Integrative Process (IP)©

ANSI Consensus National Standard Guide©
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for

Design and Construction of Sustainable Buildings and Communities

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Integrative Process (IP)
ANSI Consensus Standard Guide 2.0
for
Design and Construction of Sustainable Buildings and Communities

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SECTION ONE – Introduction and Making the Case

1.A Introduction

This Integrative Process (IP) Guide is comprised of two sections: Section One introduces the history, intent, background, philosophy, and fundamental premises that support the growing need for building design and construction teams to align around the implementation of a clearly defined Integrative Process. Section Two defines that process; providing a step-by-step outline for its implementation. Accordingly, Section Two is the portion that project teams should follow when they desire to conform with this ANSI Consensus Standard Guide.

This document is the result of six years of work beginning in November 2005, when a core committee of building industry practitioners gathered in Chicago to begin a dialogue on how to offer the marketplace a document that codifies the meaning, importance, structure, and practice of an Integrative Design Process. The Institute for Market Transformation to Sustainability (MTS) requested the formation of this group to create a standard guideline of practice that would provide building Owners and building design and construction practitioners with a framework for practicing in a highly interactive way, using a co-learning process. This Integrative Process is essential for achieving both cost efficiencies and highly effective sustainably oriented performance. Many professionals talk about the need for this process, but very few teams do it well. This guide is intended to inform designers, engineers, constructors, facilities managers, building owners, and clients about this process and to provide a framework for taking the mystery out of this way of practicing.

Version 2.0 is a refinement of the *ANSI/MTS 1.0 Whole Systems Integrated Process Guide (WSIP)-2007 for Sustainable Buildings and Communities*. After Version 1.0 was adopted, a book was published to elaborate on the “lessons learned” from implementing an Integrative Process (IP). The book, *The Integrative Design Guide to Green Building*, written by the 7group and Bill Reed (IDGGB, or, the Reference Guide), built upon the structure of the original ANSI Standard Guide and appreciably refined it. Further, in 2009, approximately thirty peer reviewers, from a range of design and building professions, were engaged to review the detail practices and stages outlined in the book; a workshop was held in Seattle, Washington in October 2009 to synthesize their comments. This Version 2.0 is guided by the suggestions, comments, and edits that grew out of this peer review process.

As outlined in the prior Version 1.0 Standard Guide, the premises of this document are:

- It needs to be simple enough to be referenced by busy building professionals and clients seeking to understand why they can benefit from an IP structure.
- It needs to be specific enough to function as a guideline for practitioners and clients in determining the scope and deliverables associated with building design, construction, and operations practices.
- The framework needs to be generic enough to be applicable to a wide variety of project types and process entry points in the timeline of a project.
- It needs to speak to all participants in project delivery, so that they can comfortably participate in the integrative design process.

1.B Integrative Process Definition

The Integrative Process actively seeks to design and construct projects that are cost-effective over both the short and long terms, by engaging all project team members in an intentional process of discovering mutually beneficial interrelationships and synergies between systems and components, in a way that unifies technical and living systems, so that high levels of building performance, human performance, and environmental benefits are achieved.

1.C Intent of this Standard Guide

1.C.1 Consensus Standard Guide

This document is intended to serve as a Consensus Standard Guide and common reference that will support the building industry (architects, constructers, designers, engineers, landscape architects, ecologists, facilities managers, clients, manufacturers, and so on) in the practice of integrative design, integrative construction, and integrative operations. Accordingly, this document is written in the form of a Standard Guide, in accordance with the definition of a Consensus Standard Guide: *a compendium of information that outlines a series of options for implementing an Integrative Process, but it does not recommend specific or prescriptive courses of action*. It is largely qualitative and designed to present a clear framework that can be adapted and applied to any situation or building type by tailoring the process to the unique characteristics of each and every building project, regardless of function or location. Therefore, as a Standard Guide, it is intended to increase the awareness of information and approaches pertaining to Integrative Design, and it is contrasted from more quantitative Consensus Standards.

1.C.2 Relationship to AIA's Integrated Project Delivery (IPD)

This Integrative Process Guide outlines a process that is distinctly different from, but is intended to complement, the American Institute of Architects' (AIA) Integrated Project Delivery (IPD) approach. The AIA's IPD is a project delivery approach that integrates people, systems, business structures and practices (primarily through contract and legal agreements) into a process that collaboratively harnesses the talents and insights of all participants to optimize project results, increase value to the owner, reduce waste, and maximize efficiency through all phases of design, fabrication, and construction. This Guide presents a systematic methodology and structured process of *how* to achieve these results; it outlines the details of an optimal step-by-step process that client, design, and constructor teams can utilize to achieve these IPD goals by presenting *how* to achieve mutually beneficial interrelationships between people, project, site, and infrastructure systems. The benefits include greater cost effectiveness, value, building performance, and human performance, while addressing sustainability issues associated with energy, water, materials, and habitat.

1.C.3 Relationship to US Green Building Council's LEED® Green Building Rating System

Developing metrics for assessing a project team's engagement and use of this Integrative Process Guide contributed to the US Green Building Council's (USGBC) development of an Integrative Process credit intended for incorporation as a new credit in Leadership in Energy and Environmental Design (LEED) 2012. This proposed credit includes activities associated with "Discovery",and "Implementation" across energy-related and water-related systems, as well as integrative cost analyses associated with these systems. It rewards project teams for using the information gathered during the Discovery Phase to make improved building design decisions during implementation; it requires project teams to identify and execute synergistic opportunities for high performance outcomes across different disciplines and building systems, so that cost-effective project outcomes are achieved through analyses of key systems interrelationships before decisions are made on building form and throughout the design process. Although this IP Standard Guide serves as a Reference Standard for project teams pursuing this proposed new LEED credit, it also serves as a valuable resource to help guide teams through an integrative process so that high performance LEED Certified projects can be achieved cost-effectively.

1.C.4 Ensuring that this Standard Guide is Implemented Effectively

Substantial market experience corroborates that *"everyone is saying they are doing integrative design, but they really are not."* The Federal Trade Commission Environmental Marketing Guide (http://business.ftc.gov/documents/bus42-complying-environmental-marketing-guides) identifies this problem, and in doing so, makes it clear that the substantial cost and risk reduction benefits achievable by following the Integrative Process outlined in this IP Standard Guide will not be realized unless this process outlined herein is implemented effectively.

Additionally, the stock of higher performing projects that currently are needed to address rising long-term energy costs/price volatility and dangerous climate change will be too expensive without adhering to this process. It also is worth noting that national public meetings on green building underwriting conducted at Federal Reserve regional offices in 2010 concluded that Integrative Process (IP) is such an important part of underwriting, that a consensus determined "IP has sufficient value that it should be a condition of financing:" http://mts.sustainableproducts.com/Integrative_Design.html. Also at this preceding link is Fireman's Fund Insurance Company's IP Risk Reduction Statement concluding that adherence to this IP Standard reduces design and construction risk. Further, the National Consensus Green Building Underwriting Standard identifies that use of this IP Standard increases cash flow.

Accordingly, if an Owner desires an Integrative Process that is effective in achieving the associated economic, risk reduction, and environmental benefits, that Owner should consider requiring their design and construction professionals to follow this Integrative Process Guide by incorporating it into their contracts. This is especially important with regard to ensuring that the all-team Workshops identified in this IP Standard Guide are conducted. Further, such contracts should specify which professional or entity will take the lead in facilitating the Integrative Process. In incorporating this Standard Guide in contracts, Owners may want to consult with legal counsel who possess Integrative Process expertise, to ensure that the Owner's needs and an effective Integrative Process are both achieved, thus adding value to their projects. Even if such contractual requirements are found undesirable (for whatever reason), germane provisions of this IP Guide should at the very least be incorporated into the project specifications in order to ensure their implementation.

1.C.5 Reference Guide for this IP Standard Guide

Implementing the Integrative Process presented herein also requires significantly more detailed information than can be presented within the scope of typical Standard Guides. Therefore, this Integrative Process Guide is designed (but not required) to be used in conjunction with its companion "Reference Guide", the aforementioned *Integrative Design Guide to Green Building* (IDGGB), which provides far more detailed guidance for implementing an integrative process and uses the same format outlined in this IP Guide. As such, the IDGGB is referenced throughout this IP Standard Guide in order to provide additional guidance.

In summary, the intent and purpose of an Integrative Process is to effectively manage and optimize synergies between the complex set of technical and living systems associated with design and construction in order to effectively pursue sustainable practices. To achieve cost effective and increasingly more effective environmental performance, it is necessary to shift from conventional linear design and delivery processes to design and construction practices that focus on interrelated systems integration. This IP Standard Guide is intended to provide project teams with a clear step-by-step outline of a process for doing so.

1.D Background

1.D.1 Philosophy

All things and all life are interrelated and connected. Ignoring these interconnections has created the need to address more directly how humans can work to sustain life on this planet.

When working in a way that isolates design and construction disciplines into silos (architects, mechanical engineers, landscape architects, constructors, etc), fragmented solutions are created. These ‘solutions’ can, and do, create unintended consequences – some are positive, but most are negative. The corollary is that when working to integrate areas of practice, it becomes possible to find performance and cost synergies and benefits.

To work this way requires that the people involved in the process – those who hold knowledge that is spread across various disciplines – are brought together in ways that enable the knowledge, analyses, and ideas from each discipline to inform and link with the systems and components of all other disciplines. This synthesis requires a process that develops all major issues in parallel with each other, so that the entire design and construction team can identify cross-linked interrelationships and resultant benefits from beginning to end.

An integrative process mandates more coordination. It encourages rigorous questioning. It challenges typical assumptions and rules-of- thumb from the very beginning of the project. The coordination of building and site systems should be addressed early and questioned before schematic design starts, or at the least, while it proceeds. Integrating the many systems involved in a building project requires that the expertise of each team member responsible for each system, be brought together for the purpose of augmenting the efficiency and effectiveness of *every* system and team member.

All issues need to be addressed concurrently, with everyone present, at the earliest possible time. This can be summarized as: **E**verybody **E**ngaging **E**very issue, **E**arly in the project.

1.D.2 Two Examples of Integrative Process Benefits

All *relationships* should be identified for optimal results, and value-engineering should not focus on optimizing individual components; Amory Lovins calls this "Tunneling through the cost barrier", while the Lean Construction Institute calls this “Optimizing the system, not its parts”.

In the conventional design process, each discipline’s representative is expected to design the sub assemblies and systems under his or her control with the most effective benefit for the lowest cost. In the Integrative Process, the full client-design-building-and-operations team is looking to find the overlapping relationships, services, and redundancies, so that potential inter-dependencies and benefits (that otherwise would have gone un-noticed) can be exploited. Normally, previous assumptions and standard practices leave such synergies unexamined.

It is remarkable how many technologies and techniques can be changed and minimized when all systems of a project are looked at as an integrated whole, rather than as a set of fragmented pieces that are optimized in isolation. This recognition requires the client-design-building-and-operations team to function as a unified whole system to investigate these potential synergies.

a. Building Systems as a Unified Organism (not separate pieces)

A Passive Solar Home in the Western USA:

Before the invention of low-emissivity glass, passive solar homes typically cost $5,000 more than a conventional house of equal size. This was usually the case, because in addition to the required larger areas of glass, increased insulation and thermal mass, mechanical systems had to be installed to serve as a back-up heat source.

When low-emissivity, argon filled glazing appeared in the market, a number of cascading benefits were realized that reduced the cost of a passive solar house to approximately $2,000 *less* than conventional construction, while at the same time reducing annual energy costs by 50 to 70 percent.

It works this way: The insulation value of the high performance glass is such that a number of reductions are possible.

- The well-insulated walls and windows no longer need to be warmed by a heat source. Also, heating components that compensate for the uncomfortable radiant heat loss from our bodies to cold surfaces of glass (and measures to reduce condensation) are no longer needed. Therefore, instead of the usual ductwork along the perimeter of the house that is installed to bathe windows with warm air, it is possible to eliminate these runs. Consequently, the ducts are limited to a central trunk serving all rooms from the internal walls. Money is saved.
- Because the walls and windows are such effective insulators, a boiler is no longer needed. The house is capable of being heated with a quick recovery hot water heater. More money is saved.
- Because the house is so tightly built, the issue of indoor air quality is a concern. The air handler is replaced by an air handler, which also serves as an air-to-air heat exchanger. Some money is spent with this action, but the house is much more desirable from a health perspective.

The overall approach spends more money on glazing and insulation in order to capture overall net savings (and benefits) resulting from eliminating the boiler and reducing ductwork; significantly reduced energy costs and better indoor air quality also are achieved.

b. Building Team as a Unified Organism (not solving problems in isolation)
All *people* relationships should be designed to interact in order to achieve optimal results; purposeful studies and meetings are held to explore system interrelationships and exchange ideas for possible new solutions.

Fostering an Interdisciplinary Process: “A Deer in the Headlights”:

The Pennsylvania Department of Environmental Protection Cambria office building project in Ebensburg, PA was a project with two clients: the DEP (the building user), and the developer (the owner), who was responsible for designing, building, managing, and leasing the building to the Commonwealth of Pennsylvania, earning profit from lease revenues. This project served as a learning laboratory about the importance of making sure that all project team members are convened in a series of sessions focused on integrative design solutions as early as possible.

An early schematic design meeting was held with the project team, including the project engineers, architect, constructors, the developer, and DEP representatives. The schema for the design emerged as an elongated rectangle consisting of a central core and two wings. The plan was oriented lengthwise on an east-west axis, with the larger wing to the west and the smaller to the east. An early decision was made to couple ground-source heat pumps with underfloor supply-air-plenum distribution. The design architect had decided before this early schematic design meeting that the central HVAC equipment should be located in a penthouse on the building’s roof. Given this decision, the meeting’s participants initiated a discussion about piping and ductwork: specifically, how best to get the piping from the ground-source heat pump well-field up to the penthouse, and how to distribute air ducts back down from the air-handling units into the underfloor supply-air plenums on both the first and second floors of this 34,500-square-foot building.

The team engaged in a back-and-forth conversation, discussing where the piping would go, what the size of the vertical duct shafts should be, how all of this could fit into the central core, and how to avoid conflicts between these distribution components and other building elements such as elevators, structural components, sprinkler pipes, etc. As this discussion unfolded over a period of about twenty minutes, the architect realized that this process was not, in fact, an integrative design process. Rather, this process of deciding (albeit, as a group) how best to assemble these systems amounted to little more than accelerated coordination. Further, the decision to locate the central HVAC system components in the penthouse had been made in isolation (by the Architect) without any input from the other disciplines at the table.

Realizing this, the architect stopped the meeting. He looked across the table at the mechanical engineer, and asked, “If you were designing this building, where would you locate the central HVAC system components? Where’s the best place for the mechanical room?” The engineer was stunned. He sat in silence; later, he said that he felt like a deer caught in headlights. The architect, noticing the engineer’s discomfort, asked what was wrong. He explained, “Nobody’s ever asked me that question before.” Here was someone with over twenty years’ experience designing HVAC systems, yet never in his career had an architect asked him for his expert advice on where to locate the HVAC system components and the mechanical room. It only took a couple of minutes, though, for the engineer to recover. He suggested placing the eleven ground-source heat pump units in two separate mechanical spaces on the ground floor of the building—six units in one room (serving the west wing) and five in the other room (serving the east wing). He explained that he could then route supply piping from the well field directly up through the slab on grade to each of these units, thereby eliminating *all* of the piping up to the penthouse and back. Additionally, supply air could be provided directly into the first-floor air plenum with only a foot or two of ductwork in three directions. Further, only five feet of vertical ductwork would be needed to supply air to the second-floor plenum, thereby eliminating virtually all of the ductwork that otherwise would have been needed to provide supply air from the penthouse. Further still, the engineer noted that since the duct runs would be so significantly reduced, less resistance to airflow would result, which meant that fan sizes could be reduced. Lastly, he explained that instead of facilities staff having to climb a ladder in the janitor’s closet to get onto the roof and then go out into the snow and rain to replace filters, compressors, and so on, these activities could be performed in an easily accessible, weather-enclosed space, resulting in significantly improved ease of maintenance over the life of the building.

The engineer’s solution was elegant. In fact, everyone loved the idea except for one person, the owner, who heard only that he was going to lose 400 square feet of prime lease space from the first floor of his building. Locked into a minimum square footage of lease space, he viewed such an adjustment as impossible. But, after some discussion and calculations, it was determined that this new idea would save the owner $40,000 in base construction costs. Hearing this, the owner happily agreed to make up the lost square footage by adding an inexpensive 18 inches of length to each end of the building. Everyone was happy. The significant operational savings that would be realized from both energy savings and simplified maintenance were, as it turned out, icing on the cake. Even the sheet metal Constructor, who initially balked at the idea of losing all that ductwork (asserting that such a system would never work), said by the end of the project that it was the best system he had ever installed.

1.D.3. Everyone is Practicing Integrative Design . . . "at least that's what they say"

What is this mysterious "Integrative Design" process and what does it mean? How do you know if you really are practicing integrative design or not? How does a client know who to believe when selecting a team?

With the steadily increasing demand for green and sustainable building, and the proliferation of the U.S. Green Building Council's LEED® Green Building Rating System, there is a heightened awareness that the design process itself determines the success and cost effectiveness of implementing green building and using rating systems. Practitioners now recognize that an integrative design process can make or break a project, but it can be difficult to achieve and it depends on every member of the team participating and committing to it. The difficulty of this process is that it challenges people's ability to go outside of their comfort zone, do things differently, and refine their personal skills when encountering resistance and conflict.

When asked about green building, design professionals often respond in one of two ways. First, there are the naysayers, those who feel that green design is either a passing trend, or an expensive add-on layer superimposed onto "traditional" design. Second, there are those professing that they've been doing green design since the '70s solar craze, and that everything they do is green and sustainable.

So how do you know if you are really practicing integrative design? To answer this question, one needs to have a set of indicators—both qualitative and quantitative criteria—that evaluate whether or not one really is working collaboratively in a team setting. The U.S. Green Building Council (USGBC) created the LEED rating system to answer the question, "what is a green building?" Similarly, the design and construction industry now needs to have a set of indicators that can answer the question—"how green is your process?" ...or, "how integrated is your process?"

To answer this question, it is first necessary to raise awareness about our current practice and be honest about what doesn't work in order to recognize the indicators of a "dis-integrated," or dysfunctional, process. These include:

- Lack of clear and shared understanding of *project goals and basic aspirations* during conceptual and schematic design
- Poor *communication* resulting in errors, omissions, and assumptions that result in over-sizing systems, redundancy, and gaps in knowledge and performance analysis
- A heightened degree of *mystery* between disciplines, particularly around specific analysis (For example, the architect doesn't understand how the mechanical engineer arrived at the current design, or what assumptions defined the system's performance analysis.)
- Lack of *value* in meetings, tasks or activities—this could range from "value engineering" (which jokingly is referred to as neither) to ongoing, repetitive meetings whose outcomes are not clearly defined, and people's time is wasted.
- Overlaps in roles and gaps between team members' *responsibilities* (especially in LEED projects)
- *Silos* – decision-making happens without collaboration (for example, the architect saying, "It's too early in design to include the mechanical engineer, interior designer, or landscape architect").
- Lack of a specific or defined *map*—the integrated design process differs in significant ways from the conventional design process to which we've become accustomed or conditioned. To succeed, the project team should intentionally map

its process with clearly targeted goals and with identified decision-making paths, milestones and methodologies for analysis. Without these, the team has no idea where it will end up and will suffer added headaches and increased cost. Without a map, it's too easy to fall back into conventional practice patterns.
- *Meeting structure* and flows—particularly early in the process, project teams need to engage in brainstorming, workshops, and targeted meetings interspersed between larger group meetings. To avoid silo behavior, teams should focus on specific analyses, feedback loops and co-solving problems.
- An "abyss" exists between the design and construction professionals, and these two camps function more as if they are enemies than on the same team, which often results from current contractual structures and obligations.

On the other hand, you know you are participating in an integrative design process when:

… you are asked for your input on a wide range of issues—including those outside of your immediate area of expertise or purview.

…a number of project team members are pushed out of their "comfort zone" (they either find this exciting and invigorating, or initially terrifying and disturbing!).

…there is a shared understanding of project goals via collaborative working sessions.

…the expectations of your work are clearly defined and sufficiently detailed—the results have targeted, quantified performance goals.

…other people's work depends on yours; tasks are *interdependent*—you can't just go off and hide in a corner, then push through your deliverables. Integrated systems result from an integrative process in which stakeholders co-solve problems.

…you feel that group interactions inspire creativity—working sessions are more "fun."

…you feel more respected and valued than in a traditional project, and you feel obligated to respond in kind—you sense a higher level of morale and alignment with the core values expressed by the group, resulting in an expanded degree of pride in the outcome.

…there is a focus and emphasis on process itself, including an early collaborative goal-setting session attended by all team members (no later than schematic design) to establish a shared understanding of project targets and priorities.

…the process is mapped clearly—stakeholders actually spend time planning how problems will be solved together, with decisions made in a transparent way—this defined "map" is incorporated into main project schedule.

…innovative solutions that challenge "rules-of-thumb" are encouraged (innovation doesn't mean high-tech or risky strategies).

…decision-makers (client) and an expanded array of stakeholders are involved in a significant and valuable way.

…the project embraces issues not usually considered in the typical design process—such as the health of the watershed, the regional ecology, and the community—by engaging an ongoing process of discovery that identifies what contributes to the health of the project's context or place.

…you feel a greater sense of ownership in the entirety (or whole), rather than in individual aspects or components.

…there is dialogue and debate surrounding design decisions, leading to a higher level of "buy-in" and consensus among the team.

. . . designers and constructors are working together to find creative reconciling solutions from the beginning of design through construction.

However, it is important to remember that very little in life is black and white, including the design and construction process. Most processes are neither completely collaborative nor completely dysfunctional. More likely, there are variations. One typical scenario is that a team gets off to a great start, but then the process degrades over time. At the outset, a team focused on green design will plan an initial workshop—excitement is high, enthusiasm abounds. People leave the workshop revved up and ready to charge ahead…however, ingrained habits are hard to change! Either the workshop was a one-hit wonder and didn't include a rigorous mapping process, or there wasn't enough built into the ensuing process to ensure that collaborative interaction would continue.

The first workshop isn't enough. The team's process will not be integrated unless team members continue to pay vigilant attention to it, and continue to question even their own participation and habits. A truly integrative design process will include a variety of interactions among the team—a series of larger workshop meetings with smaller focused meetings in between, all orchestrated to build on each other. Each meeting, interaction, and activity should serve to add clarity and value to the exploration, analysis, and resulting design. If not, the merits of these activities should be questioned and alternatives explored that might better serve the purpose.

The indicators of an integrative design process are reflected in both the built product and the human interaction that leads to it. Decreased costs resulting from the elimination of redundancies and streamlining systems are a solid indicator that the design team is not just piling on technology without a rigorous and carefully considered method of analysis. As a result, highly integrated building systems can't fall prey to typical value engineering methods, because components are inextricably interrelated, and they cannot be reduced by merely removing some, without significant impacts on other systems components. Clarity about both the design and the steps to be taken in the design and construction process are another strong indicator of an integrative process—the mystery surrounding who knows what and how they do what they do is lessened, thereby augmenting clarity that is visible both during the entire process and in the final product.

Accountability is another indicator. Accountability in the form of quantifiable building performance metrics (where LEED and other rating systems play a role) gives design teams a measurable means for determining what actually has been accomplished. Such accountability in the design process requires that stakeholders are held to task for specific milestones; their input is interdependent with others and therefore critical in order to produce deliverables and meet deadlines.

The first step in assuring one's proficiency as an integrative designer involves paying particular attention to one's own indicators—if you are reflective about your participation and the participation of others in the group, you have a much higher chance of success. In other words, when one looks for quantifiable feedback that evaluates the collaborative nature of the process, the likelihood of achieving success is much higher.

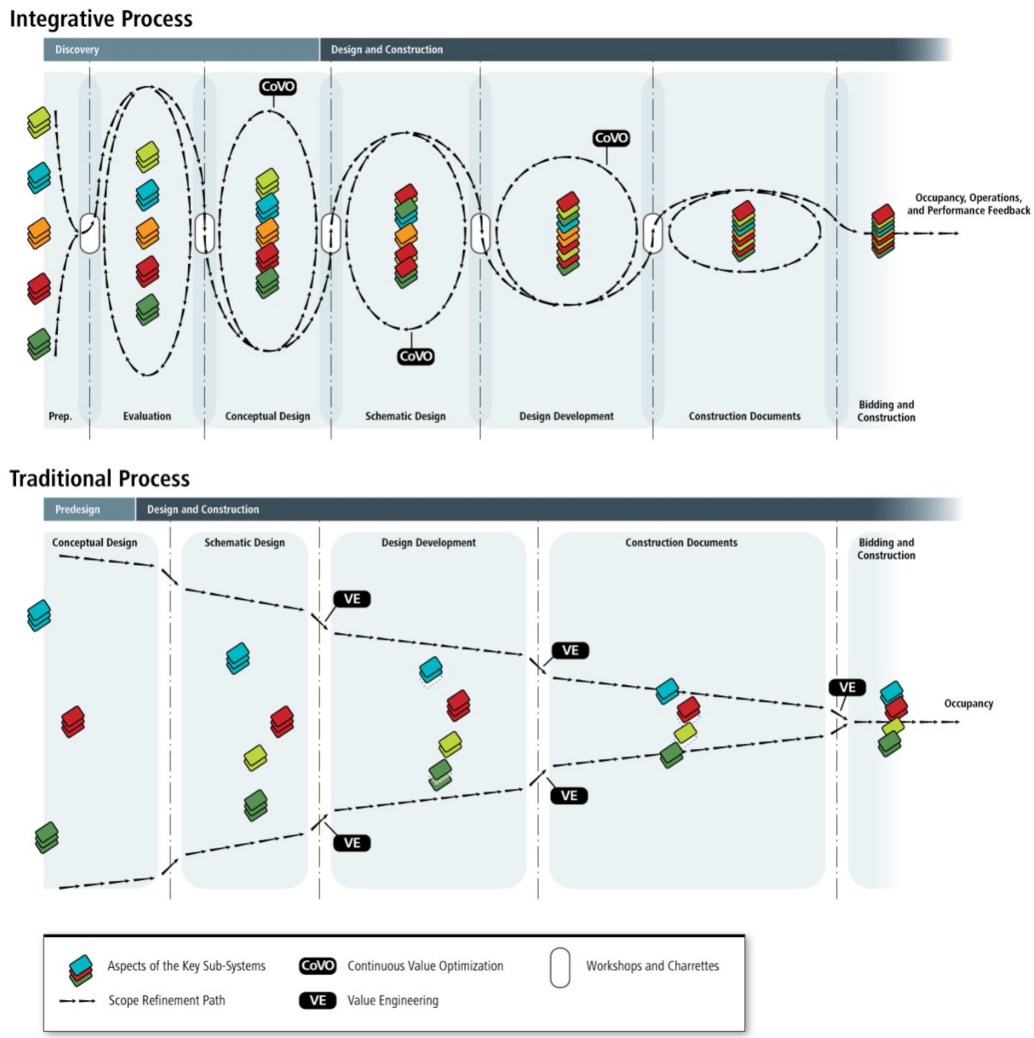
1.E The Integrative Process Structure Compared to a Conventional, Linear Process

The Integrative Process structure is different from the conventional, or linear, design and construction process. Achieving the greatest effectiveness in cost and environmental performance requires that every issue and every team member be brought into the project at the earliest point.

The structure to manage this flow of people, information, and analysis is fairly simple:

- All disciplines gather information and data relevant to the project;
- This information is analyzed;
- The people who hold this information (clients, designers, engineers, Constructors, operators) gather together in workshops to compare notes and identify opportunities for synergy.

This process of research, analysis, and meeting is done in a repeating cycle that progressively approximates and refines the design solution. In the best scenario, this cycling of research and workshops continues until the project systems are optimized and all reasonable synergies are identified. Accordingly, the Integrative Process can be diagrammed and outlined as follows:



RESEARCH / ANALYSIS - Individual expert team members initially develop a rough understanding of the issues associated with the project before meeting – these issues are associated with ecological systems, energy systems, water systems, material resources, skill resources. This occurs so the design process can begin with a common understanding of the base issues.

WORKSHOP - The team members come together with all stakeholders in the first workshop (charrette) to compare ideas, to set performance goals, and to begin forming a cohesive team that functions as a consortium of co-designers. By being in relationship to each other, each team member invites the issues associated with the system for which he or she is responsible to come into relationship with all others, so that a more integrated and optimized project results.

RESEARCH / ANALYSIS - Team members go back to work on their respective issues – refining the analysis, testing alternatives, comparing notes, and generating ideas in smaller meetings.

WORKSHOP - The team reassembles for a deep discussion of overlapping benefits and opportunities – how best to utilize the "waste" products from one system to benefit other systems. New opportunities are discovered, explored and tested across disciplines, new questions are raised, and cost issues are evaluated.

RESEARCH / ANALYSIS - Team members go apart again to design and analyze with more focus and potentially with greater benefits accruing. New ideas are uncovered.

WORKSHOP(S) - The team reassembles once again to further refine the design and to optimize systems being used (building and mechanical systems) and to integrate systems connected with the project (energy, water, habitat, materials, etc.). Cost issues are further analyzed and optimized.

This pattern continues until iterative solutions move as far as the team and client wish. Simply stated, good integration is a continuously dynamic iterative process. All issues need to be kept in play so that the connections and relationships can be optimized. A linear process approaches each problem directly and separately, while an integrative process approaches each problem from the varied viewpoints of multiple participants and the issues they represent. It is a continuous circling process, one that encourages exploration in order to ensure discovery of the best opportunities, while permitting continuous adjustments as more understanding emerges.

Three to five workshops are the typical number of large meetings required to move integration forward, in conjunction with many additional sub-meetings. When and how team members interact is the responsibility of the project manager or integration facilitator. Nevertheless, unless the project team meets with some level of intentional integration (and updated analysis) at least every two weeks, the momentum of exploration will diminish.
The essential foundation of an Integrative Process is the Discovery Phase. An understanding of the invisible relationships between the basic systems (habitat, energy, water, materials) of a project needs to be gained before the design of any tangible, physical relationships can begin. Every key issue needs to be brought into play – the more the better. This requires that the client, the design and construction team members, the community, and other stakeholders representing key issues and interests, be brought into a relationship with each other so that co-discovery can take place.

The design process should begin by determining, as best as possible, how to increase the beneficial interrelationships between human, biotic, technical, and earth systems. This understanding becomes the foundation for any design aimed at saving resources, restoring the health and benefits of natural system processes, and engaging humans in an understanding of these functions, so that they can serve as effective stewards. Participants in the design, construction, and operations phases of the project should actively seek to optimize the interrelationships between these systems over time – in other words, making sustainable (and best) use of resources, both technical and natural.

As stated earlier, an Integrative Process requires the committed engagement of everyone about every issue early in the project. The trick is managing this process so that every person's time is considered, avoiding excess costs and wasted time. Not everyone needs to be around the table at every meeting. Each project is unique, so every project requires a process management roadmap to make sure that assignments are accomplished and addressed by having the right people present at the right time. Management of this design process is critical if money is to be used efficiently and if the energy and engaged enthusiasm of team members is to be maintained.

1.F The Key Aspects of an Integrative Process

To achieve an environmentally and cost effective integrated project, the following practices represent basic minimum requirements. Certainly it is possible to achieve a sustainable project without these practice aspects; however, the large majority of project teams will stumble in their effort to achieve high level goals if any of these aspects are not addressed:

1. The Client (the main financial decision maker) needs to be involved in the integrated, design decision-making process – so he/she is aware of how decisions are made and will not mistakenly disrupt decisions that have resulted from connected synergies.
2. Select the right design team (No experts, only co-learners).
3. Align the stakeholders and design / construction team around the purpose and values that are driving the real reason for the project and its greening effort - making money, or "I want a building" are rarely, if ever, the purpose of the project.
4. Identify Key Systems/ Patterns – form shapers (habitat, water, energy, and materials).
5. Optimize and find synergies between building and natural systems during the Discovery Process - use evaluation tools iteratively in pre-design, or at the latest, schematic design – after this it can get expensive to "add green technologies" to a project that wasn't designed with these in mind from the beginning.
6. Use tools to facilitate integration, to inform design decisions and to reduce resource and energy consumption, such as building information modeling (BIM), energy modeling, etc.
7. Commit to specific measurable goals for key systems.
8. Identify Champions or a Core Team to hold these goals throughout the project.
9. Map the Integration Process.
10. Iterate the design – workshops & research / analysis: work towards Whole System synergy.
11. Follow through during the Construction Process.
12. Commission the project and begin this during early design (make sure it performs the way it was intended and designed to perform – just because it's built doesn't mean it works).
13. Maintenance and Monitoring (entropy happens – feedback is essential to maintain performance).

SECTION TWO – Implementation

(Italicized items indicate additions to the Section Outlines in the Reference Manual)

This section outlines the Integrative Process that project teams should follow when they desire compliance with this ANSI Consensus Standard Guide. Implementing this process consists of three basic parts:

- Part A – Discovery

  This is the most important phase of integrative design; it can be thought of as an extensive expansion of what is conventionally called "Pre-Design". It is unlikely that a project's environmental goals will be achieved cost-effectively – or at all, for that matter – if this phase is not engaged with rigor and is not perceived as a discreet and new way of thinking about the design process. Discovery work needs to be accomplished before "putting pencil to paper" . . . in other words, before schematic design begins.

- Part B – Design and Construction

This phase begins with what is currently call "Schematic Design" . . . as such, it more closely resembles conventional practice in its structure, but it expands and enlivens the process by folding-in all of the work and collective understanding of systems interactions reached during the prior Discovery Phase.

- Part C – Occupancy, Operations, and Performance Feedback

  This implementation outline does not examine this phase in any comprehensive way, since doing so is beyond the scope of this Standard Guide, and in fact, it likely requires an additional Standard to give it its full dimension; however, it should be considered while engaging Parts A and B, since without feedback, the building and the inter-relationships of its systems, including occupants and their response to their environment, do not come alive. In other words, without such post-occupancy feedback, there will be no means to assess the degree to which Parts A and B successfully addressed these inter-relationships.

Integrative Design Guide

Each of these three Parts – or phases – is further sub-divided into a series of stages; 13 total stages are outlined below and form the primary content of this Standard Guide by briefly describing the tasks and activities associated with each stage. These activities are detailed and elaborated further in *The Integrative Design Guide to Green Building: Redefining the Practice of Sustainability,* which is intended to serve as a supplemental and companion "Reference Guide" for implementing the Integrative Process described in this IP Standard Guide. Therefore, the remainder of this Standard Guide will refer to this Integrative Design Guide book as the "IDGGB" or "Reference Guide". Often supplemental resources from this IDGGB are referenced by the page number on which they can be found in the first edition of this book (published in 2009 by John Wiley & Sons, Inc.)

An Optimal Process

The implementation outline presented herein introduces and describes briefly the steps and activities that make up each stage of the Integrative Process. It is important to note that this process is presented as an "optimal" one that can be adjusted, applied, and tailored to fit project-specific parameters and circumstances. In other words, this Standard Guide should not be used to dictate a linear methodology; rather, its purpose is to identify an idealized structure and set of activities that will need to be adjusted and tailored to the parameters of each unique project and team.

Accordingly, Section Two of this Standard Guide is intended to provide a replicable outline of the steps necessary for implementing an Integrative Process. However, it is not prescriptive. It is not intended to provide a checklist of steps that must (or even can) be followed precisely for every project. Instead, the intent of this Standard Guide is to provide a methodology for improving the building design, construction, and operations process that can remain flexible and scalable, depending upon the unique circumstances of each project. For example, smaller projects may not be large enough to afford all of the activities associated with all of the stages, while some major projects likely could warrant more stages and workshops. Additionally, on a small and less complex project, implementing the tasks discussed below for the Discovery Phase might be completed in a few weeks, while on larger more complex building projects, this may take many months.

Facilitation and Leadership Skills

It also is clear that implementing the Integrative Process requires management, group facilitation, and moderator skills in order to execute this series of activities effectively; in this context, effectiveness is really about relationships – about the way people interact with each other and how they can interact more effectively with each other. In particular, project team workshops constitute an important part of the IP Guide, as described above. Therefore, the project team likely will want to assign the role of Integration Facilitator to a team member (or members) to lead the team's integrative efforts and/or to facilitate workshops. In many cases, hiring a Consultant with these facilitation skills is a good option. Additionally, users of this Standard Guide may want to consider seeking management/facilitation guidance and/or training as part of their execution of this process, particularly with regard to developing the necessary organizational and leadership skills of the person(s) leading the team, since the quality of any project team's focus and function is often a reflection of the leadership skills at the table, as opposed to just the implemented process alone. These skills include (among others):

- Ability to ask generative questions (questions that go beyond the expectation of automatic answers - i.e., these require the generation of new thoughts by the participants).
- Ability to facilitate group dynamics and reconcile/harmonize conflicting forces.
- Ability to clearly delegate and communicate responsibilities to various "champions' on the team, and then hold these champions accountable.
- Ability to "essentialize" all key points.
- Ability to schedule multiple simultaneously-occurring tasks.
- Ability to allow time for reflection.
- Ability to be flexible.

Four Key Subsystems

Additionally, all development of the built environment finds itself inherently linked and inescapably bound to larger nested systems and to primary sub-systems within that whole. Consequently, the Integrative Process outlined below – and particularly during the first nine stages – repeatedly references the *four key subsystems.* **The IDGGB describes the subsystems in detail, starting on page 70. In summary, these four key subsystems are associated with the following fundamental principles**:

- **Habitat (both human and other biotic systems)**
  Preserving habitat is our obligation not only to the other species with whom humans share our planet but also to ourselves. As such, this Standard Guide groups human habitat with all other habitat systems into *one subsystem* – humans as a part of nature, not apart from nature – for the purpose of engaging the following principles:
  1. Partner all human activities with living systems in mutually beneficial relationships—a project should contribute to supporting the systems of life on its site and within its watershed.
  2. Understand and respect local ecological and social systems, including (but not exclusively) human social health and well-being.
  3. Build in essential feedback mechanisms to continuously evolve these relationships.

- **Water**
  1. Strive to make annual water budget equal to or less than annual rainfall on site.
  2. Use less water.
  3. Retain all rainwater on-site *(to the extent allowable by law)*.
  4. Manage water (rainwater and/or wastewater) to replicate natural flows in order to minimize water leaving the site.
  5. Cascade water use to support all life (human and other biotic systems), if water will be leaving the site.
  6. Recharge groundwater table (where possible).
  7. Strive to clean all water to potable standards before it leaves the site.

8. Meet or exceed all local, state, and federal laws and guidelines relative to water management.

- **Energy**
  1. Create less demand via the use of conservation strategies including but not limited to orientation (and other "passive" strategies), increased envelope performance demand patterns, reduced lighting and loads, etc.
  2. Use available site energies—e.g., sources and sinks—sun, wind, earth-coupling (such as ground-coupling, water-coupling, etc.), and diurnal cycles.
  3. Increase efficiency of what is left—e.g., equipment, appliances, diversity factors, parasitic losses, part-load performance, occupant behavior, etc.
  4. Minimize or neutralize carbon footprint.

- **Materials**
  1. Use less – that which is not used has no environmental impact.
  2. Use materials that are abundant and renewable and that do not destroy human and/or earth systems in their extraction, manufacture, and disposal.
  3. Strive to use locally sourced, recyclable, nontoxic, and/or low-embodied-energy materials. Life Cycle Assessment (LCA) tools are effective at evaluating such comprehensive environmental impacts.

Cost Analysis

Continuous cost analysis also is an extremely important component of this process, and might be considered a fifth key subsystem. If projects are not economically sustainable, they simply are not sustainable. During early stages, such cost implications have the potential for being "glossed-over" or overlooked. Therefore, this is one of several reasons why the Integrative Process works best when Constructors and Designers work together from the very beginning, before anything is designed; hence the participation of Constructors on the team during the earliest design phases, whenever possible, is strongly encouraged. The inclusion of a savvy constructor or cost estimator from the outset can be critical, and can often provide the owner and project team with the necessary confidence to move into subsequent phases – both for financing purposes and also for overall budgeting purposes.

2.A PART A: DISCOVERY

It should be noted that the entire Discovery Phase may be new to many owners/developers, and even to other industry professionals. Clear goals, schedule, deliverables, and fees will need to be established for this phase. The concept of integrative thinking during the Discovery Phase workshops will need to be reinforced and consistently encouraged. An effective and seasoned Integration Facilitator will add significant value to this phase. As mentioned above, project teams without this expertise may want to consider hiring an experienced consultant for this facilitation.

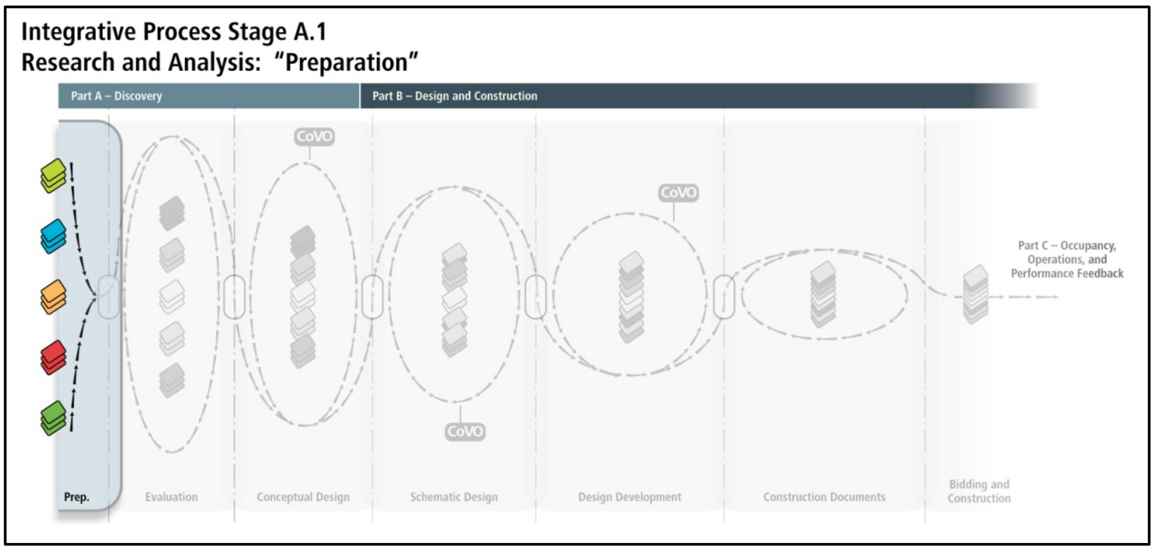
Additionally, it is recommended that at the very beginning of (or prior to) the Discovery Phase, the Owner should engage key team members (see page 128 of the IDGGB) and begin to formulate his/her own goals for the project (these goals should not be binding, but provide a starting point for the team). These goals should include budget, business intentions, ability to use life cycle costing, time frame, ROI assumptions, quality expectations, scope, etc.

The following pages outline the activities and tasks to be engaged during each of the 13 stages of the Integrative Process, the first five of which comprise Part A – Discovery.

2.A.1 STAGE A.1

RESEARCH AND ANALYSIS: PREPARATION

Perform preliminary research and analysis to prepare for Workshop No. 1, the Goal-Setting Workshop (this is a component of the work defined in Proposal A – see below). Without initial research, potential sustainable design opportunities will not be able to be discussed with a high level of rationale (in other words, it will be a fact-free meeting). It helps to begin with research and analysis prior to the Goal-Setting Workshop by gathering data pertaining to the four key subsystems. This sets the stage for the initial workshop and provides a framework for continuous analysis and development throughout the entire process. Accordingly, the following should be addressed prior to the Goal-Setting Workshop:



A.1.0 PREPARE *PROPOSAL A*

- Establish scope and fees for initial Goal-Setting Workshop.

  Because the process of integrative design is new and the skill sets of team members vary, project design fees can have a wide range of variation. The following "Proposal A–Proposal B" approach, when possible, enables a realistic fee proposal from all team members and serves as an effective structure for establishing clear scopes of work.

  - *Proposal A:* Selected key consultants or team members are asked to submit a fee focused only on participating in the initial goal-setting workshop and preparing the background research needed for that workshop (stages A.1 and A.2 only). This background research and initial goal-setting workshop can be used to set performance goals as well as to define the *integrative process road map* (see A.1.4. and A.2.1. along with pages 123-125 of the IDGGB, which include a sample road map), a process management scheduling tool that delineates coordination, meetings, sub-meetings, workshops, and deliverables for those various meetings. With the goals and process road map established, the consultants have a much more realistic idea of the scope of work required from them for the remainder of the project.
  - *Proposal B:* With the much clearer understanding of scope and schedule obtained during Stages A.1 and A.2, all team members can now assign more accurate fees to the tasks required for the remainder of the project. Proposal B then addresses the duration of the project and is written by each consultant based upon the agreed-upon scope and schedule road map developed at the goal-setting workshop (Stage a.2 Workshop No. 1*). It is a good idea, when soliciting Proposal A fees, to also request a*

non-binding Proposal B fee estimate. This helps the Client develop an overall, rough budget for the project. It also gauges the A/E and constructor team's approach and serve as a check to see if the Owner and the project team are in alignment regarding the anticipated level of effort required.

A.1.1 Fundamental Research in Advance of Workshop No. 1

- Site selection: Assess optional sites (if not already selected)

  If no site(s) have been selected, provide a mechanism for establishing site selection criteria.

- Context: Identify base ecological conditions and perform preliminary analysis of the four key subsystems (see pages 110-120 of the IDGGB):
  - Habitat (including human inhabitants)
  - Water
  - Energy
  - Materials

- Stakeholders: Identify key stakeholders—social and ecological.

  Identify all key participants on the team and prepare an initial list of probable team members with thought given to when each would be introduced into the process. At the A.1 stage, team members should include at a minimum, the Owner, Architect and Constructor with other design consultants and key subcontractors added as needed. It also is recommended that a Commissioning Authority be hired for attendance at the Stage A.2 Workshop No. 1, if possible.

  Determine likely construction delivery method; note that conventional Design-Bid-Build construction delivery likely will be unsuccessful at achieving high performance goals cost-effectively, and should be avoided where possible. Additionally, an Owner may not legally be able to hire the Constructor during design, particularly where prohibited by public procurement law for publicly-funded projects, so in these situations, the Owner should include the Constructor's perspective by selecting a consultant/construction management firm as a project team member.

- Program: Develop initial functional programmatic requirements

  In additional to space-by-space functional descriptions, provide initial profile(s) of how the building will be used and by whom.

- *Commissioning: Engage initial process for preparing the OPR*

  Begin to establish Owner's Project Requirements (OPR). Most everything done in these early stages pertains to establishing the initial OPR content. The commissioning authority is not separately responsible for documenting the OPR document. See the IDGGB Reference Guide pages 137-140 for a more detailed description of activities pertaining to the creation and functions of an OPR. Additional details on the Commissioning Process (Owner's Quality Process) can be found in ASHRAE Guideline 0-2005, The *Commissioning Process*, as an additional reference guideline applicable to the IP Guide.

A.1.2 Principles and Measurement

- Select rating system(s) and establish performance measurement criteria

  It is important to establish initial baseline assumptions for use as benchmarks against which to assess design decisions. The U.S. Green Building Council's LEED® program, along with other green building rating systems and assessment tools, can serve as a useful tool for establishing project targets by utilizing the benchmarks and metrics it has established for measuring performance. Other rating systems and analysis tools include: Green Guide for Healthcare (GGHC), Labs21, CO2 balancing, ecological footprint, life cycle assessment (LCA), Natural Step, SBTool from International Initiative for a Sustainable Built Environment (iiSBE), BREAM in the United Kingdom, CASBEE in Japan, Green Globes, International Green Construction Code (IGCC), etc.

A.1.3 COST ANALYSIS

- Prepare integrated cost-bundling framework template

  It is helpful during this first stage to set up a framework of costs listed or grouped by broad function, such as foundations, envelope, mechanical systems, electrical systems, and so forth. This listing gives team members reference points for recognizing, connecting, and recording relationships between systems. In other words, it provides the framework template, in the form of a spreadsheet, for integrative *cost bundling* described in Stage A3.3. This document can be created with blank cells for future use; its use will be described further in subsequent stages.

A.1.4 SCHEDULE AND FEES

- Develop a scheduling template—a *Road Map*—for assigning tasks

  Develop a schedule and task spreadsheet template, or *integrative process road map* described in more detail below in Stage A.2.1. Include some assumptions about time frames and task definitions for the discovery and schematic design phases that the team can begin modifying at Workshop No. 1. This will help team members better understand:

  - The detailed scope of integrative design work (interactions and tasks) for the project.
  - The issues that will need to be addressed that may have been mentioned, but only generally or vaguely, in the RFP.
  - The specific tasks and interactions, so that a *Proposal B* can be written more accurately and fairly.
  - The process of examining this detailed scheduling with the team, as this provides a greater opportunity for team members to be aligned around the interactions required by this highly iterative process and helps them to avoid operating upon more conventionalized assumptions.

- Prepare Agenda for Workshop No. 1

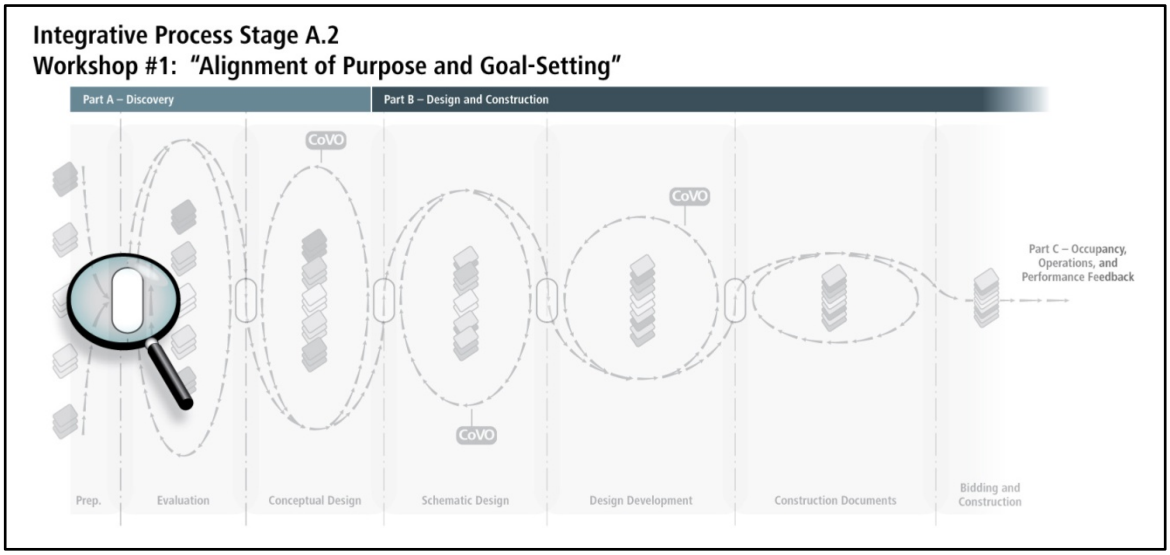
  To help team members become aligned around common purpose, it is extremely important to include the primary team members in developing the agenda for the first workshop. This can be accomplished by scheduling a conference call with the appropriate team leaders. The discussion during this call should center on the project team's expected outcomes so that the team's efforts can focus on and align around expectations.

2.A.2 STAGE A.2

WORKSHOP NO. 1: ALIGNMENT OF PURPOSE AND GOAL-SETTING

The Goal-Setting Workshop serves as a critical contributor to the Integrative Process—it creates alignment. Without alignment around the source and meaning of the project's goals, the team may not understand the real purpose behind them, and might miss the larger target and its essential aspects. It is the grounding work required for the team to begin to function as co-learners; learning the nature of the client's goals and the purpose behind them will help ground the team for creative problem solving and for much more fruitful interaction thereby increasing the potential for the project's success.

Along with all other project team members identified on page 128 of the IDGGB, ensure that the Constructor's participation is engaged for this workshop, if possible, to obtain input and feedback on all systems, including input on constructability, sourcing, and costs.



A.2.1 WORKSHOP NO. 1: TASKS AND ACTIVITIES

- Introduce participants to the fundamentals of the integrative design process and to systems thinking.

- Elicit client's deeper intentions and purpose for the project.

- Engage (facilitated) exercise to elicit stakeholders' values and aspirations.

  One of the key lessons learned about this process is that the project team needs to generate and decide on how to address the effects on environmental sustainability that the project will create, whether they be impacts or benefits; therefore, getting alignment around the team's and stakeholders' real aspirations is essential – if this does not occur, the design process may fall back to the default mode of repeating the patterns of conventional design. Examples of facilitated exercises, such as the Touchstones and Core Values exercises, are described in detail on pages 82-87 and 129-130 of the IDGGB.

  Establish a Core Team to hold and evolve these aspirations and values (see a description of the Core Team below at the end of Stage *A.2.1).*

  The terms "Touchstones" and Core Values" are defined in the Glossary in Appendix A, but for purposes of clarification, the following example exercise illustrates how Touchstones can be identified by the project team and become applicable to the integrative process:

  Examples of a Touchstones exercise:
  The purpose of this brain-storming session is to identify and list the primary goals and aspirations of the project team and to prioritize important issues. These "Touchstones"

identify what the project team and stakeholders determine are the most important design considerations that would define success. The exercise begins by identifying these issues, then prioritizing them and/or exploring the ways that these issues are interconnected.

At the first workshop/charrette with the team, before talking about the project design, its components, and even its program, the facilitator simply can ask the question, “What are you trying to accomplish by building this project?” . . . or “Picture yourself six months or a year after moving into your new building, what are the characteristics that you would say about your project that made it a success?” Ask this question in the context of issues associated with sustainability by identifying the following five key environmental imperatives:

- Climate Change
- Potable Water
- Resource Destruction
- Habitat Destruction
- Pollution/Toxins

Open a discussion about how the team thinks a successful project would address these issues – as well as others associated with the unique specifics of the project and Place – and how they are interrelated. Accordingly, the resulting primary objectives, or “Touchstones”, can be identified explicitly at the outset in order to help guide the team through their decision-making process, from conceptual design through occupancy. Additional benefits that should not be underestimated result from of this exercise as well; these include: team alignment around issues, collective and individual “buy-in” of objectives, and ownership of them. The results of this exercise also contribute to creating the initial Owner’s Project Requirements (OPR) as part of the Commissioning process.

It should be noted that this exercise represents only an entry-level process. It aligns people around basic ideas that need to be addressed in a project; however, the prioritization piece of it can lead team members, at times, to think that some of the identified environmental issues are “less important” if they didn’t get many votes. . . . but all issues are important; you can’t “vote on nature.” Alternatively, ask team members during workshops to identify how any three of the identified issues are connected. Then, ask them to select two more that have interrelationships with the first three, and then two more, and so on. In this way, project teams begin to see the interconnections more than the fragmented issues or elements in isolation.

- Clarify functional and programmatic goals

  In addition to functional program issues, this discussion should include:

  - Team presentation of project status, constraints, opportunities.
  - Presentation of results from Stage A.1 research.
  - A systems overview of the project’s existing conditions and base issues (e.g. ecological, energy, water, and material).
  - Building owner, users, and operations / maintenance staff in a discussion regarding occupant engagement and behavior as a tool to achieve project’s integrated goals (targeting behavior change in the occupants and operators following occupancy).
  - Feasibility of various applicable construction delivery methodologies (Design Build, CM-At-Risk, IPD, etc.). As mentioned above in Stage A1.1 above, conventional Design-Bid-Build construction delivery likely will be unsuccessful at achieving high performance goals cost-effectively, and should be avoided where possible.
  - Applicability and use of Building Information Modeling (BIM) for use as a functional and

decision-making tool.

- Establish initial Principles, Benchmarks, Metrics, and Performance Targets for the four key subsystems (see pages 130-133 of the IDGGB):
    - Habitat (including human inhabitants)
    - Water
    - Energy
    - Materials

  Present potential rating systems as resources for establishing performance targets, and the metrics and benchmarks to be used for evaluation of performance.

  The terms "Metrics", "Benchmarks", and "Performance Targets" are defined in the Glossary in Appendix A, but for purposes of clarification, the following example illustrates how these relate to on another:

  <u>Example for Benchmarks, Metrics, and Performance Targets:</u>
  From LEED 2009 for New Construction and Major Renovations, EA Credit 1 Optimize Energy Performance states (parenthetical terms added):

  Demonstrate a percentage improvement in the proposed building performance rating compared with the **(Benchmark)** *baseline building performance rating. Calculate the* **(Benchmark)** *baseline building performance according to* **(the Metric)** *Appendix G of ANSI/ASHRAE/IESNA Standard 90.1-2007 using a computer simulation model for the whole building project. The minimum* **(Performance Targets of)** *energy cost savings percentage for each point threshold is as follows: New Buildings Existing - 12%; Building Renovations – 8%.*

- Generate potential strategies for achieving identified Performance Targets.
    - Better than establishing Performance Targets and Goals is the concept of working towards highest Potential. By engaging the team in imagining the highest value that could be added to a project and its stakeholders (its users, the Earth, the community, the watershed, etc.) there is the possibility of exceeding generally accepted goals (such as LEED targets). Working on stretching goals or achieving the highest potential imagined can inspire design teams to reach higher levels of performance than is typically expected.

- Determine order of magnitude cost impacts of proposed strategies.

- Provide time for reflection and feedback loops from client and team members.

  Ensure that all key decision makers are involved in the process of establishing goals and project direction to avoid decisions reached at the workshop from backfiring due to lack of critical support or buy-in. Building into the workshop intentional reflection time and feedback loops that invite participants to pause and reflect upon how the meeting is progressing can help eliminate such problems. This can take the form, for example, of asking the owner's team to meet during lunch to discuss the findings of the team thus far and to report back to the group as a means of kicking off the afternoon. This has the added advantage of giving people – some of whom may feel uncomfortable sharing their thoughts in the larger group format – a voice within the comfort of a smaller group, leading to more casual conversation with their coworkers. Another form this strategy can take can be as simple as pausing – for five or ten minutes at a logical break point in conversation or at a major transition – to ask everyone to reflect on what they are experiencing through this process.

- Develop an Integrative Process Road Map that identifies responsibilities, deliverables, and dates, as described and detailed in the IDGGB.

  An Integrative Process Road Map identifies in a detailed spreadsheet the team member responsibilities and deliverables for engaging a clearly defined and manageable integrative design process that is tied to specific tasks and dates. (Refer to the IDGGB for a sample in Figure 5-13 on Pages 124-125, along with a more detailed description on pages 135-137).

  - The Road Map identifies: responsibilities for action items and the champions for various environmental issues; detailed and staged deliverables (so that rational system optimization decisions can be made); and schedules for meetings with defined purpose and expected attendees. This serves as a scheduling and process map that stipulates points of joint decision-making and problem solving between team members (not just individual assignments that are later integrated into a project).
  - The actual scheduling process of the Road Map is best done with the entire team or with a subgroup that walks the team through the process. All members of the team are invited to comment on what is needed from the others to help them—and help the project—achieve the environmental goals and performance targets. Remarkable observations sometimes occur in this process—such as "I didn't know I was responsible for an hourly simulation model," or "I didn't realize how many meetings we were going to have at the beginning of the project," or even "I don't think we're the right firm to be involved in this project."
  - This mapping process allows for the design team to understand the scope of the work and project expectations from a very detailed perspective. As a result, there is more likely buy-in from the consultants, more accurate fees, and greater engagement in the integrative process that the project will need to engage for achieving cost and environmental effectiveness. In addition, there likely will be fewer instances of begrudging the engagement. The integrative process typically can be mapped out in detail for a three to six-month period with reasonably frequent adjustments as the project moves forward and as inevitable changes occur. It is not the most entertaining process, but it is a very enlightening one.

- Commissioning: Continue documentation of the Owner's Project Requirements (OPR)

  Most everything done in these early stages pertains to establishing the OPR content. The commissioning authority is not separately responsible for documenting the OPR. Consider that in many ways, this first workshop serves as an OPR-creation or confirmation exercise, and documentation should be created that can be utilized as the OPR, including the initial Performance Targets described above. See pages 137-140 of the IDGGB for a more detailed description of activities pertaining to the creation and functions of an OPR. As mentioned in Stage A.1.1, additional details on the Commissioning Process (Owner's Quality Process) can be found in ASHRAE Guideline 0-2005, *The Commissioning Process*, as an additional reference guideline applicable to the IP Guide.

- *Establish a Core Team – depending on the size and ambitions of the project*

  Establish a Core Team empowered with decision-making authority and process management. This small group of team members is responsible for focusing and addressing the issues of an Owner's Board of Directors, building committee, or any large governing body. It is unwieldy to have to assemble a large group of people to represent the Client – especially when rapid decisions are required. The Core Team along with the project Integration Facilitator (coach, project manager, architectural lead, or whomever *elects to lead the integrative process) is "in charge" and orchestrates the work-flow and organization; in other words, the Core Team is charged with making decisions and deciding "who should be doing what."*

Another, and deeper dimension of a Core Team is to take responsibility for holding the evolutionary potential (or the 'core') of the project throughout its life. Its long-term purpose is to maintain, build upon, improve, and evolve the project's aspirations for sustainable performance over time. By focusing on evolving the values and aspirations of the project, the Core Team can potentially inspire the team to move beyond initially established goals.

A.2.2 Principles and Measurement

- Document Touchstones, Principles, Metrics, Benchmarks, and Performance Targets from Workshop No. 1 (See IDGGB page 141 for a description of these aspects).

A.2.3 Cost Analysis

- Document order of magnitude cost impacts of proposed strategies to reflect input from Workshop No. 1.

  This is not cost estimating at this "vision" stage. It is often helpful to have one workshop where everyone knows that they are (theoretically) free of constraints – knowing those will come and be present for the rest of the job. Rather, identifying both first cost and operations implications of proposed strategies should set the stage for preliminary Life Cycle Cost Analysis (LCCA) regarding select key items should suffice, followed by estimates of the Net Present Value and payback periods for the proposed measures in the next few stages.

A.2.4 Schedule and Next Steps

- Adjust Integrative Process Road Map to reflect any input from participants after Workshop No. 1.

- Distribute report from Workshop No. 1.

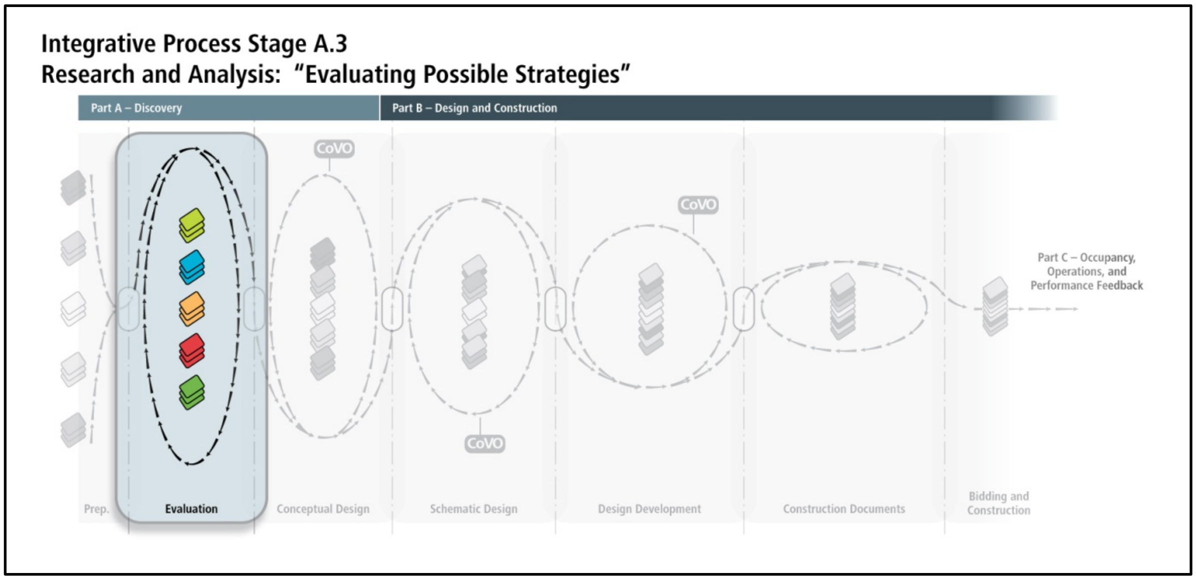
  Document and distribute a report of Workshop No. 1 preparation, activities and results including:
  - Fundamental research and analysis.
  - Principles, performance targets, and measurement criteria from Workshop No. 1.
  - Document order of magnitude cost impacts of proposed strategies to reflect input from Workshop No 1.
  - Schedule and next steps: Updated schedule to reflect input from Workshop No. 1

3. STAGE A.3

Research and Analysis: Evaluating Possible Strategies

From this point forward, the process begins repeating the pattern of Research and Analysis followed by Team Workshops. During this Research and Analysis stage, the team continues to refine initial studies, based on the understandings developed at Workshop No. 1, by testing design concepts and performance targets for feasibility. This process is highly iterative.

Entitlements and Permitting are a critical component for many projects, so engaging the permitting authorities and building department of the applicable jurisdiction in the earliest stages of the project can be important. This stage represents an appropriate point to engage these issues and stakeholders by engaging code and municipal officials.



A.3.0 PREPARE *PROPOSAL B*

- Develop *Proposal B*: confirm scope and fees based on Workshop No. 1 scope refinement

  If using a two-part fee proposal, as discussed in Stage A.1, develop *Proposal(s) B* to define the scope of services for all team members, including any potential additional consultants needed (See IDGGB for more details).

A.3.1 RESEARCH AND ANALYSIS ACTIVITIES: FIRST ITERATION

- Explore and identify a wide range of opportunities and possible strategies before collapsing into solutions.

  Include explorations within individual disciplines, smaller related groups and public meeting outreach (as appropriate).

- Expand the analysis of the four key subsystems (see pages 146-153 of the IDGGB):
  - Habitat (including human inhabitants)
  - Water
  - Energy
  - Materials

A.3.2 PRINCIPLES AND MEASUREMENT

- Evaluate design concepts against Performance Targets from Workshop No. 1.

  Include evaluations of design concepts against selected rating system criteria, if applicable, as part of your performance assessments relative to targets.

- Commissioning: Prepare conceptual phase OPR (see page 154 of the IDGGB)

  Teams should be challenged to include in the OPR sets of both "required goals" and potentially higher "desired goals" that can address notions such as "it would be great if. . ."

A.3.3 COST ANALYSIS

- Apply unit cost estimates to the integrative cost-bundling template (see more detailed description of this cost bundling framework on pages 154-155 of the IDGGB).
- Use line-item unit cost estimates as a starting point for understanding the first-cost impacts of the alternative systems components (and systems groupings) that are being tested, modeled, and considered. This is done to create a "project palette" of related line-item costs associated with these alternatives that allows the team to see the whole set of potential project systems' (and associated components') costs. In this way, the team can assemble, or bundle, interrelated system "groupings" or "combinations" of systems and components. In other words, the team draws from this list items that are related to each other with regard to how they interact in terms of their costs (in parallel with the analysis of these groupings' performance implications). It should be noted that the line-item costs for each listed component do not need to be finely honed at this stage; it is the relative difference between the costs of each alternative "grouping" or "combination" (bundle) that is being explored.
- Refine Life Cycle Cost Analysis (LCCA): Consider a net-present-value analysis of life cycle costs for these bundles to include:
    - First cost of systems options.
    - Operations, maintenance, and replacement costs.
    - Productivity and environmental cost impacts when possible.
- Refine Life Cycle Cost Analysis (LCCA).

A.3.4 SCHEDULE AND NEXT STEPS

- Update Integrative Process Road Map in preparation for Workshop No. 2.
- Prepare Agenda for Workshop No. 2.

2.A.4. STAGE A.4

WORKSHOP NO. 2: CONCEPTUAL DESIGN EXPLORATION

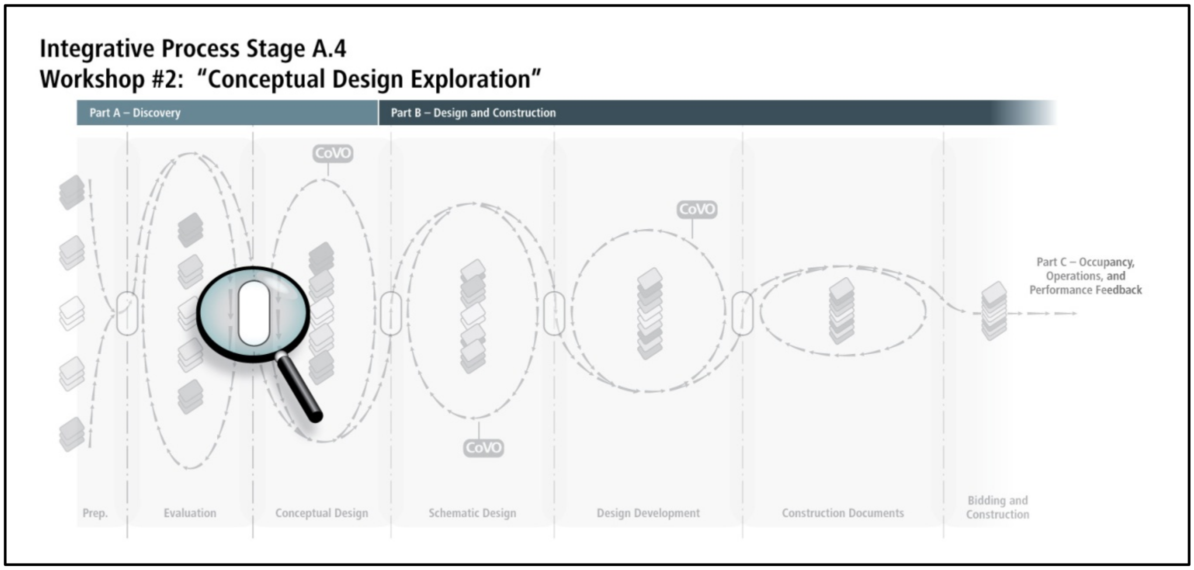
This workshop, or charrette, initiates the transition from research and alignment of objectives to the actual design process. It is best when this charrette can focus on generating conceptual design ideas; but if a project enters the Integrative Process late, this charrette also can focus on reviewing conceptual design ideas that already have been developed and exploring alternatives.

The project's key team members who attended Workshop No. 1 should be present at Workshop No. 2 so that team buy-in and a sense of "ownership by all" continues to develop.

It should be noted that the implementation outline below can be used to create the template for a Workshop No. 2 agenda and tailored to the specific parameters of each project. However, the agenda for this session needs to remain fluid and flexible during the workshop, allowing for it to change in response to the "energy in the room" (as always), the degree of progress made at each step, the potential exploration of new discoveries, and so forth. It also should be noted that this workshop can occur as an all-day event on a single day, or it can be structured to last as long as three or four days, depending on project complexity and the team's goals.

If the Constructor has not been involved up until now, this is an important stage at which the

Constructor's participation becomes even more valuable and should be included whenever possible. In particular, the creative experience and additional perspective on design ideas that Constructors can offer, not to mention their thoughts on how design impacts constructability and cost, are often overlooked. In other words, the Constructor is best viewed as another co-designer.



A.4.1 WORKSHOP NO. 2: ACTIVITIES

- Present and assess the findings from Stage A.3 (Research and Analysis) of the four key subsystems (see pages 157-158 of the IDGGB):
  - Habitat (including human inhabitants)
  - Water
  - Energy
  - Materials
- Generate conceptual site and building design concepts (related to the four key subsystems) from:
  - Touchstones and Principles (see descriptions in the IDGGB).
  - Site forces (see examples in Figure 5-28 on page 159 of the IDGGB).
    The conceptual design effort at this charrette often begins with a group *site forces exercise*, which involves diagramming on a site-plan overlay those flows entering the site and those leaving. These site-specific flows can be thought of as "site forces," and they include solar orientation, prevailing winds, pedestrian and/or vehicular circulation, public transportation access, utilities access, topography, stormwater flows, views, noise sources, neighborhood connections, and so forth.
  - Community and watershed living-system patterns.
  - Functional program.
    Consider encouraging "energy programming" as a component of this work (for example, see practices by the Energy Studies in Buildings Laboratory at the University of Oregon). In summary, this process looks at program use proximities and the related energy impacts and synergies.
  - Breakout group working sessions (see descriptions and examples of small group sessions on pages 160-164 of the IDGGB).
- Confirm alignment with Touchstones, Principles, Metrics, Benchmarks, and Performance Targets

    - Assess concepts for alignment with principles, and performance targets.
    - Review and refine occupant engagement and behavior strategies.

- Review (and refine) integrative cost-bundling studies in progress.
- Review and adjust the Integrative Process Road Map.
- Provide time for reflection and feedback loops from (and between) client and team members.
- Commissioning: Review Owner's Project Requirements (OPR).

A.4.2 TRINCIPLES AND MEASUREMENT

- Document adjustments to Performance Targets to reflect input from Workshop No. 2.
- Commissioning: Adjust OPR to reflect input from Workshop No. 2.

A.4.3 COST ANALYSIS

- Update any required integrative cost-bundling templates to reflect input from Workshop No. 2.

A.4.4 SCHEDULE AND NEXT STEPS

- Update Integrative Process Road Map to reflect input from Workshop No. 2.
- Distribute Workshop No. 2 Report.

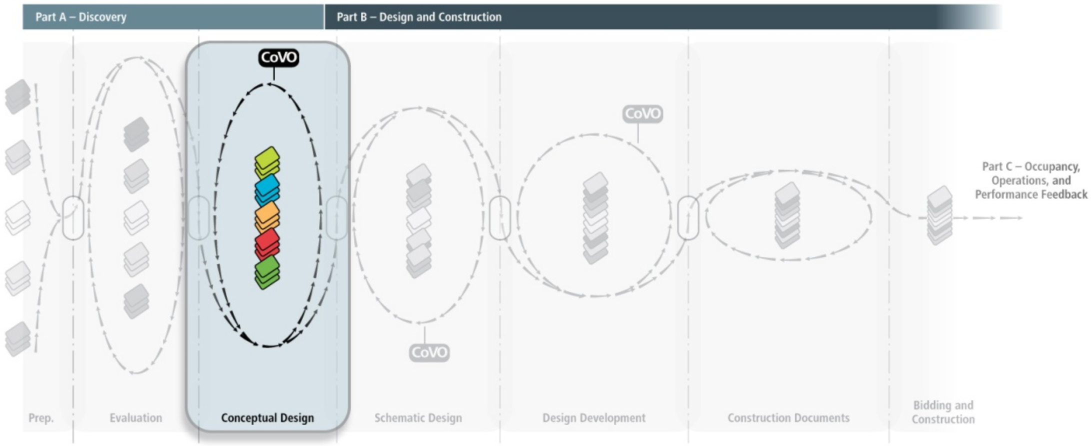
    Document and distribute a report of Workshop No. 2 including:
    - Document adjustments to performance targets that reflect input from Workshop No. 2.
    - Commissioning / Owner's Quality Process: Adjustments to the OPR to reflect input from Workshop No. 2.
    - Cost Analysis: Update any required integrative cost-bundling templates to reflect input from Workshop No. 2.
    - Schedule and next steps: Updated schedule to reflect input from Workshop No. 2.

2.A.5. STAGE A.5

RESEARCH AND ANALYSIS: TESTING CONCEPTUAL DESIGN IDEAS

This is a critical point in the process. This stage is the bridge between Discovery and Schematic Design. The project team needs to be reasonably sure that the essential form-giving issues of the key subsystems have been addressed *before* giving form to the building. These should be analyzed to a level to which the team can confidently commit, so that the subsystems can be coalesced into a limited number of schematic design schemes.

Integrative Process Stage A.5
Research and Analysis: "Testing Conceptual Design Ideas"



A.5.1 RESEARCH AND ANALYSIS ACTIVITIES: EXPLORATIONS WITHIN INDIVIDUAL DISCIPLINES AND SMALLER RELATED GROUPS

- Test (and evaluate) conceptual design schemes from Workshop No. 2 within the realities of the program and guiding principles relative to the four key subsystems (see pages 168-193 of the IDGGB for detailed descriptions of this analysis and example tools to use):
  - Habitat (including human inhabitants)
  - Water
  - Energy
  - Materials

  This analysis includes explorations within individual disciplines, smaller related groups and public meeting outreach (as appropriate).

  Reconcile conflicts identified during evaluation – there are two options when making decisions about seemingly conflicting issues: compromise or harmonize:

  > When teams compromise they "concede". This means everyone loses a little ground on each issue but not so much that it really hurts; however, neither side has a reasonably positive outcome. Example: replace single-glazed windows in a house with double-glazed windows. The windows cost more and the energy payback is minimal – maybe 30 years. In other words, lose-lose.
  >
  > When teams reconcile, they are "harmonizing". Both sides of the issue are positive. Example: replace the single-glazed windows with triple-glazed, argon filled, low emissivity windows. The seemingly expensive windows allow significant reductions in ductwork due to eliminating the need for perimeter heating and a major downsizing of the boiler. The more expensive better-quality windows allow for a total reduction of capital costs as a whole compared to purchasing the less expensive double-glazed windows, AND the energy savings is high enough each month to be meaningful to the owner, while associated environmental impacts are reduced. This is a win-win-win situation.

  Review occupant engagement and behavior strategies in order to model possible savings and synergies.

- Coalesce findings and bring analysis to a reasonable conclusion before beginning the Schematic Design phase.

A.5.2 Principles and Measurement

- Confirm and solidify Metrics, Benchmarks, and Performance Targets
- Commissioning: Develop Basis of Design (BOD)

  It is also helpful for each discipline to develop systems narratives, or stories, to help explain technical concepts, the reasons "why" decisions are being made, and potential relationships to other systems/disciplines without technical jargon (in layman's terms). More detail about how to formulate and utilize BOD documents effectively is described in detail on pages 194-195 of the IDGGB.

A.5.3 Cost Analysis

- Put a price tag on every strategy and subsystem, then aggregate them into integrated cost bundles.

  It should be noted that financing sources may need to be educated on strategies and subsystems, and/or the team may need to address financing options that may impact the feasibility and reality of some strategies.

A.5.4 Schedule and Next Steps

- Update Integrative Process Road Map in preparation for Workshop No. 3.
- Prepare Agenda for Workshop No. 3.

2.B PART B: DESIGN AND CONSTRUCTION

2.B.1. STAGE B.1

Workshop No. 3: Schematic Design Kickoff – Bringing It All Together (without committing to building form)

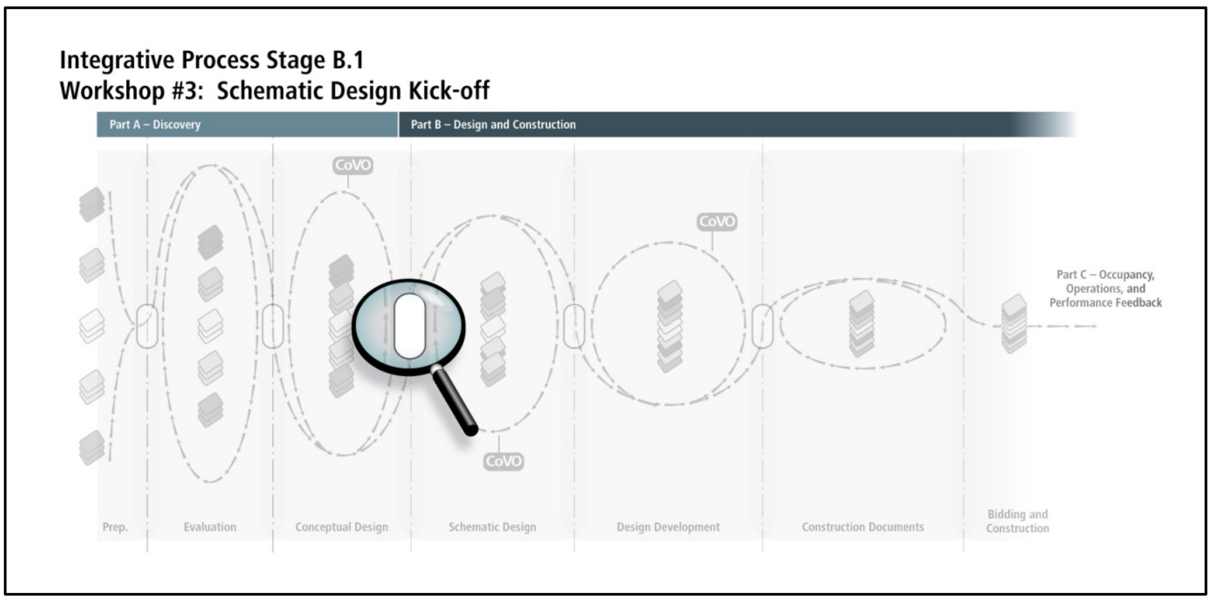
At this point, team members have analyzed major subsystems, including options for the building's architectural form and massing, but the team has yet to put these pieces together in a whole building design. Nevertheless, project designers need to restrain themselves from locking into what the building looks like too soon. Focusing too quickly on the architectural form and/or aesthetic issues alone tends to pessimize performance and to downgrade the whole. In other words, this stage begins by ensuring that each of the major subsystems has been refined to a relatively high degree via reasonably thorough analyses before giving final form to the building.

During Workshop No. 2 (Stage A.4), how these systems might interact with each other has been examined conceptually. These conceptual ideas and systems performance were then tested during the Research and Analysis of Stage A.5; now, during Schematic Design, it is time to put these systems together in greater detail to see how they will support each other and, most importantly, to discover how the design evolves from integrating these separate pieces. Via iterative analysis, how these systems are in relationship and mutual support of one another can be discovered, thereby allowing this process to inform the building's architectural form and solution. At the same time, the team continues to look at these systems and their components in continually finer detail and progressive approximation with a finer grain of analysis.

This Schematic Design effort is kicked off during this stage in Workshop No. 3. Similar to Workshop No. 2, the Implementation Outline below can be used to create an agenda for Workshop No. 3; but, again, the agenda for this session needs to remain fluid and flexible during the workshop, as the team makes new discoveries. It also should be noted, again, that this workshop can occur as an all day event on a single day, or it can be structured to last as long as three or four days, depending upon project complexity and the team's goals. Lastly, the Constructor's participation once again is extremely valuable at this workshop and should be encouraged (if at all possible), so that the project's construction professionals can be included as co-designers.

Additionally, the construction process needs to be considered now. The construction processes should inform the design process and not simply be an output of it. Investigating Production System Design using computer simulations may be valuable at this point. Alternative construction operations may reveal assumptions that the product design should take into account, thereby rendering the Constructor's input even more valuable.

As discussed above in the introduction to Section Two of this Standard Guide, the implementation outline herein presents an "optimal" process that will need to be adjusted and tailored to the parameters of each unique project and team. Accordingly, it may be sensed by some project teams as unrealistic to imagine a *standardized* process that expects 3 full workshops (plus the attendant tasks associated with same) prior to focusing on building form. Accordingly, some teams may need to consider how best to adapt this optimal process to their constraints, perhaps by engaging workshop iterations that can be inserted at key moments, as appropriate for the project.



B.1.1 WORKSHOP NO. 3 ACTIVITIES

- Present sketch concepts (multiple), supporting data, and discoveries from *Stage A.5* Research and Analysis.

- Develop site and building configuration sketch solutions by evaluating flows and exploring interrelationships between the four key subsystems (see pages 222-231 of the IDGGB):
    - Habitat (including human inhabitants)
    - Water

- Energy
- Materials

- Assess the realistic potential for achieving Performance Targets and review commitment to Touchstones and Principles

- Identify the systems that require more extensive cost-bundling analysis, including life-cycle-cost impacts.

  This will require agreement between the Owner, design team, and Constructor on the appropriate variables for this calculation, e.g. discount rate, energy cost escalation, etc.

- Provide time for reflection and feedback loops from (and between) client and team members

- Commissioning: Identify where the Owner's Project Requirements (OPR) and Basis of Design (BOD) will need refinement based upon new discoveries.

B.1.2 PRINCIPLES AND MEASUREMENT

- Document adjustments to Performance Targets to reflect input from Workshop No. 3.

- Commissioning: Adjust OPR and BOD to reflect input from Workshop No. 3.

  Similar to previous comments about the OPR, the BOD is a vital design team document or collection of documents that each design team member is responsible for generating and maintaining, since it serves as a collection of agreed upon specific criteria driving design decisions and being continuously modified. It should be in the middle of the table as opposed to off to the side getting updated later. More detail about how to utilize OPR and BOD documents effectively at this Stage is described in detail on pages 233-235 of the IDGGB.

B.1.3 COST ANALYSIS

- Update any required integrative cost-bundling templates to reflect input from Workshop No. 3.

  Budget parameters may be more precisely defined at this point. Discussions can begin to address the potential for establishing contracts on a Not to Exceed or GMP basis, if appropriate.

B.1.4 SCHEDULE AND NEXT STEPS

- Refine and extend forward the Integration Process Road Map tasks and schedule into future phases to reflect input from Workshop No. 3.

- Distribute report from Workshop No. 3

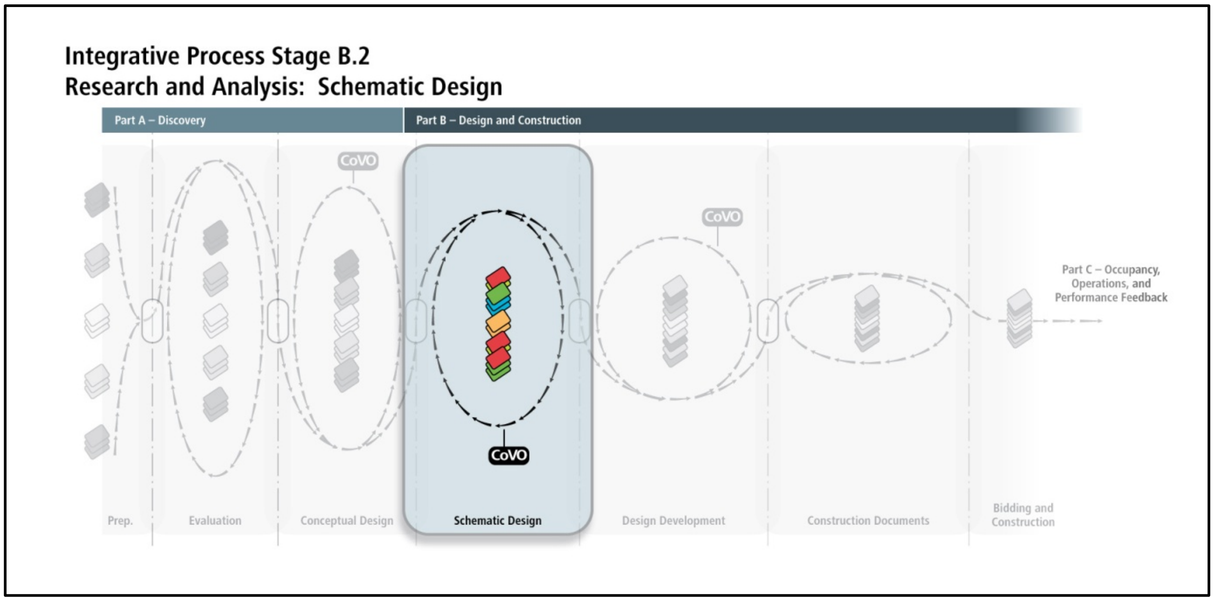
  Document and distribute report from Workshop No. 3, including:
  - Adjustments to performance targets to reflect input from Workshop No. 3.
  - Owner's Quality Process Quality Commissioning: Adjustments to the OPR and BOD that reflect input from Workshop No. 3.
  - Outline specifications based on results of Workshop No. 3.
  - Cost Analysis: Update any required integrative cost-bundling templates to reflect input from Workshop No. 3.
  - Schedule and next steps: Updated schedule to reflect input from Workshop No. 3.

2.B.2 STAGE B.2

RESEARCH AND ANALYSIS: SCHEMATIC DESIGN – BRINGING IT ALL TOGETHER (AND NOW COMMITTING TO BUILDING FORM)

Schematic design now begins in earnest. This Research and Analysis period is focused on iterating and refining the results of all previous work and developing a project solution or solutions that address multiple issues with minimal materials, systems, and expense. Also, this process focuses on using the opportunity of building to restore and contribute to the health of local living systems—in other words, elegant design.

Include explorations within individual disciplines, smaller related groups and public meeting outreach (as appropriate).



B.2.1 RESEARCH AND ANALYSIS ACTIVITIES: SCHEMATIC DESIGN

- Engage a more informed schematic design process and develop building form solutions from conceptual sketches produced in Workshop No. 3.

- Iterate, iterate, iterate, with meetings, conference calls, etc., to integrate the four key subsystems with building form (see pages 237-254 of the IDGGB):
    - Habitat (including human inhabitants)
    - Water
    - Energy
    - Materials

  Activities include:
    - Develop building form solutions from conceptual sketches produced in Workshop No. 3 by pursuing an iterative process of engaged communication to integrate the four key subsystems with building form.
    - Evaluate schematic design schemes from Workshop No. 3 within the realities of the program and principles, performance targets, and cost relative to the four key subsystems.

- Engage sub-team meetings across disciplines and expertise areas circling back with integrated design team and with Owner, as described in the above-referenced pages of the IDGGB.
- Analyze Occupant Engagement and behavior issues.
- Begin Outline Specifications describing systems and materials being considered.
- *Implement Building Information Modeling (BIM) – it is now reasonable to begin to populate the model with specific information for more detailed analysis and detailed design permutations.* (See detailed descriptions of BIM on pages 198-202 of the IDGGB).

B.2.2 PRINCIPLES AND MEASUREMENT

- Examine building performance in detail and evaluate results against Performance Targets.
- Commissioning: Adjust the OPR and BOD to reflect proposed schematic design.

B.2.3 COST ANALYSIS

- Refine integrated cost-bundling numbers to ensure that proposed schemes, systems combinations, and cost scenarios can be evaluated with increasing accuracy (see pages 256-258 of the IDGGB for how to address cost-bundling at this Stage).

B.2.4 SCHEDULE AND NEXT STEPS

- Adjust and prepare Integration Process Road Map for team review to include tasks and schedule impacts that have emerged from schematic design discoveries.
- Begin Implementation of BIM - if utilized.
- Prepare Agenda for Workshop No. 4.

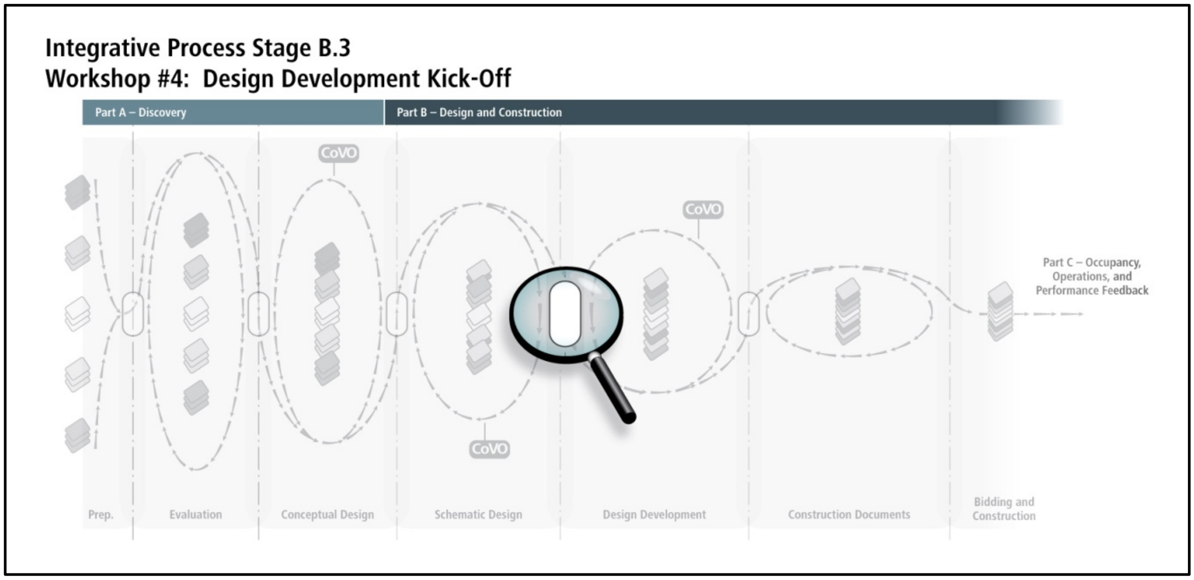
This likely is the latest point for selecting construction delivery mechanisms (e.g. design-bid-build vs. CMGC vs. design-build vs. Integrated Project Delivery, etc.).

2.B.3. STAGE B.3

WORKSHOP NO. 4: DESIGN DEVELOPMENT KICKOFF – CT IS BROUGHT TOGETHER: DOES IT WORK?

At this point, Schematic Design documents have been submitted to the owner as a single architectural solution, with possible variants. The team now has an understanding of the interrelationships between the four key subsystems and the project's potential for achieving the Performance Targets within the ranges defined during Discovery and analyzed during Schematic Design. The pieces have been brought together into a building form to which the team now needs to commit collectively by validating that the schematic solution falls within these ranges for all Performance Targets, before engaging more detailed optimization analysis in Stage B.4, Design Development.

In essence, Workshop No. 4 functions both as a Schematic Design sign-off and as an organizational meeting for outlining Design Development activities. The benefit of breakout groups at this point likely is limited; rather, the team as a whole needs to verify that all of the threads have been brought together. Then the team needs to identify any gaps in the schematic analyses that will need to be addressed, by engaging more refined analysis, in order to reach higher levels of performance within these ranges of Performance Targets.



B.3.1 WORKSHOP NO. 4 ACTIVITIES

- Present schematic design solutions from *Stage B.2* Research and Analysis and verify that the ranges of Performance Targets are being met for the four key subsystems (see pages 267-274 of the IDGGB):
  - Habitat (including human inhabitants)
  - Water
  - Energy
  - Materials
- Verify that schematic design solution meets building program requirements and environmental performance objectives.
- Commit to building form, configuration, and systems interrelationships that will be analyzed in further detail for optimization during *Stage B.4* Research and Analysis.
- Identify the systems components variants that will require more detailed cost-bundling analysis.
- Identify Measurement and Verification (M&V) methods and opportunities for providing continuous performance feedback.
- Commissioning: Identify where the OPR and BOD require updating.

B.3.2 PRINCIPLES AND MEASUREMENT

- Document adjustments to Performance Targets that reflect schematic design solution.
- Commissioning: Adjust OPR and BOD to reflect schematic design solution.

B.3.3 COST ANALYSIS

- Expand any integrative cost-bundling templates to reflect input from Workshop No. 4.

B.3.4 SCHEDULE AND NEXT STEPS

- Refine and extend forward the Integration Process Road Map tasks and schedule through

Design Development.

- Distribute Workshop No. 4 Report.

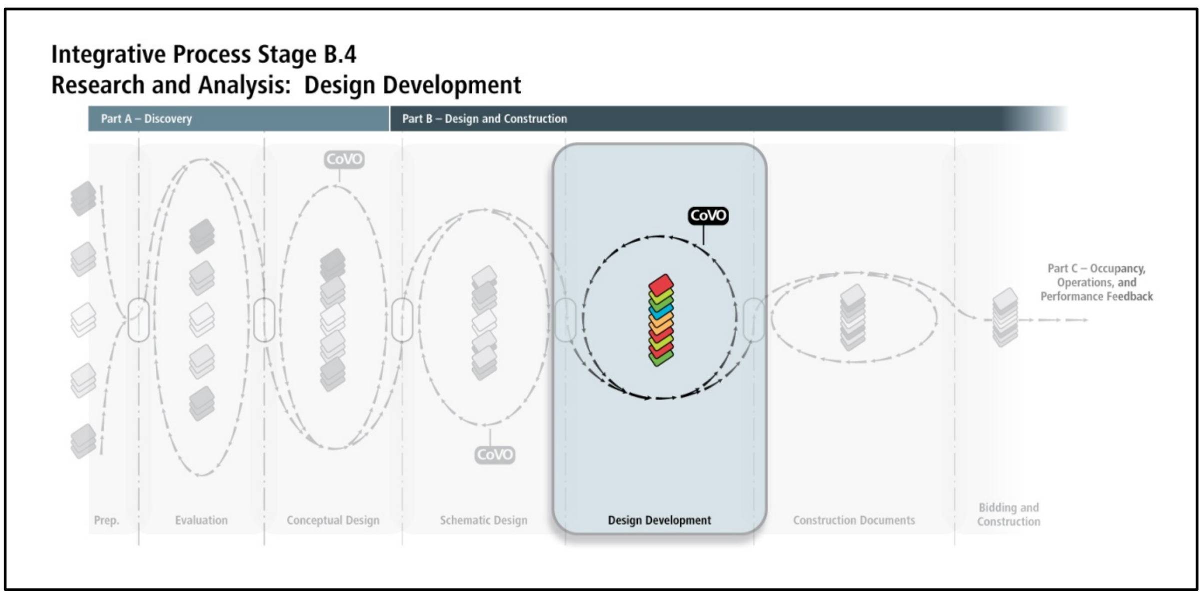
  Document and distribute Workshop No. 4 Report including:
  - Adjustments to performance targets that reflect schematic design solution.
  - Commissioning: Adjust OPR and BOD to reflect schematic design solution.
  - Developed specifications.
  - Cost Analysis: Expand any integrative cost-bundling templates to reflect input from Workshop No. 4.
  - Schedule and next steps: Updated schedule to reflect input from Workshop No. 4.

2.B.4. STAGE B.4

RESEARCH AND ANALYSIS: DESIGN DEVELOPMENT (OPTIMIZATION)

Design Development is about optimization. Accordingly, during this stage, team members are fine-tuning the details of their systems, components, and system interrelationships via iterative and more progressively detailed analysis. The conclusion of Design Development constitutes the conclusion of making design decisions. It bears repeating, then, that activities during DD focus on "Designing in Detail," except for at the finest level, which remains for Construction Documents; therefore, "Design is Done" at the end of this stage. What is meant by "Done" here is that the design of all systems that support the Performance Targets for all four key subsystems is complete.

Include explorations within individual disciplines, smaller related groups and public meeting outreach (as appropriate).



B.4.1 RESEARCH AND ANALYSIS ACTIVITIES: DESIGN DEVELOPMENT

- Engage detailed analysis of systems interrelationships with continuous iterations between disciplines.

  The analysis here should address in detail the project-specific questions about systems interrelationships that were asked during Workshop No. 4 pertaining to the four key subsystems. Interim meetings between team members are essential to accomplish this, and are described in more detail in the IDGGB.

- Validate achievement of Performance Targets for specific components of the four key subsystems (see pages 278-285 of the IDGGB):
    - Habitat (including human inhabitants)
    - Water
    - Energy
    - Materials

  If solutions for integrating the four key subsystems are not completed in detail during this Stage, and their Performance Targets are not verified by detailed analysis, then it likely will be too late to realize integrative solutions – the design will not be "Done." Accordingly, this detailed analysis should address questions that are highly project specific, so presenting a comprehensive list of the types of analysis to be engaged during this stage would be impossible (and well beyond the scope of this IP Standard Guide), since the nature of such analysis varies as widely as design parameters differ from project to project. However, examples that are intended to illustrate what level of detail should be addressed in the systems integration analysis during DD are presented in the IDGGB.

  Also, provide a report and review of occupant engagement/behavior strategies and the expected benefits (both social and ecological) from same.

- Obtain continued input and feedback from Constructor on all systems – the Constructor's role at this point can be critical to achieving successful outcomes.

B.4.2 PRINCIPLES AND MEASUREMENT

- Document in detail and validate building-performance results against Performance Targets.

  Update and expand outline specifications and begin developing specifications.

- Prepare draft Measurement and Verification (M&V) Plan.
- Commissioning (Cx): see pages 287-294 of the IDGGB for more detailed descriptions:
    - Commissioning Authority (CxA) to review design progress and identify opportunities for further optimization and potential conflicts. The CxA should be engaged from the beginning of the integrative process and participating as much as possible to provide input on optimizing performance and operations throughout.
    - Identify the preliminary list of systems to be commissioned.
    - Prepare preliminary Cx Plan (see example on pages 295-296 of the IDGGB).

  Engage Owner's operations and maintenance (O&M) staff more formally at this phase to reinforce their meaningful input that was provided earlier.

B.4.3 COST ANALYSIS

- Utilize integrated cost-bundling templates to optimize value and performance (true value engineering) to conclude cost analysis for all major systems.

  Ensure that the technical, programmatic, and aesthetic elements are weighed and valued when making cost decisions, which requires an iterative collaboration between the Owner, Architect, and Constructor.

  Identify and quantify green building rebates and incentives, if not analyzed earlier.

B.4.4 SCHEDULE AND NEXT STEPS

- Extend forward the Integration Process Road Map tasks and schedule through the Documentation phase and begin integrating with the Constructor if this has not yet occurred.

  Once again, it is emphasized that early integration with the Constructor and key sub consultants (mechanical, electrical, curtain wall, building envelope, etc.) is a key step to successfully implementing the Integrative Process. Cost estimates, constructability input, and element-installation-experience sharing are a critical aspect of aligning Constructors with the four key subsystem goals and Performance Targets.

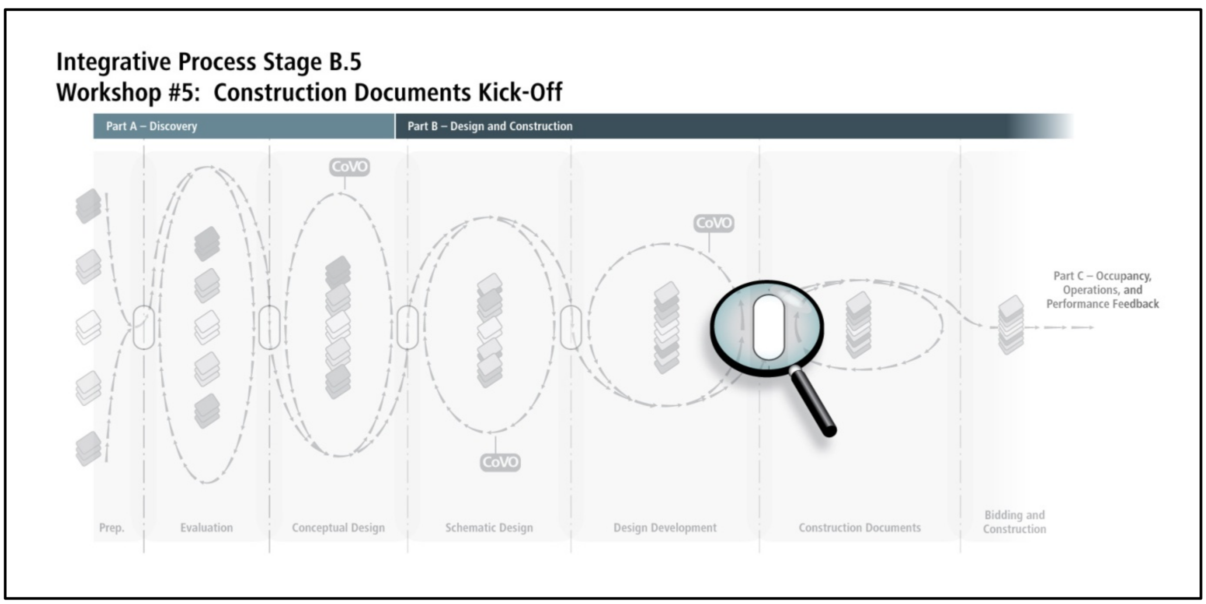
- Prepare Agenda for Workshop No. 5.

2.B.5. STAGE B.5

WORKSHOP NO. 5: CONSTRUCTION DOCUMENTS KICKOFF - PERFORMANCE VERIFICATION AND QUALITY CONTROL

The design is done. The four key subsystems are no longer separate. They are now part of a whole. To proceed confidently with the documentation phase, it will be worthwhile to have a final review of project intentions. Project teams should ask: Did the team miss anything during the intensity of the DD stage? Are there any last opportunities to integrate systems that may have slipped through the process? In preparing for this workshop, make sure the data to support the actual achievement of expected performance results is available. All generalizations and guesswork should now be put to rest with concrete performance calculations.

The principle objective in this workshop is to design the documentation process in ways that can best integrate and communicate the details of the project, so that systems can be effectively priced and constructed. In addition to clear, communicative drawings, designing a process for developing meaningful, thorough, and understandable specifications is a key aspect of this phase; this process needs to be addressed by the entire team at the workshop.



B.5.1 Workshop No. 5 Activities

- Verify that the design meets all Performance Targets (modeled or calculated).

  Include confirmation that all occupant performance / behavior design assumptions remain accurate.

- Present and verify the integrated performance of the project as an interrelated whole.

- Identify where Specifications will need to be altered to effectively document project performance and integrate the four key subsystems (habitat, water, energy, and materials).

- Verify final cost-bundling analysis and cost impacts related to all major systems and components.

- Commissioning: Review Commissioning Plan for alignment with BOD and schedule Commissioning review of mid-construction documents.

B.5.2 PRINCIPLES AND MEASUREMENT

- Document final Performance Targets.

- Review draft Measurement and Verification Plan.

- Commissioning: Update OPR, BOD, and Commissioning Plan to reflect input from Workshop No. 5.

B.5.3 COST ANALYSIS

- Document integrated cost implications of final design decisions.

B.5.4 SCHEDULE AND NEXT STEPS

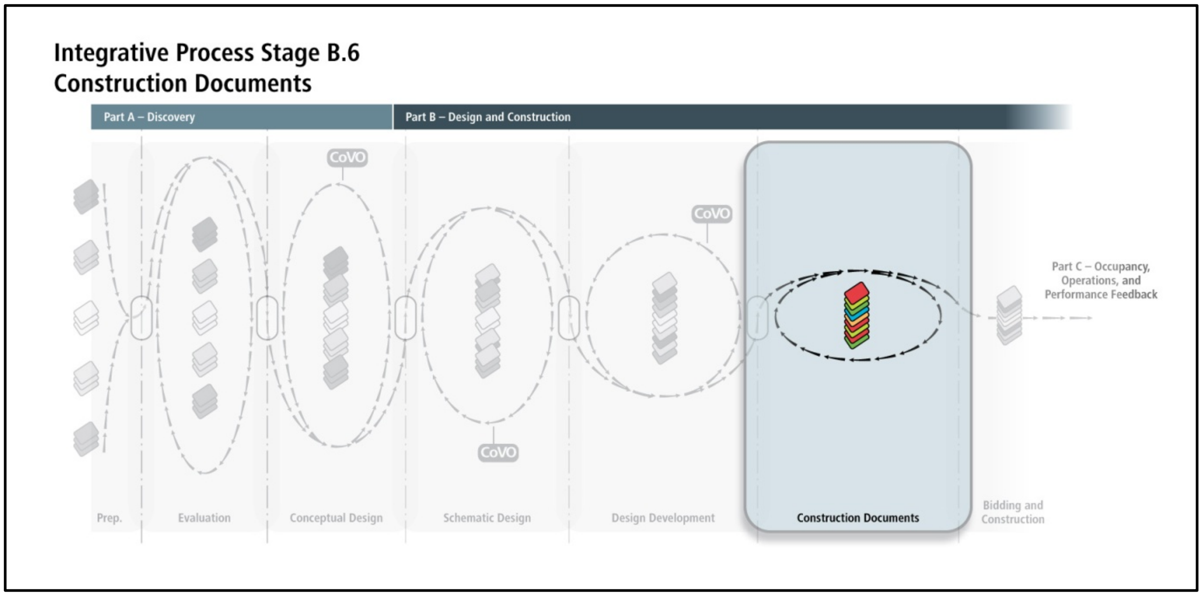
- Plan quality control review process of Construction Documents.

- Distribute Workshop No. 5 Report.

2.B.6. STAGE B.6

CONSTRUCTION DOCUMENTS: NO MORE DESIGNING

In the best of worlds, this stage is a disciplined process of drawing and specification documentation. *Disciplined* means that check points exist along the way that will verify the systemic integration and coordination of systems through the Construction Documents. To achieve a deep optimization of systems, almost every decision and interrelationship needs to be understood and reconfirmed. It is necessary to make sure that the people doing the technical documentation understand why and how decisions have been made, so that they can "think into" the issues and resolve any remaining discrepancies with the same level of creativity and understanding that informed the design team's integration of the four key subsystems. Building Information Modeling (BIM) tools will be very useful in this stage.



B.6.1 Documentation Activities

- Complete Bidding Documents with thorough Specifications that communicate both performance requirements and project intentions that integrate the four key subsystems.
- Commissioning (Cx): Update Cx Plan and insert Cx requirements into Specifications (see pages 304-308 of the IDGGB for more detailed descriptions of Cx activities during this Stage).

B.6.2 Principles and Measurement

- Finalize performance calculations to validate final design and document results.
- Produce final Measurement and Verification Plan to build performance measurement and feedback mechanisms into project.
- Commissioning: Perform detailed review of Drawings and Specifications to ensure consistency with OPR and BOD.

B.6.3 Cost Analysis

- Review unique cost implications with Constructor and finalize cost estimate.

B.6.4 Schedule and Next Steps

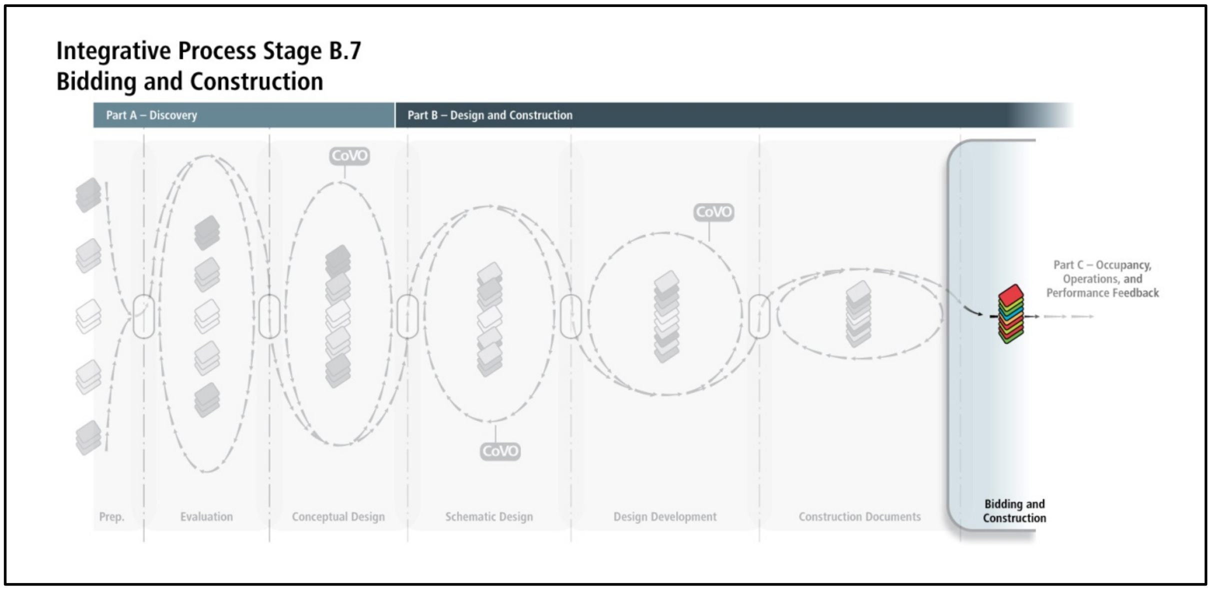
- Schedule quality control reviews of Construction Documents.

2.B.7. STAGE B.7

Bidding and Construction: Alignment with the Constructor

The Integrative Process outline and this Standard Guide for these last two stages are not intended to provide a comprehensive or detailed outline of the myriad activities and variables associated with construction and occupancy. Rather, this Guide's intended purpose is to provide a general overview of the aspects associated with integrative design that affect team members as they engage construction and occupancy activities.

Although the title of this stage includes “alignment with the Constructor”, such alignment needs to begin in design phases. **This Standard Guide is intended to be unambiguous in its preference for having the Constructor be part of the integrative team from the beginning, commencing in early design.**



B.7.1 BIDDING AND CONSTRUCTION ACTIVITIES

- Explain unique aspects of project and the integration of all systems at the Pre-Bid and Pre-Construction conferences.

- Review with Constructor’s team (all trades and subcontractors) their roles and responsibilities prior to commencing construction regarding:
    - Subcontractors’ roles in supporting the integration of their work into the whole.
    - Each subcontractor’s role in supporting the documentation necessary to demonstrate achievement of Performance Targets.

  Constructors and trades people need to understand that their components are part of a larger whole, and this likely requires them to be made aware of the components in the project that will require products and installation processes that fall outside of conventionalized norms. Accordingly, it is useful to convene meetings with trades people – those who actually will be on-site doing the work – at several points in the construction process. These multiple meetings need to be scheduled contemporaneously with the specific work being performed at various stages of construction, as clarified by examples on pages 330-331 of the IDGGB.

  Review Constructor submittals through the unique filters of environmental performance.
    - Construction Acceptance - it is important to note that the Owner and Design Team should continue the integrative process throughout construction to review and approve the constructed work. This should include setting expectations early through approval of submittals, mock-ups and/or first-in-place construction, along with on-going review of subsequent installations.

- Commissioning: Coordinate with Constructor’s team installation of all systems regarding achievement of Performance Targets (Refer to pages 332-334 of the IDGGB for more detailed descriptions; see also ASHRAEGuideline 0-2005, *The Commissioning Process*, as an additional reference guideline applicable to the IP Guide).

- Perform site observations.
- Incorporate Commissioning schedule into construction schedule.
- Review submittals.
- Develop construction checklists and commissioning (functional) tests.
- Witness start-up.
- Perform commissioning (functional) tests.
- Verify training of building operations team.
- Prepare final Commissioning report.
- Produce systems manuals.

Other activities include:

- Verify construction and project metrics with the Constructor and subcontractors throughout the project.
- Create documentation feedback structure to keep buyout in line with performance and purchasing expectations.
- Involve Owner's O&M staff in construction process and commissioning.
- Refer to the IDGGB for more detailed descriptions.

B.7.2 PRINCIPLES AND MEASUREMENT

- Manage the collection of documents that verify achievement of Performance Targets.
- Commissioning: Document construction checklist and commissioning testing results and prepare Commissioning (Cx) reports and Recommissioning Plan.

B.7.3 COST ANALYSIS

- Coordinate with Constructor to ensure that subcontracts are awarded based upon performance requirements, not just price.

  Several mechanisms can ensure that this will happen (such as performance specifications, construction partnering, etc.), but these likely will differ from one project to another, depending on the implemented project delivery methodology.

B.7.4 SCHEDULE AND NEXT STEPS

- Ensure systematic communication between design and building team.

  It can be effective to require in the specifications that various topics related to Performance Targets be included as regular agenda items at all job conferences for the purpose of updating status, coordinating trades, and sequencing appropriately. This often requires interim meetings and/or communication between various team members; not at all unlike the traditional construction process, but environmental performance issues and systems interrelationships are now thrown into the mix with equal priority. Throughout this process, the incorporation of feedback mechanisms should remain part of all discussions to ensure that building and occupants have the capability to measure and assess operational performance.

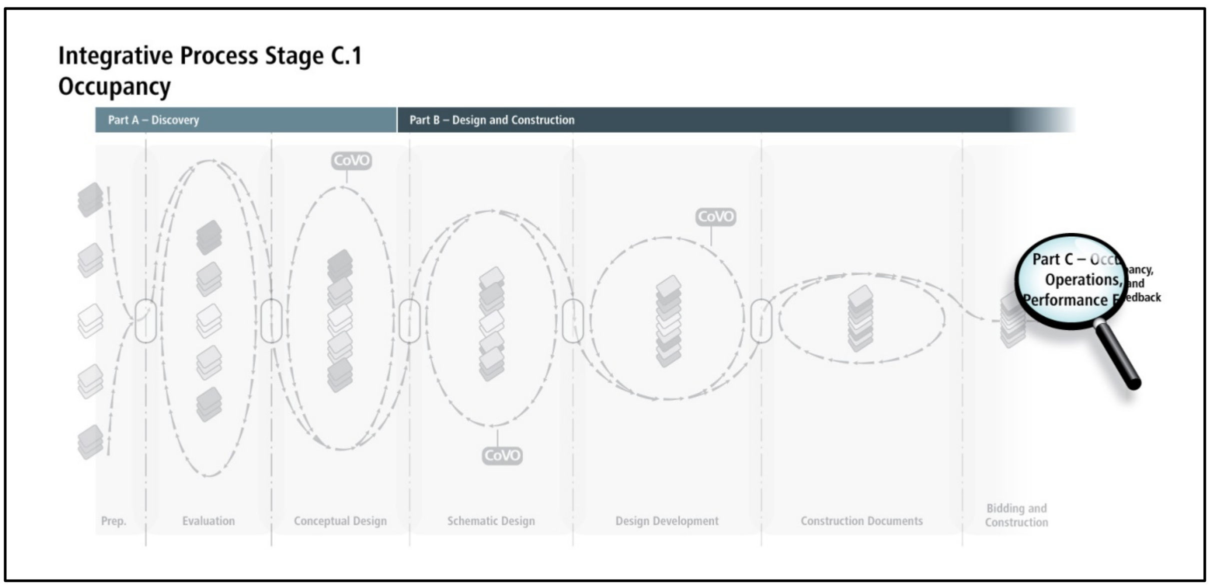
2.C PART C: OCCUPANCY, OPERATIONS, AND PERFORMANCE FEEDBACK

2.C.1. STAGE C.1

OCCUPANCY: FEEDBACK FROM ALL SYSTEMS

The Call for Performance Feedback: At this point, construction has been completed and the operations phase begins. The intent of this Standard Guide is not to describe, in any comprehensive way, how to operate a building, since the procedures and impacts associated with building operations are far beyond the scope of this Standard Guide. Rather, the purpose here is to explore what needs to be measured and how. Accordingly, the Standard Guide's last stage focuses on how to go about engaging performance measurement and creating performance feedback mechanisms.

Such measurement and feedback is critical for informing the operations of the facility, so that the degree to which established Performance Targets have been met can be assessed. Such feedback helps designers, Constructors, and owners better understand the implications that their process and decisions might have on future project outcomes, so long as this feedback can be identified and documented. In other words, performance feedback can help project teams understand the results of their integrative process, so that they can continually evolve their process toward better and more effective integration. Convening a project team meeting post-occupancy can be extremely useful in this regard. The purpose of this meeting is to generate a discussion with all team members about lessons learned by exploring: What worked? What did not work? How might it be possible to do better and think about this differently?



C.1.1 OPERATIONS ACTIVITIES

- Establish operations team consisting of key stakeholders responsible for continuously monitoring, maintaining, and improving environmental performance.

  This feedback should be provided to the Owner, the occupants, and the O&M staff . . . but also to design and construction team to inform future decisions/process.

- Establish and implement standard operating procedures (SOPs) that provide continuous feedback regarding performance of the four key subsystems:

  - Habitat (including human inhabitants)
  - Water
  - Energy
  - Materials

  Activities include:
  - Conducting post occupancy evaluations of occupants and O&M staff.
  - Conducting a lessons-learned workshop with the original team.
  - Developing action plans for occupant behavior (changes) based on feedback.

- Commissioning: Conduct periodic Recommissioning in accordance with Recommissioning Manual.

C.1.2 PRINCIPLES AND MEASUREMENT

- Document key indicators that serve as proxies for the health of the larger ecosystem.
- Document occupant surveys and reconcile results with building systems performance.
- Implement measurement and verification (M&V) plan continuously over the life of the building.
- Insert results of periodic Recommissioning into Recommissioning Manual.

C.1.3 COST ANALYSIS

- Track economic performance of the four key subsystems.

C.1.4 SCHEDULE AND NEXT STEPS

- Implement all of the above over the life of the building.

3.0 SECTION THREE – Appendices

A. Glossary

Basis of Design
The BOD is narrative and analytical documentation prepared by the A-E design professionals along with design submissions to explain how the Owner's Project Requirements are met by the proposed design. It describes the technical approach used for systems selections, integration, and sequence of operations, focusing on design features critical to overall building performance. An OPR is developed for an owner/user audience in layperson's language, while the BOD is typically developed in more technical terms.
[modified from the Whole Building Design Guide, http://www.wbdg.org/project/doc_comp.php]

Benchmark
Standard*, or a set of standards, used as a point of* reference *for evaluating* performance *or* level *of* quality*.*
[Businessdictionary.com]

Building Information Modeling (BIM)
A Building Information Model (BIM) is a digital representation of physical and functional characteristics of a facility. As such, it serves as a shared knowledge resource for information about a facility forming a reliable basis for decisions during its life-cycle from inception onward. A basic premise of BIM is collaboration by different stakeholders at different phases of the life cycle of a facility to insert, extract, update or modify information in the BIM process to support and reflect the roles of that stakeholder. The BIM is a shared digital representation founded on open standards for interoperability.
[National Institute of Building Sciences buildingSMART alliance™]

Building Systems
Physical or performance related components that are combined to provide a specific function in a building. These are typically grouped in performance categories in specifications (e.g, mechanical systems, electrical systems, lighting systems, structural systems, plumbing systems, etc.)

Charrette (Workshop)
A fast-paced intensive workshop with key client, design, engineering, and building participants. These charrette events typically range from half-day to week-long events. They provide a framework for achieving significant production and meaningful agreement among participants in relatively brief amounts of time.

Commissioning
An intensive Owner's Quality Process that begins during design and continues through construction, occupancy, and operations. Commissioning ensures that the new building operates initially as the owner intended and that building staff are prepared to operate and maintain its systems and equipment.
[Lawrence Berkeley Laboratory definition http://cx.lbl.gov/definition.html]

Conceptual Design
Conceptual design is a step in the creative process. It describes the general framework of an idea, along with the principles from which it is derived. It explores iteratively the intentions and representations of ideas aimed at achieving performance targets.

Construction Documents
Legally binding drawings and specifications that set forth, in detail, requirements for the construction of the project.

Core Values
Principles that guide an organization's internal conduct as well as its relationship with the external world.
[Businessdictionary.com]

Example:

- *Values can be defined as those things that are important to or valued by someone. That someone can be an individual or, collectively, an organization. One place where values are important is in relation to vision. One of the imperatives for organizational vision (whether a client/design team or business) is that it must be based on and consistent with the organization's core values. An organization's core values – as an example, integrity, professionalism, caring, teamwork, and stewardship- are often part of an organization's vision. When values are shared by all members of an organization, they are extraordinarily important tools for making judgments, assessing probable outcomes of contemplated actions, and choosing among alternatives. Perhaps more important, they put all members "on the same sheet of music" with regard to what all members as a body consider important.*
  [National Defense University, "Strategic Leadership and Decision Making", Chapter 15, Values And Ethics]

Cost Bundling
A holistic cost analysis that first identifies all components affected by each major integrative strategy, then groups the costs associated with all such affected components into integrative combinations, or "bundles", instead of estimating solely the individual line item cost for each component or system individually.

Design Development
The elaboration and refinement of the schematic design so as to define and resolve all aspects and interrelationships of the project's subsystems and components

Discovery Conceptual Design
The concept design that arises out of a disciplined and thorough Discovery analysis and evaluation process.

Discovery Evaluation
The analysis of site forces and issues that will affect and inform building form and design

Discovery Phase
The Discovery Process is a phase that informs the early part of the conventional Pre-Design Phase. In terms of Sustainable Design, the Discovery Phase is a significant phase. Site forces, energy, daylighting, material choice, water balancing implications are understood and inform the rough massing and preferred location of the building before *the concept design process is engaged. This provides many more opportunities and restraints for the architect to consider before creating the building form.*

Discovery Preparation
The initial research and process road mapping that precedes the analysis and evaluation of issues, forces, and programming of the project

Entropy
Inevitable and steady deterioration of a system or society.
[free online dictionary]

Four Key Subsystems
The alchemists were correct—earth, wind, fire, and water are the four essential elements required for life. The sun (fire) is out of our control, other than how we use its present or stored energy (fossil fuels) as a resource. However, the other elements directly in our control are essential to the pursuit of the sustainable conditions that serve to sustain life. Without healthy soil (earth), clean air (wind), and clean water, we will not be able to grow healthy food, or build shelter, for the support of all species—the essential base condition necessary to sustain life. A building cannot function without, or be without impact on, the contributions of these four key subsystems, which are continually referenced throughout this Standard Guide as (1) water, (2) habitat (human and other biotic), (3) energy, and (4) materials. Consequently, all development finds itself bound to these four primary subsystems.

High Performance Building
A building that integrates and optimizes on a lifecycle basis all major high performance attributes, including energy [and water] conservation, environment, safety, security, durability, accessibility, cost-benefit, productivity, sustainability, functionality, and operational considerations (Energy Independence and Security Act 2007 401 PL 110-140). High Performance Buildings are not sustainable in themselves; even a carbon neutral, water balanced, and pollutant-free building is still an interruption of the life and most likely damaging the planet due to its construction and on-going internal activities associated with its operations.

Integration Facilitator
A person who organizes and leads large and/or complex meetings and processes in order to systematically explore, discover, and structure reciprocal interrelationships between people, organizations, their missions and the systems, technologies, products, and processes associated with building and human performance.

Integrative Cost Bundling
A spreadsheet consisting of line-item unit cost estimates as a starting point for understanding the first-cost impacts of alternative systems components (and systems groupings, or "bundles") that are being tested, modeled, and considered for a project. This is done to create a "project palette" of line-item costs for these alternatives that allows the team to see the whole set of potential project systems (and associated components) costs, so that the team can assemble, or bundle, interrelated system "groupings" or "combinations" of systems and components. In other words, from this list are drawn items that are related to each other with regard to how they interact and in terms of their costs as a group, rather than solely as individual separate components.

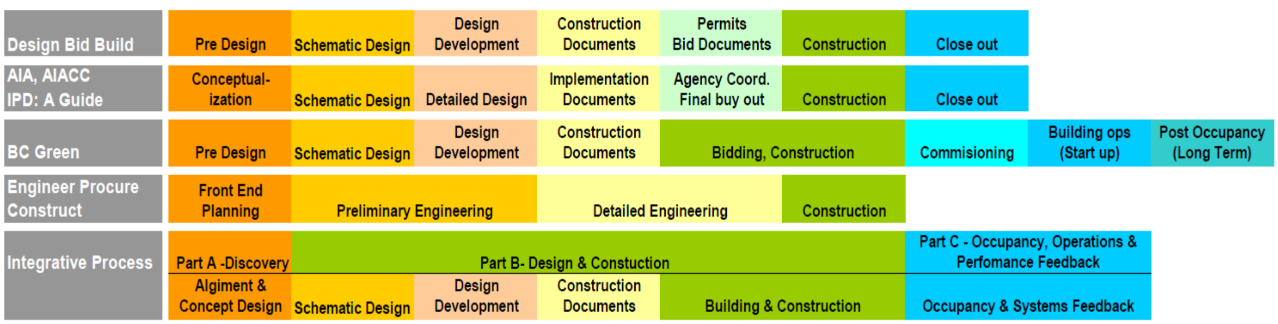
Integrative Process
A process of design, construction, and operations that is organized to structure the interaction between people who hold knowledge of the various technical and living systems associated with a building project. This process is organized to explore, discover, identify and structure mutually beneficial interrelationships and synergies between these multiple systems.

Integrated Project Delivery (IPD from AIA)
Integrated Project Delivery (IPD) is a project delivery approach that integrates people, systems, business structures (contract and legal agreements) and practices into a process that collaboratively harnesses the talents and insights of all participants to optimize project results,

increase value to the owner, reduce waste, and maximize efficiency through all phases of design, fabrication, and construction.

AIA's California Chapter denotes the phases of an integrative process as "conceptualization", "criteria design", "detailed design" and "implementation documents" for instance. This way the team knows they are working within the framework of a nonconventional process. This Integrative Process Guide uses more conventional design phase terminology. For reference they compare as indicated in the following table and diagram:

IP Guide terms	*Traditional terms*	*IPD terms*
Discovery Preparation		
Discovery Evaluation		
Discovery Conceptual Design	*Pre-design / Conceptual Design*	*Conceptualization*
Schematic Design	*Schematic Design*	*Criteria Design*
Design Development	*Design Development*	*Detailed Design*
Construction Documents	*Construction Documents*	*Implementation Documents*



Integrative Process Road Map / Process Management Roadmap
An Integrative Process Road Map identifies in a detailed spreadsheet the team members' responsibilities and the required deliverables for engaging a clearly defined and manageable integrative design process; it is tied to specific tasks and dates. The process of developing such a map has proved beneficial in the scoping of work and in keeping track of the complex interactions required between team members in order to optimize building, natural, and social systems and to identify synergies between them.

Life Cycle Assessment (LCA)
Life Cycle Assessment (LCA) is a scientific methodology evaluating the environmental impacts and energy use of products / materials over a product's life from raw materials extraction to end of life / reuse. LCA is an emerging tool that is not able to accurately compare one product to another without published and harmonized product criteria rules.
[See Leadership Standards Campaign Framework (Aug. 2011)]

Life Cycle Cost Analysis
Life-cycle cost analysis (LCCA) is a method for assessing the total cost of ownership. It takes into account all costs of acquiring, owning, and disposing of a building or building system. LCCA is especially useful when project alternatives that fulfill the same performance requirements, but differ with respect to initial costs and operating costs, have to be compared in order to select the one that maximizes net savings.
[Whole Building Design Guide, http://www.wbdg.org/resources/lcca.php]

Linear process
A linear process emphasizes design disciplines working with ideas in isolation from other disciplines. At relatively few points in time these ideas are presented and combined with the systems designed by other disciplines. Slight adjustments are possible with these minimal interactions. Generally, this approach is "successful" because the expectations of this design approach do not question design assumptions that have "worked" in the past.

Living systems
A living system maintains its identity and self-organizes to a higher level of complexity and resilience in order to preserve itself. A forest, a human community, and a wetland are living systems. Because sustainability is about sustaining life – it is necessary that humans understand and become re-integrated with life and how living systems process themselves.

Measurement and Verification Plan
A well-defined and implemented M&V plan provides the basis for documenting building performance in a transparent manner that can be subject to independent, third party verification. [Lawrence Berkeley Lab, http://mnv.lbl.gov/keyMnVDocs/mnvplan]

Metrics
Standards of measurement by which efficiency, performance, progress, or quality of a plan, process, or product (such as a design iteration) can be assessed.
[Businessdictionary.com]

Organism
A system regarded as analogous in its structure or functions to a living body: the social organism, a building as an organism, etc.
[free online dictionary]

Owner's Project Requirements
The Owner's Project Requirements (OPR) provide an explanation of the ideas, concepts and criteria that are considered to be very important to the owner, coming out of the programming and conceptual design phases and which are desired to be tracked throughout design and construction. The OPR is developed by the owner not the design team. The OPR provides the direction for the design team. The OPR document sets the functional goals that the design is judged against and establishes the basis of the criteria used during construction to verify actual performance. The OPR does not list items that are already required by code. The OPR is generally not a description of what specifically will be included in the project design, but is the more general feature and categorical performance criteria to be met by the design. Where practical and known, the OPR includes measurable indicators used to verify that the performance requirements were met.
*[www.documents.dgs.ca.gov/bsc/CALGreen/CX-SAMPLE-**PROJECT**.pdf]*

Performance Targets
Measurable goals or objectives that are established for a building system (or program) that generally can be quantified but, in some cases, qualified.

Principle
A basic truth, law, or rule that has to be, or usually is to be followed, or can be desirably followed, or is an inevitable consequence of something, such as the laws observed in nature or the way that a system is constructed. The principles of such a system are understood by its users as the essential characteristics of the system, or reflect the system's designed purpose; the effective operation or use of which would be impossible if any one of the principles was to be ignored.

[Adapted from: Alpa, Guido (1994) "General Principles of Law," Annual Survey of International & Comparative Law: Vol. 1: Iss. 1, Article 2]

<u>*Examples:*</u>

- *The nature of the land, its healthy functioning, its living systems, and physics inform the structuring of human habitat.*
- *Unpolluted, biologically diverse, and carbon-rich soil is one of the foundations for healthy food.*
- *Conserving energy by means of a well-insulated and reasonably airtight envelope is an ecologically effective and cost effective way of reducing energy use.*

Production System Design

Production system design is called "work structuring" and serves the three goals of production systems: do the job, maximize value, and minimize waste. For each of the latter two, ends-means hierarchies are proposed that progressively answer the question "What should we do to achieve a goal?" moving from desired ends to actionable means.
[Production System Design: Work Structuring Revisited, LCI White Paper #11, Ballard et al, www.leanconstruction.org/pdf/WP_11_Work_*Structuring.pdf]*

Recommissioning

A type of commissioning that occurs when a building that has already been commissioned undergoes another commissioning process. The decision to recommission may be triggered by a change in building use or ownership, the onset of operational problems, a predetermined time interval, or some other need. Ideally, a plan for recommissioning is established as part of a new building's original commissioning process or an existing building's retrocommissioning process.
[Lawrence Berkeley Laboratory definition http://cx.lbl.gov/definition.html]

Schematic Design

Schematic design studies consist of drawings and other documents illustrating the scale and relationships of the project components

Site Forces

The flows and interrelationships of water, wind, sun, animal and people movement, ground water, plant habitat, and so on that will impact or be impacted by a proposed building project and / or other human activity.

Standard Guide / Consensus Standard Guide:

A compendium of information or series of options that does not recommend a specific course of action - A guide increases the awareness of information and approaches in a given subject area, and is contrasted to more quantitative consensus standards: classification, practice, specification, and test method.
[ASTM Blue Book definition]

Sustainable Building

Emphasizes the process of designing buildings so that they will sustain the health of the planet's organisms and systems over time. Buildings themselves are not sustainable within the context and meaning of sustaining life on the planet. Therefore it is the process of building that may achieve this, along with neutralizing the damage that buildings and their processes cause.

Synergies

The interaction of two or more agents or forces so that their combined effect is greater than the sum of their individual effects.
[free online dictionary]

Systems
A group of interacting, interrelated, or interdependent elements forming a purposeful and complex whole.

Systems thinking
The process of understanding how things influence one another within a whole - Systems Thinking has been defined as an approach to problem solving, by viewing "problems" as parts of an overall system, rather than reacting to specific part, outcomes or events and potentially contributing to the further development of unintended consequences.
[Systems Thinking in Schools, Waters Foundation, http://www.watersfoundation.org/index.cfm?fuseaction=materials.main]

Technical systems
Mechanical and man-made systems that deteriorate and suffer reduced performance (due to entropy).

Touchstones
Goals, aspirations, or general criteria established by project teams from the outset against which design iterations can be evaluated in order to guide design decisions and stay aligned with these original goals and aspirations.

Whole system
The various systems of a building, a body, a community, a watershed, etc., interacting as an integrated whole organism in relationship with the larger systems in which it is nested.

B. Reference Standards and Guidelines

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