IDP IS A METHOD FOR REALIZING HIGH PERFORMANCE BUILDINGS THAT CONTRIBUTE TO SUSTAINABLE COMMUNITIES; IDP IS A PROCESS MORE THAN AN END RESUL
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IDP IS ABOUT LEARNING HOW TO RESPECT AND COMMUNICATE BETWEEN PARTICIPANTS; IDP SESSIONS HAVE ENERGY AND CREATE MAGIC; IDP IS ABOUT CRE

ROADMAP FOR THE INTEGRATED DESIGN PROCESS

PART ONE: SUMMARY GUIDE

DEVELOPED FOR
BC GREEN BUILDING
ROUNDTABLE

PREPARED BY
BUSBY PERKINS+WILL
STANTEC CONSULTING

This document has been compiled by Busby Perkins+Will and Stantec Consulting for the BC Green Building Roundtable (BC Hydro, Canada Green Building Council, Canada Mortgage & Housing Corporation, Cascadia Region Green Building Council, City of Vancouver, Greater Vancouver Regional District, Natural Resources Canada, Terasen Gas, and Shared Services BC). This document is not intended to constitute or render engineering, architectural, legal or other professional services or advice. Nor is it a substitute for such services or advice from an experienced professional directed to the specific design situation.

While the information in the Roadmap for the Integrated Design Process is believed to be accurate, the BC Green Building Roundtable shall not be liable for damages arising from errors or omissions in this document.

The guide is not intended to endorse or recommend any particular product, material, or service. Users of the document are encouraged to use wise consumer and professional practices when implementing design strategies and selecting technologies.

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PERKINS
+WILL

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EXECUTIVE SUMMARY

The Roadmap to the Integrated Design Process has been developed for the BC Green Building Roundtable. The Roundtable shares the increasingly accepted view that an "Integrated Design Process" (IDP) is required in order to achieve high performance (sustainable) buildings while avoiding or minimizing incremental costs.

The Integrated Design Process provides a means to explore and implement sustainable design principles effectively on a project while staying within budgetary and scheduling constraints. It relies upon a multi-disciplinary and collaborative team whose members make decisions together based on a shared vision and a holistic understanding of the project. It follows the design through the entire project life, from pre-design through occupancy and into operation.

The Roadmap is divided into two distinct parts: Part One: Summary Guide; and Part Two: Reference Manual, catering to both the novice and advanced IDP practitioner. Part One can easily be read in one sitting to gain an overview and consulted thereafter as a quick reference. Part Two can be consulted periodically as a more comprehensive reference manual.

Part One: Summary Guide offers a concise but comprehensive overview of the Integrated Design Process as a concept. It examines the goals, principles, key features, and ideal team composition for an IDP, as well as providing a one-page summary for each of the seven design phases covered in more detail in Part Two.

Part Two: Reference Manual, takes the reader through the process for each design phase: Pre-design; Schematic Design; Design Development; Construction Documentation; Bidding, Construction, and Commissioning; Building Operation (start-up); and Post Occupancy (long-term operation). Each phase is explained using a consistent structure that covers process activities, output development, helpful tips, case studies, and resources.

Part Two also contains a detailed bibliography which directs the reader to additional resources that will aid them through various aspects of IDP. In addition, the appendices provide a series of useful summary tables and the complete case study credits.

INTRODUCTION

WHY THIS ROADMAP WAS DEVELOPED

The Roadmap to the Integrated Design Process has been developed for the BC Green Building Roundtable. The BC Green Building Roundtable comprises public sector and non-profit organizations collaborating to advance green building principles and practices within the building industry in British Columbia, Canada, and beyond. Roundtable members currently include: BC Hydro, Canada Green Building Council, Canada Mortgage & Housing Corporation, Cascadia Region Green Building Council, City of Vancouver, Greater Vancouver Regional District, Natural Resources Canada, Terasen Gas, and Shared Services BC. For the purposes of the *Roadmap to the Integrated Design Process*, the Roundtable also partnered with the City of Seattle. The Roundtable shares the increasingly accepted view that an "Integrated Design Process" (IDP), as defined below, is required in order to achieve high performance (sustainable) buildings while avoiding or minimizing incremental costs.

> "The Integrated Design Process (IDP) is a method for realizing high performance buildings that contribute to sustainable communities. It is a collaborative process that focuses on the design, construction, operation and occupancy of a building over its complete life-cycle. The IDP is designed to allow the client and other stakeholders to develop and realize clearly defined and challenging functional, environmental and economic goals and objectives. The IDP requires a multi-disciplinary design team that includes or acquires the skills required to address all design issues flowing from the objectives. The IDP proceeds from whole building system strategies, working through increasing levels of specificity, to realize more optimally integrated solutions."
>
> Excerpt from "The Integrated Design Process: Report on a National Workshop held in Toronto in October 2001." March 2002

This Roadmap was developed to overcome the barriers that the Roundtable sees as preventing IDP from being widely practiced. The guide is intended to do so by providing a comprehensive guide for IDP facilitators, as well as novice and seasoned participants. Simply stated, the guide outlines what the integrated design process is, how it works, and how to implement such a process.

HOW THE ROADMAP WAS DEVELOPED

The Roadmap was developed through an extensive literature review of existing best practices, an expert workshop, guidance from the Roundtable, and with input from professionals practicing IDP.

The guide went through much iteration in an attempt to distil the essence of IDP from the wealth of information gathered. The team was mindful of the distinction between IDP and high performance or sustainable building design. Over time the technologies and strategies employed in creating high performance buildings will change, but this will happen independently of the IDP concept. The Roadmap is therefore not intended to be an exhaustive reference for high performance building design strategies and technologies, but rather a concise and comprehensive guide to IDP, the process recognized as the most effective way to achieve such buildings.

The guide also went through much filtering in order to provide the core broadly-applicable themes while addressing some of the key variations on these themes that arise for different project types, sizes, delivery methods, etc. The reader's judgment is required to recognize aspects that may not be applicable to his/her specific project and to seek additional guidance as needed.

HOW TO USE THIS ROADMAP

The Roadmap has been divided into two sections: Part One: Summary Guide; and Part Two: Reference Manual.

Part One of the Roadmap gives a concise but comprehensive overview of the Integrated Design Process as a concept. It lays out the overall intent of employing an IDP and thus explains why a client, developer or design practitioner would choose to employ such a process. Part One examines the goals, principles, key features, and ideal team composition of IDP, as well as providing a one-page summary for each of the seven design phases covered in more detail in Part Two.

Part Two of the Roadmap outlines what an IDP can contribute to each phase in a building's life and gives a more detailed overview of the steps to be taken. The typical building lifetime is divided into the following seven phases: Pre-design; Schematic Design; Design Development; Construction Documentation; Bidding, Construction, and Commissioning; Building Operation (start-up); and Post Occupancy (long-term operation). For the purpose of clarity, a consistent structure is applied to all phases, which addresses the following themes:

- How to coordinate a team;
- How to establish a foundation;
- What key meeting can take place;
- Key outputs and process activities;
- The connection between IDP and green building certification programs;
- Helpful tips;
- Case studies; and
- Resources.

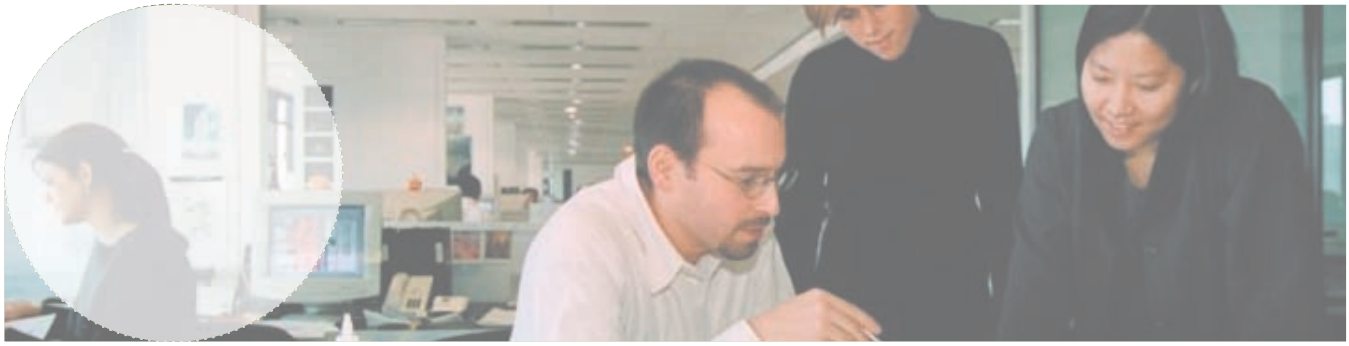
Part Two also contains a bibliography which directs the reader to more detailed resources and references that will aid them through various aspects of IDP.

The Leaf icon is used throughout the Roadmap to flag sections that have resources associated with them and/or are referenced in the bibliography and appendices.

In addition, the following appendices provide several summary tables as well as the complete case study credits:

- Appendix A is a one-page summary chart of the seven design phases and that can be used as a quick reference chart for novice and experienced IDP practitioners.
- Appendix B summarizes the different roles and responsibilities for various core and additional team members throughout the seven phase design process.
- Appendix C was developed in order to address one of the key variations: project type. This summary table offers scenario-based considerations for developer, institutional, owner/occupied and existing building project types for each phase of the design.
- Appendix D provides the full team credits for each case study.

The two-part structure evolved out of a desire to provide a concise and readable document accessible to both novice and seasoned participants while also covering the depth and breadth of information that was gathered through the literature review and from the experiences of expert IDP practitioners. Part One can easily be read in one sitting to gain an overview and consulted thereafter as a quick reference. Part Two can be consulted periodically as a more comprehensive reference manual.



WHAT IS AN INTEGRATED DESIGN PROCESS?

"The Integrated Design Process (IDP) is a method for realizing high performance buildings that contribute to sustainable communities. It is a collaborative process that focuses on the design, construction, operation and occupancy of a building over its complete life-cycle. The IDP is designed to allow the client and other stakeholders to develop and realize clearly defined and challenging functional, environmental and economic goals and objectives." (Larsson, 2002)

In general, the integrated design process is an approach to building design that seeks to achieve high performance on a wide variety of well-defined environmental and social goals while staying within budgetary and scheduling constraints. It relies upon a multi-disciplinary and collaborative team whose members make decisions together based on a shared vision and a holistic understanding of the project. It follows the design through the entire project life, from pre-design through occupancy and into operation.

IDP is a term that is not exclusively associated with high-performance building design; in principle it is a flexible approach that can be applied to almost any type of design or decision-making process. In this Roadmap, IDP is examined within the context of high performance (sustainable) building design, and the specifics of the process are tailored to this context.

The specific steps and strategies employed are directly related to the project's design intent, which not only differ between projects but also continually change as the industry evolves. For example, new building developments increasingly go beyond consideration of their immediate site to emphasize integration with the surrounding social, ecological, and economic communities. The Roadmap presents IDP in a way that can be applied regardless of the specific design intent.

Generally, IDP is:

- an iterative process, not a linear or silo-based approach;
- a flexible method, not a formula;
- different each time, not pre-determined; and
- an iterative process with ongoing learning and emergent features, not a preordained sequence of events.

IDP VS. CONVENTIONAL DESIGN

There are as many variations on how to practice an IDP as there are IDP practitioners; each team has a slightly different methodology, and perhaps a different idea of the "right" method. There is, however, a broad consensus about how IDP differs from the conventional design process. Outlining these differences, as shown in the summary table below, helps highlight the salient aspects of IDP.

In conventional design, "the architect (or designer) and the client agree on a design concept consisting of a general massing scheme, orientation, fenestration, and the general exterior appearance of the building. Then the mechanical, electrical and structural engineers are asked to implement the design and to suggest appropriate systems. The problem with conventional practice is that this design process is too quick and simple, often resulting in high operating costs, poor comfort performance and very few sustainable gestures that fall within the client's restrained budget." (Pearl, 2004)

Integrated Design Process		Conventional Design Process
Inclusive from the outset	vs	Involves team members only when essential
Front-loaded — time and energy invested early	vs	Less time, energy, and collaboration exhibited in early stages
Decisions influenced by broad team	vs	More decisions made by fewer people
Iterative process	vs	Linear process
Whole-systems thinking	vs	Systems often considered in isolation
Allows for full optimization	vs	Limited to constrained optimization
Seeks synergies	vs	Diminished opportunity for synergies
Life-cycle costing	vs	Emphasis on up-front costs
Process continues through post-occupancy	vs	Typically finished when construction is complete

Figure 1 compares the design team's level of involvement throughout a conventional design process with that for an integrated design process. The figure also relates this involvement to the diminishing opportunities to influence sustainability, depicting that the effort in an IDP is much more front-loaded, allowing the team to take best advantage of opportunities to influence sustainability.

Figure 1: Design Team Involvement

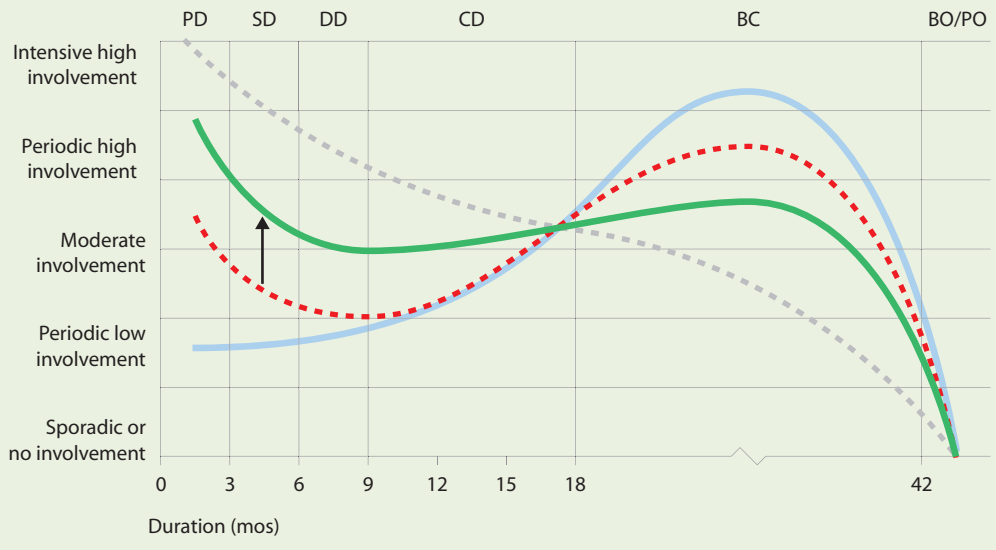


Image Credit: Busby Perkins+Will and Stantec

IDP AS A MINDSET

The integrated design process is as much a mindset as it is a process. Having the right mindset without the process is unlikely to lead to success, and following the process without the right mindset is almost certain to fail. The importance of mindset is evident in a set of principles which underpin a successful integrated design process.

Some of the principles outlined pertain to "soft" skills, such as those teambuilding, which a written document does not easily convey. To this end, other available training and resources are noted where possible, but learning by doing is the best way to hone these skills.

The following principles, in combination with the listed strategies, are vital to the integrated design process.

Attitude	Principle	Strategies
• Inclusion and collaboration	• Broad collaborative team	• Careful team formation
• Outcome oriented	• Well-defined scope, vision, goals, and objectives	• Team building
• Trust and transparency	• Effective and open communication	• Facilitation training for team • Expert facilitation
• Open-mindedness and creativity	• Innovation and synthesis	• Visioning charrettes (with comprehensive preparation) • Brainstorming
• Rigour and attention to detail	• Systematic decision making	• Goals and targets matrix • Decision-making tools
• Continuous learning and improvement	• Iterative process with feedback cycles	• Post-occupancy evaluation • Comprehensive commissioning

IDP AS A SET OF PRINCIPLES

The principles stated in the table above are applicable irrespective of the specific details of a particular project. These principles are examined more closely in this section.

BROAD COLLABORATIVE TEAM

Perhaps the most important principle for a successful IDP relates to inclusiveness and collaboration which should translate into the establishment of a broad collaborative team.

Ideally, the team includes all relevant disciplines and stakeholders who remain involved from start to finish. A broad interdisciplinary team representing all necessary

"IDP is about creating a team focused on the same objectives and unleashing creativity from design team members."

- Freda Pagani
University of British Columbia

"You can't just throw technologies at the building; we need to change the way people look at green building design; we need to educate and foster creativity…IDP is a vehicle or process to allow that. It is one of the next fundamental pieces needed if we want to move forward in a meaningful way toward truly sustainable design"

- Heather Tremain
Resource Rethinking

"Collaborative process that focuses on the design, construction, operation and occupancy of a building over its complete life-cycle…The IDP requires a multi-disciplinary design team that includes or acquires the skills required to address all design issues flowing from the objectives. The IDP proceeds from whole building system strategies, working through increasing levels of specificity, to realize more optimally integrated solutions." (Pope, 2004)

"Front-loaded design process (not more time-intensive; time is distributed differently) … Extra time for charrettes offset by less back-and-forth with client later in process." (Malin, 2004)

skills, knowledge, and perspectives is essential to ensure all relevant knowledge and resources are brought to the table.

The team must also be cohesive; members must be willing and able to work in collaboration. A project is more likely to be successful if its members trust each other and are able to cooperate. There are many excellent resources available which offer techniques that foster teamwork and cooperation. See the bibliography in Part 2: Reference Manual for a detailed listing of resources.

The make-up of the core team is project-specific and will change through the process. For more information on team formation see the next section, *The Integrated Design Team*.

WELL-DEFINED SCOPE, VISION, GOALS, AND OBJECTIVES

An outcome-oriented mindset is characterized by a clear statement of vision, goals, and objectives. To define these three components it is necessary to question underlying assumptions surrounding the scope of the project. For example, should a new building be built at all, or would a major renovation be more appropriate? Failing to ask these sometimes difficult questions early can suppress the synergies hoped for from interdisciplinary teamwork. To achieve effective outcomes, the team must develop a shared vision of what they are trying to achieve; in other words, you have to know where you're going in order to plan how to get there.

Time should be invested at the start of the project to host a Visioning Charrette or Workshop, in order to develop a clear vision accompanied by well-defined goals and objectives. These elements can be translated into discrete measurable targets which will guide the entire process, keeping the team on track. Figure 2 illustrates how Pre-Design and Schematic Design are front-loaded with more charrettes and workshops.

EFFECTIVE AND OPEN COMMUNICATION

Open and continuous lines of communication are essential throughout the process, both during and between meetings. Transparent methods of communication will build trust and give participants a greater sense of ownership over the process, reducing conflicts and allowing the project to benefit from each individual's unique contribution. Key decisions should not be made without team input.

An expert facilitator involved at the beginning of the project can set the stage for effective communication throughout the design process by instilling effective communication skills within the group and fostering an atmosphere of lasting respect and trust. See section on Tips for Effective Facilitation at the end of Part 1.

INNOVATION AND SYNTHESIS

A determination to foster open-mindedness and creativity is key to encouraging the level of innovation and synthesis required to meet the complex requirements of a high performance building. Synthesis is, by definition, the integration of separate elements to create a cohesive whole, and the term implies that the whole is greater than the sum of the individual parts. A design charrette can be used to foster an environment conducive to brainstorming, creating, and imagining exercises. Once participants have experienced true collaboration to produce innovative solutions, they will not want to go back to "business as usual".

SYSTEMATIC DECISION-MAKING

A desire for rigour and attention to detail leads to a clearly defined and understood decision-making process. "It is important for each individual to understand his/her own roles and responsibilities and how decision-making will occur." (National Charrette Institute (NCI) 2004). There are many tools that can facilitate effective decision-making including modeling programs, green building certification systems like LEED and Go Green Plus, and life-cycle costing.

Green Building Certification Programs

There are many reasons why buildings are formally certified as green buildings. Standardization of language and performance, industry recognition, and third party verification have all been cited as drivers for formal certification. Both formal certification and the informal reference to certification programs through the design process helps guide teams by providing direction and resources.

Numerous green building certification programs are available; some require third party verification, while others are self-certifying. Most address new buildings but some focus on existing building stock. Design teams wishing to pursue certification should consider some or all of the following factors when selecting a guideline:

- stage in building's in life-cycle (new, existing, retrofit)
- the type of space (tenant fit-out, core and shell space, etc.)
- the level of effort desired
- the owner's requirements
- any local design guidelines
- funding requirements

Some of the more popular certification programs include:

- LEED® (Leadership in Energy and Environmental Design) is administered by the Canada and US Green Building Councils, and has a suite of products for certifying a range of project types including new buildings, existing buildings, commercial interiors, and core and shell projects. Ratings systems are also under development for other project types including Campuses and Multi-Building Sites. The LEED rating system covers a wide range of performance criteria concerning site, water efficiency, energy efficiency, materials and resources, and indoor environmental quality. Information can be found at www.cagbc.org and www.usgbc.org.

- BOMA Go Green and Go Green Plus are Canadian certification programs administered by the Building Owner's and Manager's Association. This program is for existing commercial buildings. Information can be found at www.bomagogreen.com.

- Green Globes is an on-line auditing tool that lets designers, property owners and managers: assess and rate existing buildings against best practices and standards; and integrate principles of green architecture at every phase of project delivery for retrofits and the design of new buildings (refer to www.greenglobes.com).

- Built Green – a program for new residential projects, Built Green is administered by the Canadian Home Builders Association in BC. Information can be found at www.chbabc.org.

Resources on life-cycle analysis:

US Department of Energy. Federal Energy Management Program (FEMP) Building Life Cycle Cost (BLCC) Tool:
www1.eere.energy.gov/femp/

Resources on rating systems:

LEED Canada
www.cagbc.org
US Green Building Council
www.usgbc.org
Green Globes
www.greenglobes.com
BOMA Go Green
www.bomagogreen.com
Building Research Establishment Environmental Assessment Method (BREEAM)
www.breeam.org/

Resources on multi-criteria evaluation:

International Energy Agency (IEA), Task 23 Multi-Criteria Decision Making Method (MCDM-23)
www.iea-shc.org/task23/

Resources on modeling tools:

Office of Energy Efficiency and Renewable Energy (EERE). Building Energy Software Tools Directory, U.S. Department of Energy.
www.eere.energy.gov

Resources on occupancy evaluations:

The Usable Buildings Trust
www.usablebuildings.co.uk

The Centre for the Built Environment
www.cbe.berkeley.edu/

Resources on Commissioning:

Oregon Office of Energy Efficiency. 1997. Commissioning for Better Buildings in Oregon
www.oregon.gov/

Lawrence Berkeley National Laboratory. 2005. Cost Effectiveness of Commissioning.
www.lbl.gov

ITERATIVE PROCESS WITH FEEDBACK LOOPS

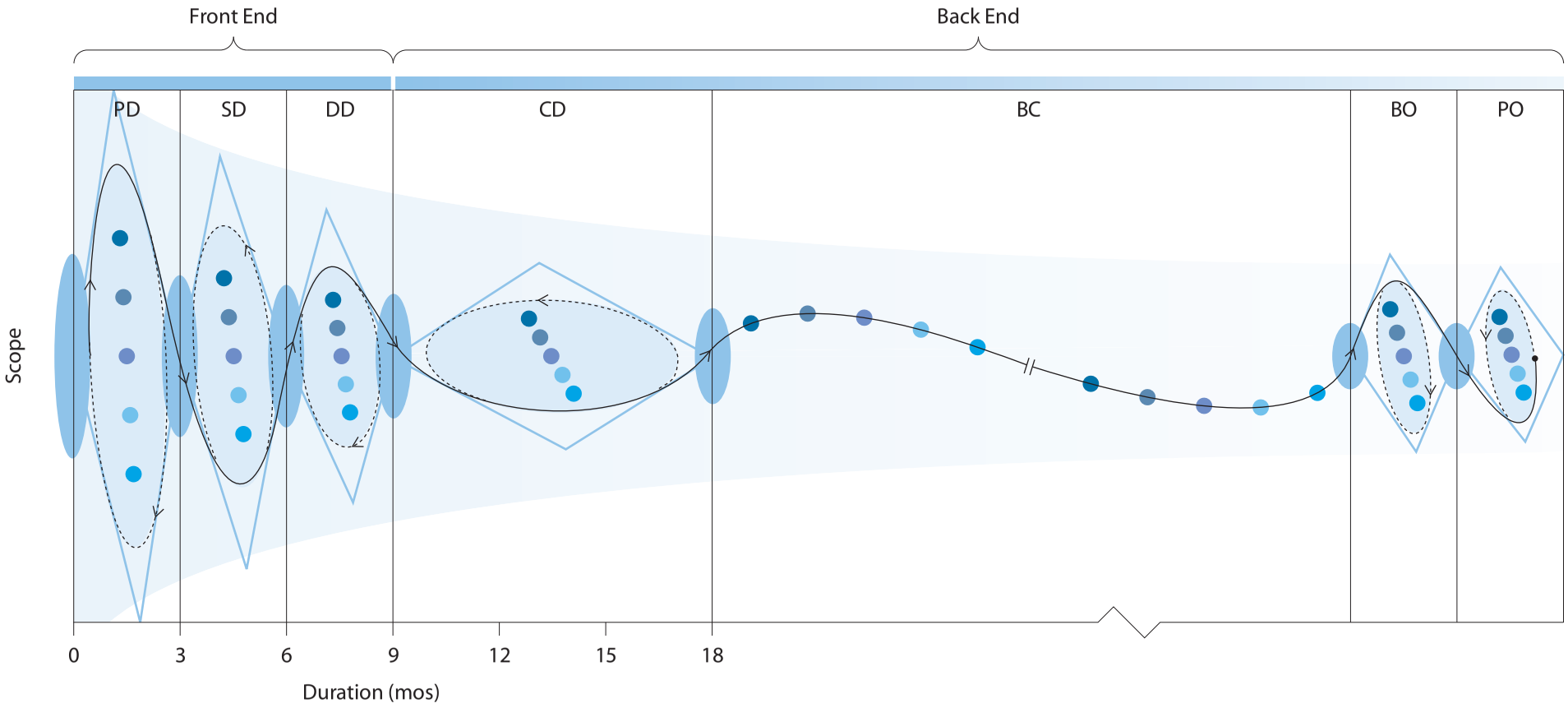
A mindset of continuous learning and improvement is imperative for a successful IDP. Unlike a conventional linear design process in which decisions and assumptions made upstream are often left unchallenged, an integrated approach includes feedback mechanisms to evaluate all decisions. An iterative process ensures that decisions reflect the broader team's collective knowledge, that interactions between different elements are considered, and that solutions go through the steps needed for optimization. Regular feedback loops can keep the team engaged and produce small successes, which reinforce the effectiveness of the process.

Feedback loops within a typical IDP include not only several design iterations but also commissioning and post-occupancy evaluation, which not only inform a building's design but also its ongoing operation. IDP is oriented to learning and improvement not only during the design process but also between projects. Lessons learned from the successes and failures of past projects are used to improve sustainable building practices for future endeavours. See Figure 2 for an illustration of this iterative process.

Figure 2 illustrates the form and methodology of a typical IDP as it progresses from a broad-scope concept to tangible reality through a series of iterative feedback loops. The figure shows how the process begins in an exploratory phase with a broad scope and loosely-defined constraints and moves toward increasing specificity through a series of iterative design loops punctuated by topic-specific meetings and all-team workshops. The occupancy and operation phases are characterized by broad team meetings that ensure proper handoff, education of operations staff and users, along with a periodic examination of the building performance through post-occupancy evaluation.

The mindsets described here may not at first be shared by team members who are new to IDP; however, participating in an integrated design process tends to foster them among team members. In other words, IDP participants tend to become the leaders and champions of future IDP endeavours.

Figure 2: Integrated Design Process



Project Constraints

Exploratory Design Process

All Team Workshop

Focused Team Workshops (water, energy, materials, etc)

Iterative Process

Additional Iterations as necessary

PD	Pre-design
SD	Schematic Design
DD	Design Development
CD	Construction Documents
BC	Bidding, Construction, Commissioning
BO	Building Operation (start up)
PO	Post-Occupancy (long term)

Image Credit: Bill Reed of Integrative Design Collaborative, Doug Pierce of Perkins+Will and Busby Perkins+Will

SUMMARY OF IDP BENEFITS

There are a multitude of distinct positive outcomes that stem directly from employing the principles of an integrated approach. The following table summarizes some of these key benefits associated with each of the principles of IDP outlined in the previous section. The table also lists some of the culminating or net benefits that arise from a successful IDP.

IDP Principle	Benefits of Successful IDP	Net Benefits
Broad, collaborative team from outset	Early formation of a broad, interdisciplinary team ensures necessary expertise is present when **opportunities for impact are greatest**. Collaboration **harnesses the team's best effort** and collective wisdom.	Realization of challenging goals and objectives Realization of high-performance (sustainable) buildings Realization of more optimally integrated solutions Maximized benefits and quality Minimized cost Good team relationships that may result in lasting partnerships for future projects
Well-defined scope, vision, goals and objectives	Investing time up front ensures **common understanding** and 'buy-in'.	
Effective and open communication	Transparency **builds trust** and increases team's sense of **ownership**. Respectful communication **avoids disputes** and harnesses a team's best effort and enthusiasm.	
Innovation and synthesis	Fostering open-mindedness and creativity leads to innovation and synthesis, which allow the team to **achieve the complex requirements** of a high performance building.	
Systematic decision-making	A clearly defined and understood decision-making process can lead to **better choices**. Tools like life-cycle costing can foster the type of **holistic and long-term thinking** necessary for sustainable design.	
Iterative process with feedback loops	Providing opportunities for feedback along the way **allows lessons to be learned** from start to finish.	

THE INTEGRATED DESIGN TEAM

From the outset of the project, formation of an appropriate design team is crucial for controlling budgets while meeting green targets and the owner's goals. That is why establishing the team is one of the first steps in undertaking the integrated design process. The ideal IDP team is one in which:

- The client takes an active role throughout the design process.
- A broad range of expertise and stakeholder perspectives is present.
- A team leader is responsible for motivating the team and coordinating the project from pre-design through to occupancy.
- An experienced facilitator is engaged to help guide the process.
- The core group of team members remains intact for the duration of the project.
- Team members collaborate well.

The design team's composition, structure, and member roles will naturally be adapted to every project, with its unique context, specific constraints and opportunities, delivery methods, and client type and values. Identify the core team described below:

CORE PROJECT TEAM MEMBERS

- Client or owner's representative (i.e., with expertise in facilities and operations management)
- Project manager
- Architect
- IDP facilitator
- Champion (optional) (alternatively, could be a member of the design team)
- Structural engineer
- Mechanical engineer with expertise in:
    - Simulation: energy modeling, thermal comfort analysis, and/ or CFD simulations.
    - Energy analysis: an energy engineer and/or bioclimatic engineer may be required in order to cover the necessary areas of expertise, such as: passive solar design, renewable energy technologies, and hybrid–tech strategies.

"The key to achieving a sustainable building is to assemble a project team with both the experience and the desire to employ a systematic, integrated design. It is important to take a team-oriented, multi-disciplinary approach in which all members of the project team recognize and commit to the steps and actions necessary to achieve the project vision." (Whole Building Design 2002)

- Electrical engineer
- Green design specialist
- Civil engineer with expertise in: stormwater, groundwater, rainwater, and/or wastewater systems
- Facilities manager/Building operator (maintenance and operations)
- Cost consultant (with experience in life-cycle costing)
- Landscape architect
- General contractor or construction manager.

The core team should be responsible for identifying and bringing in additional members as required depending on the project type, expertise of the core team, and client preferences.

ADDITIONAL MEMBERS

Additional members, who may be brought in for the duration of the project or only for a few workshops, include some or all of those outlined below.

- Ecologist
- Occupants' or users' representatives
- Building program representative, if appropriate for the building type
- Planning/regulatory/code approvals agencies representatives
- Interior designer/materials consultant
- Lighting or daylighting specialist
- Soils or geotechnical engineer
- Commissioning agent
- Marketing expert
- Surveyor
- Valuation/appraisal professional
- Controls specialist
- Other experts as required (e.g., natural ventilation, thermal storage, acoustic)
- Academics and/or students with knowledge of a relevant subject
- Members of the community who are affected by the project.

Appendix B (provided in Part 2) provides a detailed table illustrating the roles of these team members as the project proceeds from start to finish.

An IDP continually challenges assumptions. In doing so it reveals the subjectivity of many design aspects sometimes considered fixed, such as some engineering norms. Sometimes, additional perspectives can be gained by having more than one specialist in a particular field. Openness to hearing "second opinions" can be an important attribute of an effective team.

An expert may only be brought in for a brief time and still make an invaluable contribution. Some design teams have credited their overall success on a project to a single meeting with a particular specialist. A meeting with an outside specialist can inspired a team to reach further, making them want to build a better project.

In addition to being technically competent, team members must be effective communicators, have a cooperative attitude, and be open-minded. Two additional

roles, the IDP Facilitator and the Champion, are designed to help develop and maintain the right mindset. These roles may be filled by existing team members or by others hired specifically for the task.

"Having a facilitator guiding and managing the process allows team members to focus on the tasks and goals, while at the same time fostering teamwork and collaboration." (Clark 2003)

FACILITATOR

The Facilitator manages the Integrated Design Process. The Facilitator and the Champion may be the same person. This role might also be filled by the coordinating professional or project manager, or by another professional entirely. The facilitator ideally has the following characteristics:

- Is the steward of the goals and targets, which are set during the charrettes and/or workshops and updated throughout the process.
- Is skilled in the art of facilitation and group dynamics.
- Has knowledge of green design principles but need not be an expert.
- Ensures the participation of all team members and draws out the assembled expertise.
- Will ensure a proper flow of information during the charrettes and potentially for all green design matters.
- Can be the one responsible for keeping the team on time and on target for specific events like charrettes or more broadly for green building certification or the whole project.
- Has a good level of knowledge of both the integrated design process and green building certification (if pursued).

CHAMPION

The Champion is someone who is motivated and able to lead the team in the direction of sustainability. The following are characteristics of a good IDP project champion:

- Will champion the vision of the project and empower the team.
- Must be able to think laterally and challenge others to think that way.
- Must be able to challenge the client as well and therefore must have the ear of the client.
- Should help deal with the "political" issues and barriers when required to move the process forward.
- Does not need to be at all the meetings but should be at those where the project vision and goals are set or updated.
- Should be able to speak the same language as the design or ownership team and understand how projects of the type under consideration work.
- Can help align the team to a common vision while challenging members to push themselves to the highest level of performance possible for the project.
- Can be the catalyst to help the team reach further.

One person does not necessarily have all of these qualities; therefore there can be more than one champion on a project. Sometimes a champion is obvious from the start and is brought onto the project in that role; other times the champion rises to the challenge through the course of the design process. Either way, the impact that the right champion can have is often the difference between getting a project built and achieving design excellence.

Figure 3: Conventional Design Team Organization

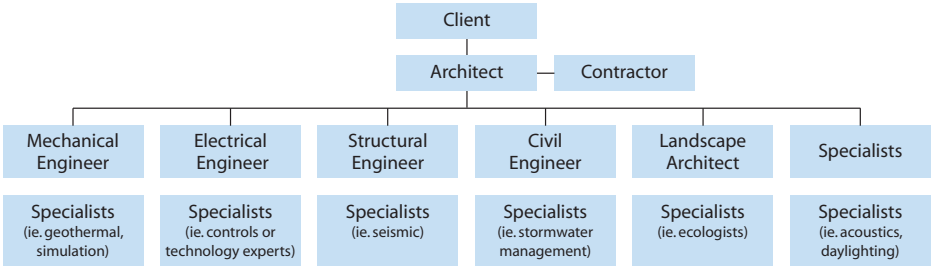


Figure 4: Integrated Design Team Organization

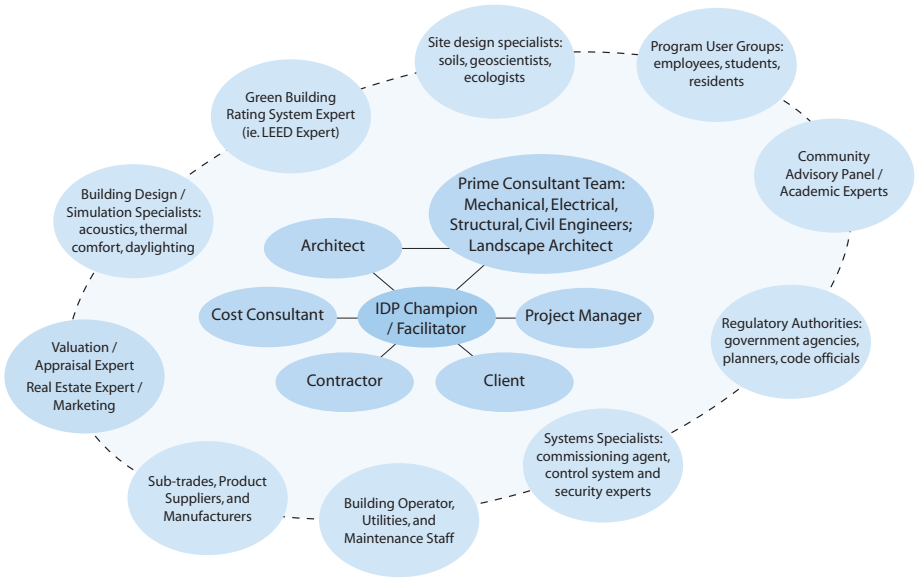


Image Credit: Busby Perkins+Will

Figure 3 shows a typical organizational chart for a conventional design process in which the client's primary contact is the architect, who coordinates with other team members in a hierarchical structure.

By contrast Figure 4 shows an organizational chart for a typical IDP in which the core team is expanded to include a contractor, IDP Champion/facilitator, and cost consultant. The core team is more closely interlinked with support from specialists as needed.

Once the team's membership is established, a number of important issues have to be resolved immediately so the team can begin to operate effectively:

- Clear allocation of responsibilities among the team.
- Contracting and reporting relationships between the various participants.
- Fee structure to compensate for additional services such as charrettes or energy modeling.
- Risk tolerance and risk management strategies for the owner and project team members.
- Level of authority required to confirm design decisions that may fall outside of typical technologies or systems.
- Team values or "code of conduct" (e.g. respect, open-mindedness, transparency).
- Communication channels.
- Decision making process.

Fee structures are an important issue. Team members should not be financially penalized for suggesting new or innovative technologies or systems that may bring greater value to the owner. For example, traditional mechanical fee structures are based on a percentage of the mechanical budget; this practice discourages innovative strategies like natural ventilation and passive solar design that can reduce the size and/or cost of mechanical equipment and hence, the related fees.

Figure 5, Capital Cost Tradeoffs, demonstrates how capital costs can be redistributed in order to achieve a green building without incremental cost. For example, the higher cost of a combination of high-performance glazing, higher insulation levels, and operable windows can be offset by the related reduction in or elimination of some mechanical components due to reduced heating and cooling loads.

Figure 5: Capital Cost Tradeoffs

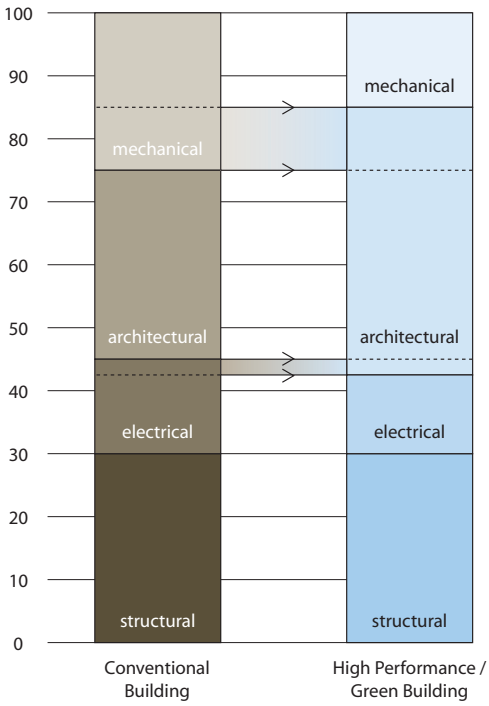


Image Credit: Stantec and Busby Perkins+Will

"An integrated design is a design in which all major components of the building are considered and designed as a totality. Components are not designed in isolation of their effects on other components and systems." (Coutu, 2003)

"While it is more than possible to achieve green design without using IDP, it is very likely going to cost more and the performance is unlikely to be as high. The reason is that a good process captures synergies and thereby improves performance and reduces costs. Traditional linear design processes rarely capture synergies." (Zimmerman, 2004)

TIPS FOR EFFECTIVE FACILITATION

Effective facilitation can often be the difference between a dynamic, synergistic and effective IDP session and one that falls flat with no real conclusions drawn. The following table summarizes some effective tips and tools for facilitating charrettes, meetings, and workshops. This table was generated from a number of resources including a facilitation workshop led by Charles Holmes of the Wray Group.

Tip / Tool	Description	Purpose
Check-ins	Participants introduce themselves, give personal anecdote, or state goal for meeting	Personalize setting, get on same page, break ice, and set context
Check-outs	Participants comment on their experiences	Chance to express concluding remarks and achieve sense of closure
Ice-breakers	Game or activity	Introductions, ease people into group setting, and stimulate discussion
Team values or Code of Conduct	Establish team's ground rules with input from all participants	Create common understanding, promote a respectful environment, and provide a means to prevent or resolve disputes
Brainstorming	Technique for generating ideas in low-risk environment	Generate new ideas, stimulate creative and lateral thinking, get input from everyone
Parking lot	List to track issues that arise but are off-topic	Keeps discussion focused without forgetting important issues
Mirroring	Facilitator repeats what a participant has said verbatim	Ensures that people are heard, builds trust, can speed up brainstorming
Paraphrasing	Facilitator repeats what a participant has said in his/her own words	Ensures that people feel heard and understood, can clarify meaning

Resources on Team Building:

Biech, Elaine, ed., 2001. The Pfeiffer Book of Successful Team-Building Tools. San Francisco, CA: Jossey-Bass Pfeiffer

Pfeiffer, J. William (Editor), 1981. A Handbook of Structured Experiences for Human Relations Training, Volume 1. San Francisco, CA: Jossey-Bass/Pfeiffer.

Resources on Facilitation and Charrettes:

ICA Associates Inc. (Group Facilitation Training) ***www.ica-associates.ca***

The National Charrette Institute. ***www.charetteinstitute.org***

International Association of Facilitators ***(http://iaf-world.org)***

IAF Handbook of Group Facilitation: Best Practices from the Leading Organization in Facilitation. International Association of Facilitators. The Institute of Cultural Affairs ***(www.ica-associates.ca)***

Resources on brainstorming and meetings:

Mind Tools "Brainstorming: Generating many radical and useful ideas" ***www.mindtools.com***
Effective Meetings.com ***www.effectivemeetings.com***

Tip / Tool	Description	Purpose
Multi-modal learning	Use of different styles of learning and participation, including visual, auditory, and written	Reflects participants' different learning styles, maximizing learning and input
Positions versus interests	Facilitator may be able to draw out underlying motives beneath a participant's position (iceberg analogy)	Highlights common ground between positions that appear conflicting or polarized
Go-around	Technique of 'going around the room' or table one-by-one to hear from everyone. Can continue until everyone has passed, indicating that they have nothing more to add	Ensures that everyone has a chance to speak, and prevents domination of discussion; participants can listen effectively knowing that they will have a turn to speak
Negative poll	Ask for a show of hands to determine who disagrees with a statement	Can allow for fast decision-making and consensus-building
Open-ended questions	Broad questions typically beginning with "how", "what", or "why"	Encourages participants to share their perspectives
Probing questions	Questions or statements such as "Can you give an example?" or "Could you elaborate on that?"	Encourages participants to provide more information
Thumb-o-meter[1]	Ask for thumbs up, down, or sideways to indicate levels of agreement	Quick way to get feedback from participants
Hot dots	A method of prioritizing using adhesive dots: participants are given a certain number of dots to place beside a certain number of choices	Used to get a sense of the group's collective priorities without making a final selection or decision

1. Source: Alex Wray of Wray Group

SUMMARY OF SEVEN PHASES OF IDP

This section provides a brief summary of what an IDP can contribute to each phase in a building's life-cycle: Pre-design; Schematic Design; Design Development; Construction Documentation; Bidding, Construction, and Commissioning; Building Operation (start-up); and Post Occupancy (long-term operation). For more detailed information on each design phase, consult Part 2: Reference Manual and Appendix A.

PHASE 1 - PRE-DESIGN

The integrated design process differs from conventional design right from the outset of a project by placing a priority on establishing the goals, core objectives and direction of the project through a visioning session. Pre-design explores the relationships between the project and its surrounding environment to help reveal the optimum choices for the site, the users, and the owner. Site options or site specifics may be analyzed in light of project requirements to uncover opportunities and synergies. Sustainability targets may be set covering a full range of economic, environmental, and social performance criteria. This ambitious beginning requires many experts to be members of the design team at the outset.

Process	Coordinate the team: • Bring together a diverse and knowledgeable team • Select an IDP Facilitator or Champion
	Establish a foundation: • Set fees to provide appropriate incentives to the design team
	Plan key meetings: • Charrette preparation • Host visioning charrette or workshop • Programming meeting • Facilities management meeting • Partnership meetings

Case Study:
City of White Rock
Operations Building

"This facility, or any facility for that matter, that wishes to be efficient can not be designed without the use of an integrated design process. Whether you choose to go green or not, this process can save both capital and operating dollars by it very nature of being, which in itself results in the direction of sustainability."

- Greg Scott
Former Client Representative

IDP Outputs	• Visions statement, goals and targets matrix • Pre-design report including charrette synopsis • Preliminary budget including cost of IDP activities such as energy modeling • Established communication pathways
IDP Team Modus Operandi	• Engage and motivate team • Team building is a fundamental part of kick-off and a priority throughout the process • Foster creativity and inter-disciplinary thinking

Key Team Members	• Core team: Client, architect, mechanical, structural, and electrical engineer, and landscape architect
	• Additional team members and stakeholders, including:
	  • Contractor (depending on project delivery type)
	  • Representative of occupant's perspective
	  • Building operators (if possible)
	  • Additional specialists (i.e. ecologist, energy engineer, etc)

PHASE 2 - SCHEMATIC DESIGN

Schematic Design builds upon the vision developed in Pre-design. It is the phase for thinking "outside the box," for exploring innovative technologies, new ideas, and fresh application methods in working towards the broad goals and objectives set out in Pre-design. Schematic Design allows experts from all disciplines to analyze the unique opportunities and constraints of the building site and to collectively explore synergies between disciplines and with neighbouring sites.

While it is important to keep the scope of investigation broad, goals and objectives must be firmed up. Schematic Design alternatives should be developed based on a synthesis of the entire team's skills and knowledge. By evaluating them on multiple criteria, the preferred design concept can be chosen.

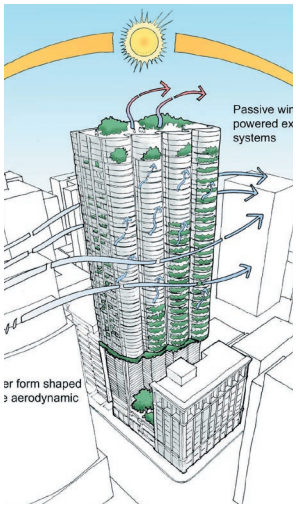
Process	Coordinate the team: • Enhance team cohesiveness and confirm team values • Encourage a team mindset supporting creativity and systems-thinking
	Establish a foundation: • Keep the project's vision and goals at hand • Have clear understanding of site challenges and opportunities • Ensure the functional program requirements and its implications for all disciplines are understood
	Plan key meetings: • Host design charrettes and workshops to brainstorm ideas, develop concepts, evaluate strategies, and refine options • Evaluate feasibility and energy impact of technologies / strategies • Report on opportunities
IDP Outputs	• Goals and targets matrix • Preliminary energy analysis • Preliminary financial estimate • Schematic Design report • Roles and responsibilities matrix
IDP Team Modus Operandi	• Ensure coordination and collaboration between disciplines • Develop a clear understanding of synergies and tradeoffs between strategies and systems proposed • Foster whole-system and life-cycle design and thinking

Key Team Members	• Core team from previous phase
	• Additional team members, including:
	  • Energy specialist
	  • Cost consultant
	  • Certification coordinator
	  • Commissioning agent
	  • Valuation professional

Case Study: Dockside Green

"The absence of objections during the approvals processes for this project is unprecedented due to several factors, namely efforts to inform, consult with, and include all local stakeholders including the Community Association, neighboring businesses, and environmental organizations. Local First Nations groups were also consulted during the planning process. This improved communication and consultation process, virtually eliminating the typically high cost of approvals, highlights the importance of involving stakeholder groups early, and continuing the dialogue with these groups throughout the development of the project."

- Carola Bloedorn
Windmill Developments



Case Study: Jameson Tower

"It was felt that the Integrated Design Process had the most impact on the Design Development phase. There was a greater efficiency in the overall design because all consultant parties' work was integrated. With an integrated design approach the architects have even more of a coordination role than normal and this has helped their understanding of the building as a whole."

– Lee Hallman, Foster + Partners

PHASE 3 - DESIGN DEVELOPMENT

Design Development is a time to firm up and validate choices, resulting in a schematic design concept being selected and approved by the client. All architectural, mechanical and electrical systems are assessed for their expected performance and impact on all other systems as well as on the goals and targets.

Process	Coordinate the team: • Engage new specialists (e.g. commissioning agent, outside experts) • Promote collaboration amongst team members
	Establish a foundation: • Assess feasibility and viability of green building strategies and technologies • Use tools to simulate (e.g. energy model) technologies and strategies and assess building performance (e.g. thermal comfort, daylighting, acoustics)
	Plan key meetings: • Design optimization loops maximize synergies between design disciplines • Smaller, focused meetings for specific issues
IDP Outputs	• Design Development report including IDP issues such as energy simulation results • Detailed financial report using life-cycle costing if possible • Outline specification with embedded performance criteria • Preliminary commissioning report • Updated roles and responsibilities matrix • Updated goals matrix
IDP Team Modus Operandi	• Ensure coordination and collaboration between disciplines • Develop a clear understanding of synergies and tradeoffs between strategies and systems proposed • Foster whole-system and life-cycle design and thinking

Key Team Members	• Team from previous phase
	• Additional team members, including:
	  • Contractor (sooner if possible)
	  • Operation and maintenance staff
	  • Materials expert
	  • Acoustician
	  • Client's marketing representative (if appropriate)
	  • Industry and academic experts

PHASE 4 - CONSTRUCTION DOCUMENTATION

The construction documents (CDs) are prepared based on approved Design Development documents as well as final calculations and specifications. If the project is to be successful, the integration that has been achieved throughout earlier phases must be maintained during this phase despite the high pressure of impending deadlines.

Process	Coordinate the team: • Coordinate CDs between disciplines
	Establish a foundation: • Review performance criteria • Integrate green aspects into CDs
	Plan key meetings: • Host regular meetings to ensure that the impacts of all changes are evaluated
IDP Outputs	• Project specifications with embedded performance criteria • Material substitution policy • Tender documents with clear explanation of innovative aspects, contractor responsibilities for green building documentation, training and supervision of trades / subcontractors • Commissioning plan • Updated roles and responsibilities matrix • Updated goals matrix
IDP Team Modus Operandi	• Keep open lines of communication • Ensure coordination of activities between disciplines • Ensure each team member understands his/her responsibilities

Key Team Members	• Team from previous phase
	• Additional team members, including:
	  • Specification writer
	  • Contractor (sooner if possible)
	  • Commissioning authority

Case Study:
City of Vancouver
National Avenue Works Yard

"The project architects and mechanical engineers developed a solution where the radiant panels would be attached to the inside face of the horizontal mullion at approximately 2.2 m above the adjacent floor level. There is a strip of vision glazing above this mullion which provides additional daylighting to the space. The solution included the addition of a sheet of foil-faced insulation to the top of the radiant panel which permitted the panel not only to perform its primary function (mitigation of heat transfer) but also to act as a light shelf, dramatically improving daylight penetration into the space."

- Kevin Hanvey
Omicron

Case Study:
BC Cancer Agency Research Centre

"We used rigorous methods of risk management. We involved not only Ledcor, but also sub-trades and occupants in brainstorming to stay ahead of problems during construction. We had some spectacular cases of preventing or mitigating change orders. These efforts reduced some change orders that might have cost 2 or 3 million dollars to half a million. We had all the key players at table throughout including architect, engineers, researchers, and the builder. Having the buildability perspective was an important part of the design process."

– Michael Kennedy
Stantec

PHASE 5 - BIDDING, CONSTRUCTION, AND COMMISSIONING

In this phase, the main design plans are realized. Many factors must be considered to ensure that the goals of the project are carried through to completion. Qualified contractors are chosen, communication procedures are set in place, and the expanded team works to transform the abstract into actuality.

Special attention is paid to the design intent in working through the inevitable construction-phase changes and adjustments. This work is facilitated through effective interface between disciplines, partial commissioning of systems during construction, final commissioning, and testing and validation. By the end of this phase the team will have achieved a finished, fully functional, and well-commissioned building, ready for occupancy.

Process	Coordinate the team: • Transition from design to construction team • Orient and train maintenance, operations staff and occupants
	Establish a foundation: • Update design intent • Include specific performance criteria in contract documents • Develop commissioning plan
	Plan key meetings: • Have pre-tender award meeting to discuss green design intent • Host a green building information session for contractor and trades • Plan regular site meetings to review design approach
IDP Outputs	• Record drawings of the built project • Commissioning reports • Operation and maintenance manuals including on-going commissioning activities
IDP Team Modus Operandi	• Engage core team with contractor and sub-contractors • Streamline communication procedures

Key Team Members	• Team from previous phase
	• Additional team members, including:
	  • Project manager
	  • Contractor (sooner if possible)
	  • Commissioning authority

PHASE 6 - BUILDING OPERATION (START UP)

This is a key transition phase during which the design team must ensure responsibility for and knowledge of the building is properly transferred to the building's new stewards: the owner, occupants, and operations staff. This phase is dependent upon completion and documentation of the commissioning that took place at the end of construction.

Process	Coordinate the team: • Ensure proper transfer of knowledge between the design team, commissioning agent, building operator, and occupants
	Establish a foundation: • Provide owner with complete building documentation including commissioning report • Develop tools for ongoing monitoring to uphold performance
	Plan key meetings: • Host a debriefing session to share lessons learned • Educate staff and occupants on the building's performance and green features • Host a project celebration to transfer project to new stewards
IDP Outputs	• Training and education materials • Measurement and verification data • Completed commissioning documentation
IDP Team Modus Operandi	• Celebrate success • Acknowledge the whole team • Engage operation and maintenance staff and building occupants

Key Team Members	• Team from previous phase
	• Additional team members, including:
	  • Building operators
	  • Building occupants
	  • Commissioning agent

Case Study: University of Victoria Engineering / Computer Science Building

"Because this building was considered from day one to be a 'green' building with the intention of making it an extremely energy efficient structure, and using an integrated design team approach and an independent commissioning consultant, decisions were made knowingly to downsize heating and cooling ventilation systems in favour of high-performance windows. Elemental costs were traded within the total of the project budget. More expensive windows resulted in less expensive mechanical systems, waterless urinals and dual flush toilets have resulted in lower plumbing costs and lower water consumption. The ongoing operating costs for this building will be substantially lower than a conventional building at a conventional construction cost. And the IDP played a major role in making this happen."

- Terence Williams
Busby Perkins+Will
(formerly Terence Williams Architect)

Case Study:
UBC Life Sciences Building

"For the Life Sciences Building, it was felt that an integrated design process was most important. There were two main things: it shifted the dynamic of the team to focus on sustainability and it also shaped the building. We had a huge issue with a large building program and a relatively small site. Because we were thinking of it in integrated terms, we looked at 'how can we get daylight in, how can we optimize solar gain, how can we create collaborative spaces, how can we integrate landscaping?' We came up with a number of building schemes – 'E,' 'O,' and 'C' shapes. We were basically trying to get blocks of building with spaces between them for daylighting. Intuitively we felt 'E' was the best shape. Through energy modeling, thermal comfort modeling, and daylight modeling we confirmed that it was the best shape. The building would have looked totally different without IDP."

- Teresa Coady
Bunting Coady Architects

PHASE 7 - POST-OCCUPANCY (LONG-TERM BUILDING OPERATION)

Integrated design does not end when construction is complete and occupants have moved in. The IDP seeks to enhance the entire life of the building through effective maintenance and operation, measurement and verification, re-commissioning, and building performance evaluation. The post construction portions of the process provide feedback loops, which facilitate continuous optimization of the building's performance. In addition, lessons learned from this feedback can trigger small-scale improvements in operation that can bring significant benefits to the occupants and owners alike. Lessons learned can also inform future projects.

Process	Coordinate the team: • Create a building performance evaluation (BPE) team Establish a foundation: • Allocate budget for building performance evaluation • Ensure monitoring equipment is in place Plan key meetings: • BPE setup and coordination meetings
IDP Outputs	• Updated building documentation • Building performance evaluation results • Continuous monitoring • Re-commissioning plan • Environmental management program
IDP Team Modus Operandi	• Engage staff and building occupants • Foster stewardship • Ongoing communication • Celebrate and share success

Key Team Members	• Team from previous phase
	• Additional team members, including:
	  • Acoustician
	  • Thermal comfort specialist
	  • Commissioning agent

SUMMARY OF PART ONE

Part One of the Roadmap for Integrated Design Process: Summary Guide has provided a concise but comprehensive overview of IDP as a concept and a summary of the key aspects of IDP at each phase of the building life-cycle. The Summary Guide has hopefully oriented IDP newcomers and helped more experienced participants frame their knowledge more clearly. Part One is intended to be a catalyst to encourage broader adoption of this process that is widely accepted as the best way to achieve high performance (sustainable) buildings while avoiding or minimizing incremental costs.

Part Two takes the reader through the process for each design phase: Pre-design; Schematic Design; Design Development; Construction Documentation; Bidding, Construction, and Commissioning; Building Operation (start-up); and Post Occupancy (long-term operation). Each phase is explained using a consistent structure that covers process activities, output development, helpful tips, case studies, and resources. Part Two also contains a detailed bibliography which directs the reader to additional resources that will aid them through various aspects of IDP. In addition, the appendices provide a series of useful summary tables and the complete case study credits.

The novice IDP practitioner may wish to read Part Two: Reference Manual in full as a more detailed introduction to IDP, while the seasoned practitioner may prefer to consult Part Two periodically as a reference. In either case, it is recommended that the reader refer to the Summary Table in Appendix A as a useful quick reference tool. Keeping in mind that Part One is only an overview, the reader may find it helpful to access the Bibliography at the end of Part Two for useful resources addressing particular aspects of IDP and high performance (sustainable) building design in more detail.