meeting platforms also provide automatic transcription services, so that details are not forgotten, and stakeholders can focus on the discussion, rather than on taking notes.
    - iv. All sessions can work on the same-cloud document. Depending on how access rights are set up, one secretary can make changes to the document, or multiple stakeholders can edit during the meeting.
  - c. This cycle of iterative refinements to the OPR/CFR can be repeated as needed; either to bring the OPR/CFR to an initial state for use by the CxP and Project Team, or to make updates to the OPR/CFR throughout the project life-cycle.
  - d. Many cloud-based platforms provide automatic versioning; this means that when a document is changed, the old version is automatically retained and can be recalled later. This allows an OPR/CFR to undergo revisions during meetings, or during editing by stakeholders outside a meeting, while retaining the ability to determine who made what changes at what time.

The above examples illustrate a wide range of possible choices for making OPR/CFR workshops efficient and effective. The Owner and CxP should agree on the overall mechanism for hosting the OPR workshops and select:

- a. Document hosting method (cloud, local files, email, version control, backups)
- b. Stakeholder directory and possible grouping of stakeholders to address specific chapters in the OPR/CFR
- c. Schedule of activities for OPR editing and OPR workshops (overall timeline, number of meetings, scheduling mechanism to ensure required stakeholders are present)

#### 04.4 OPR/CFR Document

A general format for an OPR/CFR document is presented below. The structure provided is intended to

encompass the facility requirements and enable the addition of sections, depending upon the systems and assemblies to be constructed and commissioned.

- a. **Introduction.** Includes an overview of the project and the general reasons why the project is being undertaken. A description of the Owner's processes (Cx) is typically contained in this section.
- b. **Key Owner's Requirements.** Includes a listing of the key Owner's requirements that the Cx will focus and that the Owner (CxP Team) has determined are critical to the success of the project.
- c. **General Project Description.** The size and scope of the project are included in this section.
- d. **Objectives.** The objectives for accomplishing this project are detailed in this section.
- e. **Functional Uses.** The expected functional uses for the spaces in the facility are detailed in this section. A short description of each functional use should be included to provide the context in which it was detailed.
- f. **Occupancy Requirements.** Includes the number of occupants (users and visitors) and the schedule of occupancy, including all special conditions.
- g. **Phasing.** This may affect the scope of commissioning tasks significantly: the Owner needs to assign acceptance testing of systems, installed in one phase, but tested in a subsequent phase. If this is not done explicitly, many systems run the risk of never being tested. Refer to examples below.
- h. **Budget Considerations and Limitations.** The expected budgetary restrictions and considerations are contained in this section.
- i. **Performance Criteria.** The performance criteria on which the project will be evaluated by the CxP Team are included in this section. The performance criteria for each building and system should be measurable and verifiable. Include subsections as appropriate to organize and explain the criteria:
  1. Commissioning program requirements
  2. Economic and efficiency requirements
  3. Environmental and sustainability goals
  4. User/Tenant Requirements
  5. Environmental requirements construction process, if a project requirement
  6. Maintainability and maintenance program requirements
  7. Operations training requirements
  8. Benchmarks
  9. Documentation and format requirements, including the Systems Manual

**04.5 OPR/CFR Version History.** Includes a summary of the changes made throughout the Predesign, Design, Construction, and Occupancy/Operations Phases. This information is critical to understand and document the trade-offs made over time and the resulting impact on the project.

#### **04.6 Examples**

- a. **Phasing for Design and Construction Projects.** Example: Large Spec Office Building
  1. A central air-handling system with a chiller control sequence (like air terminals which send requests to the AHU and the central plant) do not yet exist.
  2. The Owner, at completion of this project, obtains designs, design reviews, and submittal reviews from the CxP, but no testing or trend reviews.
  3. A subsequent TI project team installs the first tenant improvements; at this point, the central systems could be tested, but the TI team does not have this in their contract.
  4. The Owner ends up with an untested central system in this scenario.
  5. To avoid this scenario, the Owner must address the responsibility for testing at the outset of the shell and core project to identify how acceptance for central systems will occur. Challenges are:
    - i. Selecting the right team (the TI team may not know or understand the central systems, but the shell and core team will likely have their contract closed out by the time TI occurs)
    - ii. Warranty discussion: It may well be that the S&C team's warranty for central systems has expired

- by the time the TI team proceeds with testing (if they end up with that scope of work); faulty equipment may only be discovered as such at that stage
- iii. Allowances: To make the budgeting of the testing phase for central equipment easier, the Owner could decide to assign a separate budget for this work ahead of time, so that bids can be placed for this work with either the S&C team, the TI team, or a third-party team.
- b. **Phasing.** Part load operation: Where the Owner knows that tenant improvements may take several years before full occupancy is obtained (or in the case of a data center, before full-load is obtained), interim operation will require equipment to run at part-load.
1. Example: Highrise. A 15-story building runs for one year with just one floor occupied, and for another year with just two floors occupied, before getting a sizable anchor tenant who occupies eight floors.
  2. In this scenario, central equipment has to be capable of providing 1/15<sup>th</sup> (one-fifteenth) of design capacity on a design day, and a fraction of that for a typical day, perhaps 1/30<sup>th</sup> (one-thirtieth) or less of overall design capacity.
  3. Example: Data Center. A 25,000 sq. ft. data center operates for eight months with 1/20<sup>th</sup> (one-twentieth) of the design load before racks are loaded to one-quarter of design capacity and operates at that condition for another twelve months.
  4. Either scenario means central equipment has to be designed on day for high turndown (low-capacity operation). This may substantially alter the plant design, footprint, and cost, leading to selections such as multiple, smaller units (chillers, towers, boilers, heat pumps, AC units, etc.) and to more control points, electrical feeds, and larger equipment rooms or pads.
  5. The Owner must clarify the intended operation for the first several years, with likely scenarios in part-load operation to allow the Design Team to take this into account and allow the CxP to anticipate operational issues and comment on them during the design review phase.
- c. **Table of OPR/CFR Entries.** Table 04-01, “Example Matrix for Developing OPR” (below) will assist in the development of the OPR document using the format presented in this annex. The Key OPR section should emphasize those OPR items that are essential to the success of the project.

Table 04-01 Example Matrix for Developing OPR/CFR

Criteria	OPR/CFR Section														
	Introduction	Key Owner’s Project Requirements	General Project Description	Objectives	Functional Uses	Occupancy Requirements	Budget Considerations and Limitations	Performance Criteria							OPR Version History
								General	Economic	User Requirements	Construction Process	Operations	Systems	Assemblies	
Criteria	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
(a) Project Schedule and Budget			Schedule				Budget								
(b) Cx Scope and Budget	Scope						Budget								
(c) Project Documentation Requirements, including format for submittals, training materials, reports, and the Systems Manual. Consideration should be given to use of electronic format documents and records where appropriate.		X													
(d) Owner Directives		X													
(e) Restrictions and Limitations			X												
(f) User Requirements		X								X					
(g) Occupancy Requirements and Schedules					X	X									
(h) Training Requirements for Owner’s Personnel		X									X	X			
(i) Warranty Requirements		X										X			
(j) Benchmarking Requirements		X							X		X	X	X		
(k) Operation and Maintenance Criteria for the facility that reflect the Owner’s expectations and capabilities and the realities of the facility type		X										X	X	X	
(l) Equipment and system maintainability expectations, including limitations of operating and maintenance personnel		X		X							X	X	X		
(m) Quality Requirements for Materials and Construction		X						X			X		X	X	
(n) Allowable Tolerance in Facility System Operations				X								X	X		
(o) Energy Efficiency Goals		X		X					X			X	X	X	
(p) Environmental and Sustainability Goals		X		X				X							
(q) Community Requirements		X						X							
(r) Adaptability for Future Facility Changes and Expansion		X		X	X						X	X	X	X	
(s) Systems Integration Requirements, especially across disciplines					X			X			X				
(t) Health, Hygiene, and Indoor Environment Requirements		X				X				X					
(u) Acoustical Requirements		X						X		X	X				
(v) Vibration Requirements		X						X			X				
(w) Seismic Requirements		X						X			X				
(x) Accessibility Requirements		X						X		X	X	X			

Table 04-01 Example Matrix for Developing OPR/CFR

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								General	Economic	User Requirements	Construction Process	Operations	Systems	Assemblies	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
(y) Security Requirements		X						X		X	X				
(z) Aesthetics Requirements		X						X		X	X				
(aa) Constructability Requirements		X						X			X				
(bb) Communications Requirements		X						X		X	X				
(cc) Applicable Codes and Standards			X												