INTEGRATED DESIGN PROCESS GUIDE

By Alex Zimmerman, P. Eng.

Objectives

The intent of this guide is to explain the numerous advantages of the Integrated Design Process (IDP); to provide enough information to start applying it to your design projects; and, to help you find additional useful sources of IDP tools and information.

After reading this article you will:

- Understand what IDP is and how it is different from traditional approaches;
- Understand the benefits of IDP and why it is critical for achieving sustainable design;
- Understand how to generally structure an IDP process;
- Understand who needs to be involved, when and why;
- Understand key success factors to apply IDP; and
- Be able to find additional tools and resources to apply IDP.

"We need to use a new collaborative integrated design process that can create new approaches and tools, and beautiful environments that can restore social, economic, and environmental vitality to our communities."

— Bob Berkebile, BNIM, Kansas City, one of the world's most respected green architects

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IDP—What is it?

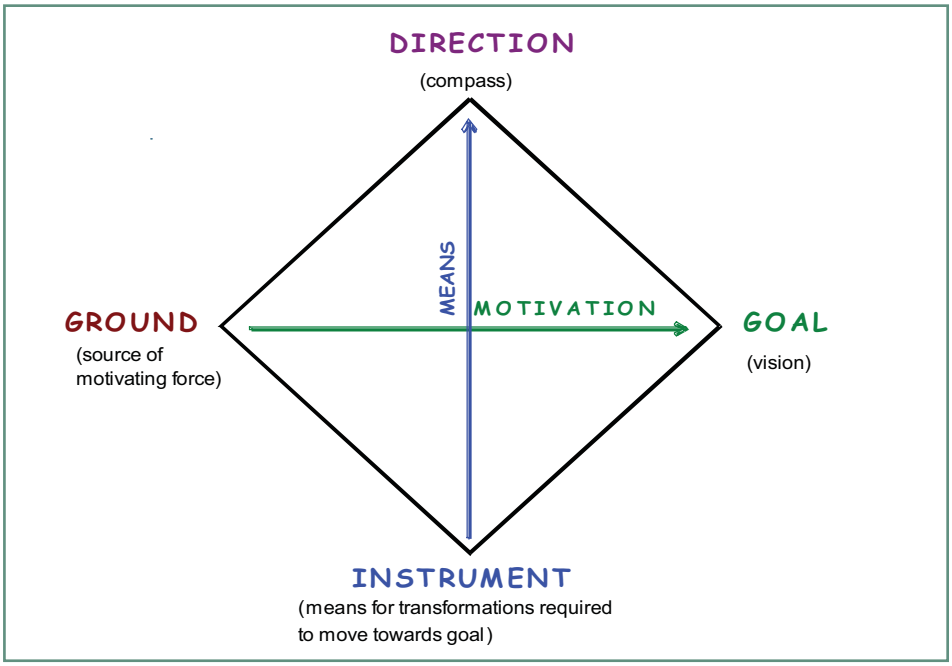
Integrated Design Process (IDP) was used in the early 1990s, by Canada's C-2000[1] program and IDEAS Challenge[2] competition to describe a more holistic approach to building design. This design process has been shown to produce more significant results than did investment in capital equipment[3]. There is now no single "right" definition for IDP. Rather, IDP describes a different, intentional way of approaching sustainable building and community design that offers a much higher likelihood of success than any other approach.

There are an increasing number of practitioners of IDP. Each has a different, and valid, perspective on how to do it, based on their experiences and practices. Most would agree that there are common elements to every definition.

- *Goal-driven* with the primary goal being sustainability, but with explicit subsidiary goals, objectives and targets set as a means to get there.
- *Facilitated* by someone whose primary role is not to produce the building design or parts of it, but to be accountable for the *process* of design.
- *Structured* to deal with issues and decisions in the right order, to avoid locking in bad performance by making non-reversible decisions with incomplete input or information.
- *Clear decision-making* for a clearly understood methodology for making decisions and resolving critical conflicts.
- *Inclusive*—everyone, from the owner to the operator, has something critical to contribute to the design and everyone must be heard.
- *Collaborative* so that the architect is not simply the form-giver, but more the leader of a broader team collaboration with additional active roles earlier in the process.
- *Holistic or systemic thinking* with the intent of producing something where the whole is greater than the sum of the parts, and which may even be more economic.
- *Whole-building budget setting*—allows financial trade-offs, so money is spent where it is most beneficial when a holistic solution is found.
- *Iterative*—to allow for new information to inform or refine previous decisions.
- *Non-traditional expertise*—on the team, as needed, or brought in at non-traditional times to contribute to the process.

Sustainability is one of the most important issues facing human society today. The challenges as they relate to buildings are complex and the solutions are not simple. Framing the challenge in terms of *motivation* and *means* is one way of clarifying our thinking. Motivation proceeds from a source or ground, towards a goal. The means require some tools and a direction to apply them. The tetrad in Figure 1 illustrates these ideas.

Why IDP—Getting to What is Important



tetrad idea by Pamela Mang

Figure 1 – Goals and Direction of IDP

[1] NRCan's C-2000 program supporting advanced, energy-efficient commercial building design.
[2] IDEAS Challenge design competition for multi-unit residential buildings, CMHC.
[3] Ibid, C-2000 program

Motivation

The Ground: Sustainability Imperative

A host of ecological impacts resulting from human activity, have produced ecosystems degradation that directly threatens our society. In the words of the UN's Millennium Ecosystem Assessment, competed in 2005:

> We are spending Earth's natural capital, putting such strain on the natural functions of Earth that the ability of the planet's ecosystems to sustain future generations can no longer be taken for granted.
>
> At the same time, the assessment shows that the future really is in our hands. We can reverse the degradation of many ecosystem services over the next 50 years, but the changes in policy and practice required are substantial and not currently underway.[4]

This is a report worth taking the time to read to understand the scope and scale of the global challenge. Closer to home, building design, construction, operation and demolition account for a significant share of the problem—about 30 per cent of the energy use and 38 per cent of the greenhouse gases in Canada.[5] Buildings are the source of about 40 per cent of all waste[6] worldwide. As building designers, we have both an opportunity and a responsibility to do something about it.

The Goal: A Sustainable Society

A sustainable human society has been imagined in many ways. One of these is the definition of sustainable development in the Bruntland Report, *Our Common Future* (1987) as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs."

While the Bruntland definition provides a high-level vision, more is needed to apply the concept. Basic principles for social and ecological sustainability, based on physics, have been articulated by the science community and are captured in a framework known as *The Natural Step*.[7]

The Natural Step principles are the "*system conditions*"[8] that society must embrace to be sustainable.

> In the sustainable society, nature is not subject to the systematic increase of:
>
> 1. concentrations of substances extracted from the Earth's crust
> 2. concentrations of substances produced by society
> 3. degradation by physical means
> 4. in that society, people are not subject to conditions that systematically undermine their capacity to meet their needs.

Together, the Bruntland definition and The Natural Step Framework system conditions provide the sustainable development goal that buildings must strive to reach.

Other decision-making tools for sustainable community development include "Smart Growth" and the "One Planet Living" frameworks.[9]

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[4] UN Millennium Ecosystem Assessment, 2005, http://www.millenniumassessment.org/en/index.aspx

[5] Based on direct energy numbers from *Energy Use Data Handbook*, 1990 and 1995 to 2001 June 2003, NRCan and an estimate of the fraction of energy uses from other sub-sectors that are attributable to buildings

[6] Lenssen and Roodman, 1995, *Worldwatch Paper 124: A Building Revolution: How Ecology and Health Concerns are Transforming Construction*, Worldwatch Institute – numbers for Canada not available

[7] http://www.naturalstep.ca/systemconditions.html

[8] Ibid.

[9] http://www.smartgrowth.org and http:///www.oneplanetliving.org

Means

The Direction: Green Buildings Rating Systems

Beyond Bruntland and The Natural Step, a strategy for achieving sustainability goals is still needed. We can develop strategies by imagining future success and then take the actions needed to get there.

In the building industry, much preparatory strategy work has been done by the various green building rating systems and energy and environmental assessment methods. These systems categorize and detail the impacts, actions and indicators required at a building level. LEED® Canada,[10] Green Globes, Go Green and other rating systems give us the compass we need as we steer towards sustainability, and as they are refined over time, they will become more effective. And, as we work to refine our building practices, our buildings will also become more sustainable.

The Instrument: Integrated Design Process as a Tool:

Even with rating systems and energy design tools spelling out the actions needed to proceed, it is still not always clear where to start and what tools to use. IDP is one of the best tools we have to help define the most appropriate design path. It provides the means to apply the design strategies and move society towards sustainability, one project at a time.

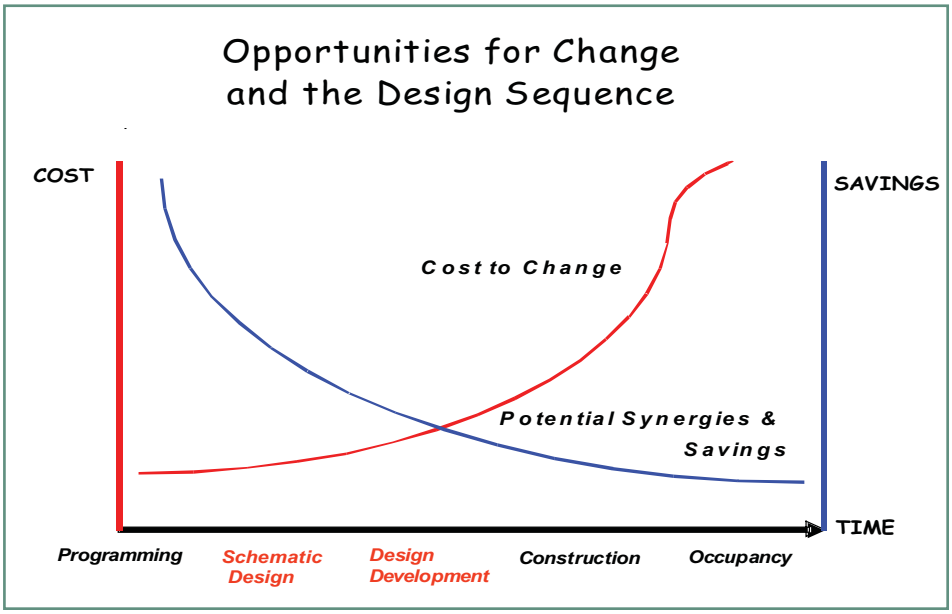

Figure 2 – BC Hydro, IEA Task 23 and others

Benefits of Integrated Design

Protecting the world is a necessary and laudable goal, but there other much more immediate benefits to making use of IDP on your projects.

Better Designs/Better Buildings

Everyone wants to build better buildings more efficiently at less cost, particularly the client. Intuitively, we know that the greatest opportunity for making changes to a design at the least cost happens early on. This is illustrated by a curve that looks something like Figure 2, where the opportunity to make changes decreases significantly and the costs to change design concepts increase dramatically as the processes advance.

IDP provides the biggest payoff at the beginning of the development curve. The IDP kickoff session should bring together everyone who can make a difference, contributing in a structured way, in response to the program and in support of the sustainability goals. Although this might seem like a blinding flash of the obvious, most projects don't structure their development and design processes to actually take advantage of the Integrated Design Process.

[10] http://www.cagbc.org

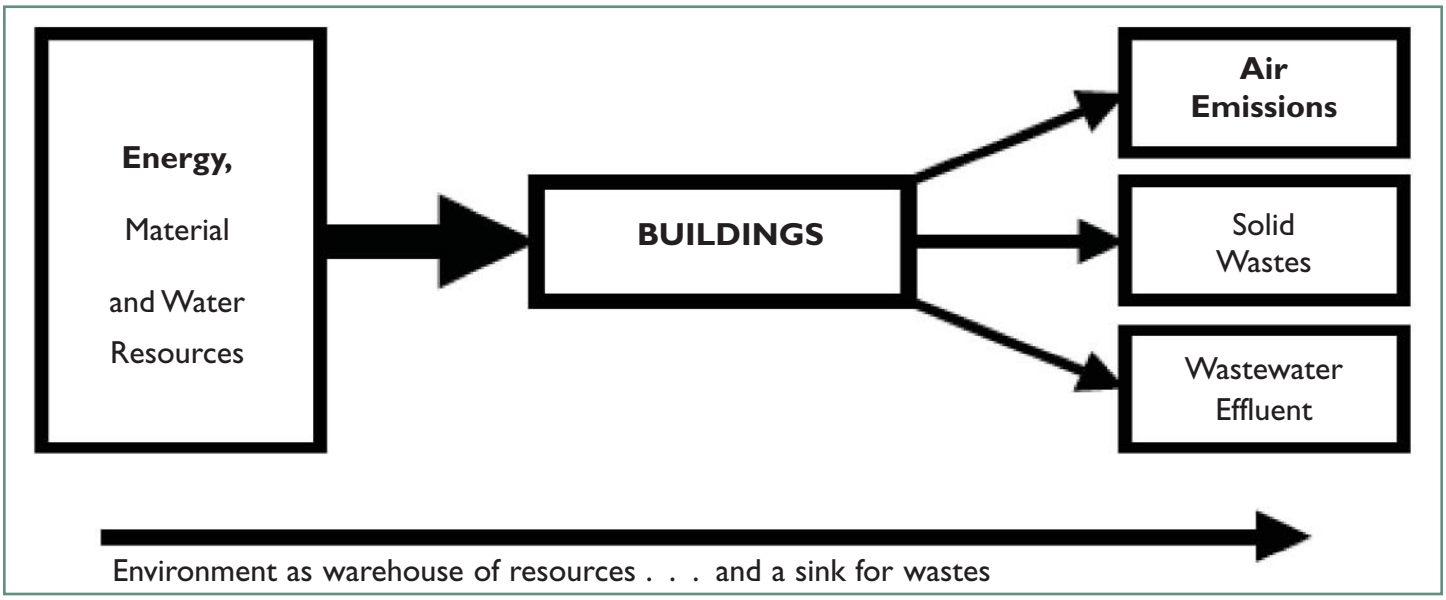

Figure 3 – Standard Process—Buildings as Transformers of Resources into Wastes

Institutional Policy

Governments, utilities and many clients want you to use IDP.

Natural Resources Canada's (NRCan) Commercial Building Incentive Program (CBIP)[11] is expressly designed to provide monetary assistance to owners and design teams to enable them to spend the time to implement integrated design on your projects. This program grew out of experience that NRCan had in the 1990s with C-2000, a demonstration program. The experience was that some additional design expertise was needed, but that most building performance gains came from a change in the **process**, and the most successful projects employed the IDP.

Several utilities have programs that support IDP. BC Hydro has its High Performance Building Program[12] that provides co-funding to perform energy studies and it is about to launch a program to promote IDP.

Enbridge Gas Distribution and Union Gas in Ontario jointly offer a Design Assistance Program[13] that provides a fixed incentive for design activities that improve your building's energy and environmental performance. Enbridge also has a New Building Construction Program that provides incentives for adding some efficiency measures.

Mountain Equipment Co-op, which has built some of the most progressive green buildings in Canada, seeks to improve performance with each new store and requires its design teams to utilize IDP. It was key to achieving the impressive performance these buildings have demonstrated to date (LEED Gold, MEC Winnipeg, C2000, MEC Montréal)[14].

> "The key to our success with these projects is what architects and engineers call the Integrated Design Process"
>
> *MEC website, www.mec.ca*

Green Buildings BC, a program that provided tools and resources to help B.C. education and health care agencies build green buildings, recognizes the value of IDP in its *Guide to Value Analysis and the Integrated Design Process.*[15]

Clients who do not explicitly ask you to use IDP likely would do so if they knew the value that IDP and green design could add to their projects.

[11] http://oee.nrcan.gc.ca/commercial/financial-assistance/new-buildings/index.cfm
[12] http://www.bchydro.com/business/
[13] http://www.cgc.enbridge.com/B/B05-11_building_design.asp
[14] http://www.mec.ca, About Us, Sustainability, Green Building Program
[15] http://www.greenbuildingsbc.com/new_buildings/pdf_files/value_analysis_dp_guide.pdf

Sustainability

Green buildings are characterized by performance improvements in a wide range of areas, such as reduced site disturbance, minimal non-renewable resource consumption, minimal emissions to water and air, and maximal quality of the indoor environment, as well as providing building flexibility and adaptability, generally at no or minimal cost increase.

Conventional design processes are generally incapable of delivering all of these goals at once. Integrated design has a history of being able to do so.

Your Association Supports IDP

In a 2003 study[16] carried out for several architectural associations, including RAIC and OAA, one of the key findings on sustainable design in Canada[17] was:

> Integrated Design Process (IDP) is essential for effective management of the sustainable design process to ensure that efficient coordination is maintained and that overall project and design costs are minimized. Several sustainable design evaluation and assessment systems require the use of IDP due to the benefits derived from working in a collaborative setting at the outset of the project.

In the 2005–2006 season (the fifth), *Sustainable Design for Canadian Buildings*, SDCB 205, RAIC's cross-country, continuing education course, was entitled "Green to Green: Opportunities for more Energy-Efficient Building Retrofits." It focused on integrated design. Similar or related courses on sustainable design will likely continue to be offered.

Competitive Advantage

An advantage of using IDP for design firms is reputation. Once competent at IDP, architects will be able to deliver better projects more consistently than their competitors. As a design professional, it will enhance your reputation, which will not only bring more business, but higher-end business. An enhanced reputation also makes recruiting and retaining new talent easier. Most of the leading-edge architectural and engineering consultancies that have gained a reputation for delivering sustainability using the IDP do very little recruiting. The best and the brightest seek them out.

The future of building design is found in IDP. A recent search of the American Institute of Architects website for "IDP" turned up 481 hits. AIA's Design and Environment committees sponsored a three-day sustainable design conference in Sheperdstown, W.Va., in 2006, with one day devoted to process, in which IDP features prominently.

The implication is clear—if you don't become competent at IDP, you will be left behind your competitors.

Personally Rewarding

One of the unanticipated benefits that I have witnessed in integrated design processes is that it is just plain fun. IDP sessions are generally challenging, creative and personally rewarding. By setting "stretch goals" and finding novel ways to reach them, creativity is unleashed in ways that conventional design rarely allows for. I have seen battle-weary professionals become enthusiastic at what they can do in this context. People rediscover why they joined the profession in the first place.

> "Integration is more than just having all the designers around a single table."
>
> *– CANMET Energy Technology Centre, Buildings Group website*

[16] By McGill Business Consulting Group

[17] *Succeeding by Design, A Perspective on Strengthening the Profession of Architecture in Ontario and Canada*, November 2003, McGill Business Consulting Group

How is IDP Different?

There is no single element of integrated design that is revolutionary. Rather it is the sum total of all of the elements and what the team does with them that differentiates IDP from conventional design. IDP differs in **intention** and **emphasis** from conventional design.

Let's look at the objectives in more detail. I'll follow these with an example of how some of these come together in practice.

Goal-driven

The big-picture goal is incorporating sustainability into the project, but it is necessary to set explicit subsidiary goals, objectives and targets as a means of breaking the goal into manageable pieces. These are best framed in performance; not prescriptive, terms and will then form the basis for strategies to achieve them.

These goals are set with the entire project team involved and must include the client. The idea is to get commitment, not compliance, from everyone involved. People support what they help create.

The first goal is a review of the project brief against the list of client needs. Is this the best location from an environmental point of view? Is a new building actually required or would a major renovation be more appropriate?

Remember, because you started this process really early on, you get to ask these questions. In some cases, the best answer for your client might not result in a new building project this time, but the added value to your client by doing the right thing enhances the relationship, your reputation and will likely result in repeat business.

From there the team moves on to specific environmental goals. These can be derived from rating system categories, but they should include fixed targets for:

- Reduced site impacts;
- Reduced off-site impacts, such as stormwater runoff, greenhouse gases or other emissions;
- Reduced energy and water consumption;
- Improved indoor environmental quality and thermal comfort, contributing to human health;
- Increased construction waste diversion and recycling, material reuse and recycled content;
- Improved durability, longevity and maintainability.

IDP, because of its inclusionary nature, is also a useful way to develop goals for social values, although there is little consensus in the building industry generally on how to deal with social issues at a project level, unless they are an explicit part of the program.

These goals and targets need to be clearly articulated, written down and kept front and centre as the design progresses. They serve as reference points as the detailed design develops or if conflict arises between goals.

Facilitated

The primary role of the facilitator is not to produce the building design or parts of it, but to be accountable for the process of integrated design. This is of course the key to good facilitation of any kind. The facilitator allows the team participants the mental space to do what they do best—in this case green design. The degree of process intervention or direction will depend on the skill of the group, with an inexperienced group typically needing more direction than a practiced group.

Can you, as design architect, act as facilitator? First, a facilitator requires certain communication abilities and attitudes for exploring ideas with the team and draw out ideas. Therefore, although the lead design architect can act as the facilitator, it is generally not a good idea, as you are wearing two hats—and probably neither very comfortably. Why make the process more difficult than it needs to be?

The facilitator can be someone else in the lead architect's office or it can be someone brought in from the outside, who specializes in green building facilitation. The key is the difference in primary roles.

Structured

There is a generally recognized order to dealing with design and sustainability issues in IDP. The reason that we need to deal with issues and decisions in the right order is to avoid locking in bad performance by making non-reversible decisions with incomplete input or information.

For instance, mechanical engineers may come up with very sophisticated air conditioning designs to deal with cooling loads, but if those cooling loads are three times what they need to be, due to huge amounts of unshaded, low-performance glazing in the wrong orientation, the improvement in energy performance will be marginal and the cost will be higher. By contrast, if architects quantitatively understand at the concept phase the impact of that glazing on performance and cost, they are in a better position to come up with alternatives.

Also, in most IDP, the design time is distributed differently. More time is spent upfront, but because the quality and completeness of decisions taken are better, less time is required later, especially by the engineers on the design team, to re-design and to correct for mistaken assumptions.

For example, on one conventionally designed project I am aware of, the owner switched glass types during construction, based on an offer from the contractor, in the belief that the new glass would save money. Unfortunately the cheaper glass also had lower thermal performance in both heating and cooling seasons, which necessitated re-design and upsizing of the mechanical systems at a premium after tenders closed. In the end, there were negligible cost savings and the operating cost was also higher for the tenants. Had IDP been employed, the owner would have understood that the system was optimized for the lowest total cost.

> "IDP is everyone, every issue, early on"
>
> *– Bill Reed, Integrative Design Collaborative*

Inclusive

Everyone, from the owner to the operator, has something critical to contribute to the improved function or performance of the design and everyone must be heard. Having said that, there are about two dozen actors involved in the design and construction of every building, from gleam-in-the-eye through to operations, and it sometimes is just not practical to have everyone in the room at all times on every issue.

In addition to the usual design team, the core team that needs to be engaged at all times should include, at a minimum, the building owner or owner's agent, the design facilitator, a cost consultant, an energy simulator and, if the procurement process allows it, a general contractor or contract manager. Representatives of user groups and the facility managers are critical to improved design and should also be invited. Other specialists in particular technologies or relevant issues can be brought in as needed. Energy modellers are also important in showing the energy costs related to particular design scenarios compared to others.

Non-traditional expertise

Technical aspects of the design may require expertise that the core team does not possess. A daylighting modeller can quantify daylight contribution that can lead to changes in switching design. An appraiser can calculate improved development residuals resulting from green design. A site ecologist can be included for constructed wetland design.

> "It is not possible to do creative, progressive sustainable design without a strong, like-minded, integrated design team."
>
> *– Peter Busby, Busby, Perkins + Wills*

Other non-buildings-related expertise may be helpful. For example, one successful recent green building project designed for an inner city brought in a university student working on a thesis about social interactions in the city's core, which helped respond to the organization's intention to have the building support local community life. Another example of new expertise helping the design team to explore alternative design issues is demonstrated by the Seville Theatre Redevelopment Project: Integrated Design Process.

https://www03.cmhc-schl.gc.ca/b2c/b2c/init.do?language=en&shop=Z01EN&areaID=0000000037&productID=00000000370000000063

Collaborative

One of the principal differences of the process is that the architect is not simply the form-giver, but an active participant in exploring alternative ideas within a broader team of experts who play active roles earlier in the process.

> "Everyone is a co-learner in the process"
>
> *– Bill Reed, SEFC IDP Workshop, April 2006*

In particular, there is joint problem-solving and joint decision-making rather than team members simply taking their assignments away to work on and bringing them back to be re-integrated. It has been proposed by some that IDP could be equally called integrated decision-making.

Holistic or systemic thinking

The old Zen saying that everything is connected to everything else is never truer than when designing for sustainability. The goal is to optimize the building's performance by considering all of the building components and subsystems together *and their interactions*, to achieve synergies. When this is done right, you get something where the whole is greater than the sum of the parts, and it may even be cheaper. The example at the end of this section illustrates a common way this is achieved.

> "Optimizing components in isolation tends to pessimize the whole system—and hence the bottom line. You can actually make a system less efficient, simply by not properly linking up those components. If they're not designed to work with one another, they'll tend to work against one another."
>
> *– Hawken, A. Lovins, H. Lovins, Natural Capitalism*

Whole-building budget setting

As design professionals, we are pretty good at knowing what our piece of the design "should" cost. We carry these rules of thumb around but they are usually not based on whole building optimization. They also tend to be the basis for value-engineering individual components. This is not the best way to get the least cost building overall. As Amory Lovins has pointed out, "Optimizing components in isolation tends to pessimize the whole system—and hence the bottom line".[18]

A green building design based on holistic thinking will not likely cost more overall, but the costs may be distributed differently than costs based on a traditional design approach. Costs get transferred from some components to others. Budgeting must be done in a way that allows the movement of money to where it does the most good when a holistic solution is found. This flexibility should also extend to the determination of the professional's fee structure, which will be discussed later.

Iterative

The traditional phases of the building design process, pre-design, schematic design and development, don't disappear in IDP. What does change however is how the work gets done in each phase and how team moves from one phase to the next. The IEA Task 23 guideline document[19] describes these intermediate workflows as "iterative loops," shown in Figure 4.

The team repeatedly reviews and refines ideas to resolve problems at whatever scale is appropriate, at each phase of design. A key aspect is to allow new information to inform or refine previous decisions.

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[18] *Natural Capitalism*, Hawken, A. Lovins, H. Lovins, 1999, Little, Brown & Company

[19] "Integrated Design Process — A Guideline for Sustainable and Solar-Optimised Design," 2003, International Energy Agency, *Task 23, Optimization of Solar Energy use in Large Buildings, Subtask B, Design Process Guidelines*

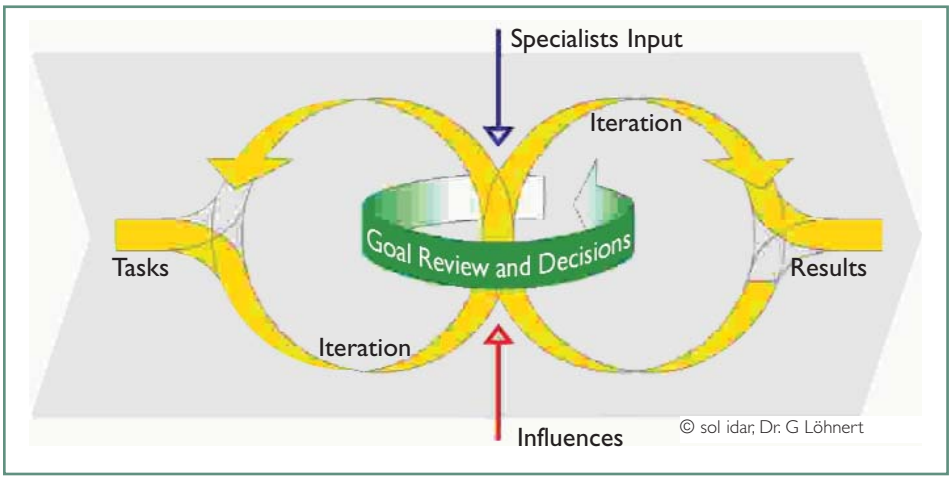


Figure 4 – Iterative Loop

It is also important to follow through on the iterations in the IDP process by explicitly identifying subsequent IDP tasks and group meetings, interwoven with the overall project schedule. If this is not done upfront, it is too easy for the design team to revert to familiar, business-as-usual, linear design processes after the excitement and energy of the initial kickoff charrette begins to wane. An explicit IDP process schedule is a key tool to managing the IDP process.

An Example of Opportunity for Synergies—"Tunnelling Through the Cost Barrier"

How do these elements come together on a project? We often hear talk about "capturing synergies" with integrated design but what do we really mean? Let's look at a common example.

Typically, high-performance glazing costs more than standard glazing that satisfies the Code requirements, and so it is rarely specified. What happens if that high-performance, solar-control glazing reduces the air-conditioning load enough that the mechanical system duct size can be reduced significantly? Now the structural beams can be reduced in depth, and floor-to-floor height can be reduced. Mechanical, structural and cladding costs have come down—perhaps enough to pay for the high-performance glazing. If the building is tall enough, perhaps an extra floor can be added while still fitting under height restrictions.

What happens if the better glazing and insulation improve wall and window thermal properties enough that perimeter radiant heating is not required to maintain cold weather comfort or the window properties are able to reduce overheating in summer? Now you have gained back at least an extra six inches of leasable space around the building perimeter, saved energy costs and have more satisfied occupants. These measures can increase the client's rate of return—again paying for the improvements in envelope performance.

Any one of these improvements, if looked at in isolation, would not be considered affordable. Savings like this will not be realized unless there is an integrated process where the mechanical and structural engineers, energy modeller and likely the cost consultant and property management, are all sitting down very early on with the architect and talking about building envelope and its impacts on other systems. Without the dialogue at an early stage, no system will be supportive of any other system and the synergies won't be captured.

These are some examples of synergies, but nearly every project will reveal other opportunities. Improvements like this are more affordable if done together than if done separately. Amory Lovins of the Rocky Mountain Institute, first identified this possibility which he calls "Tunnelling Through the Cost Barrier," as shown in Figure 5.

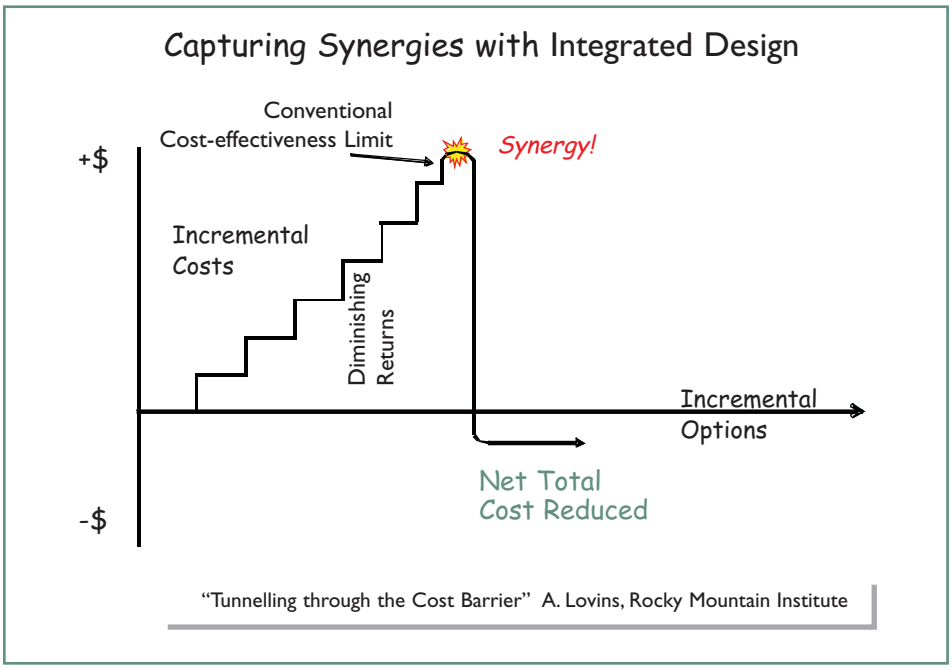
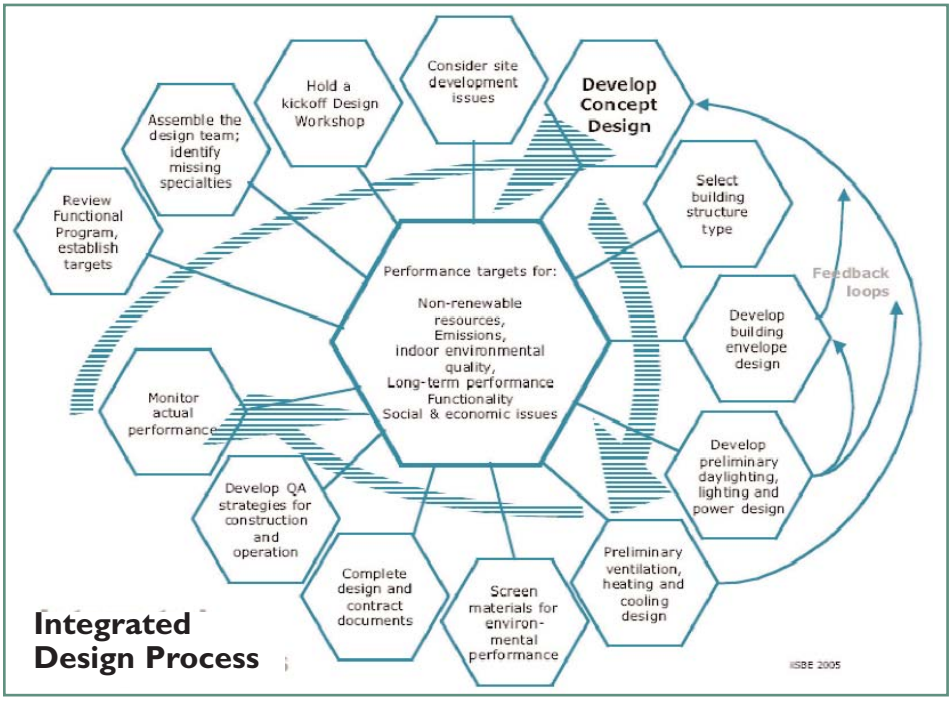


Figure 5 – Tunnelling Through the Cost Barrier

Nils Larsson, iiSBE Approach

Figure 6 is a graphical representation of the applied iiSBE process.



courtesy of Nils Larsson, iiSBE

Figure 6 — Graphic Showing the IDP Process

What does an IDP process look like?

At the beginning of this article, it was pointed out that there are a number of different practitioners of IDP, each with a different perspective on how to carry it out. A number of people and organizations have identified the steps involved in applying IDP to a design. It may be useful to summarize three different approaches. Links are provided to explore the details of each of these.

The 3 are

1. The approach by Nils Larsson of International Initiative for Sustainable Built Environment (iiSBE).
2. The Integrative Design Collaborative[20] approach by Bill Reed.
3. The process definition developed at national workshop held in Toronto in 2001.[21]

In addition, IEA Task 23 has published quite a detailed guideline and accompanying software[22] that are also useful tools. The Task 23 web link is http://www.iea-shc.org/task23/

[20] *Managing the Integrative Design Process*; PDF of Presentation Graphics - PowerPoint images from the Workshop, http://www.integrativedesign.net/our_process/home.htm

[21] *The Integrated Design Process: Report on a National Workshop* held in Toronto in October 2001, search the documents section of the database of http://www.sbis.info, for Integrated Design

[22] ibid , IEA Task 23

The IDP Overview[23] details the steps for each of the elements in the illustration. This approach begins by defining the work that needs to be done before the team is assembled and the first major workshop is held. A kickoff workshop is the first all-inclusive, collaborative decision-making meeting and major performance targets are set then. Subsequent workshops will depend on the scale and scope of the project, with larger and more complex projects requiring more workshops to deal with the issues.

The next phase is the first of the iterative loops. Developing the concept design requires the interactive consideration of structure, envelope, lighting and mechanical systems. Once these are determined, more consideration is given to materials and how to properly convey these decisions in contract documents. Quality assurance activities throughout the construction phase and into operations are critical to ensure that what is designed actually gets built.

The iiSBE link is http://iisbe.org

Bill Reed, Integrative Design Collaborative Approach

Bill Reed of the Integrative Design Collaborative[24] identifies the basic IDP elements as:

PREDESIGN 1 – STAGING THE PROJECT (The Foundation)

- Client involvement in the design decision process
- Team Selection
- Design Problem Setting
- Identifying Base Conditions

PREDESIGN 2 – MANAGEMENT MAPPING AND GOALS

The Foundation Dialogue

- Includes all participants—including main decision maker
- Charrette Design
- Alignment of Expectations and Core Purposes
- Addressing the Mindset
- Goal Setting of Environmental Metrics and Benchmarks
- Creating a Project Specific Systems Map and Schedule

DESIGN PROCESS – SYSTEM OPTIMIZATION

- Schematic Design
- Contractor or Cost Estimator Engagement
- Design Development

CONSTRUCTION AND OPERATIONS – REALIZING THE OBJECTIVES

- Follow Through in Construction Process
- Commissioning
- Maintenance and Monitoring

The link to the Integrative Design Collaborative website is http://www.integrativedesign.net/

As you can see, there are similarities with the diagram and process laid out by the other descriptions. A presentation of this process is available on the Integrative Design Collaborative website, which adds detail for each of these elements.

The approach proposed at the Toronto IDP workshop[25] has similarities to the other two approaches. Figures 7 and 8 illustrate the process in a more linear fashion. The key elements, including early client involvement in decision-making, careful team selection, kick-off meetings, goal setting and iterative design loops, are all there. This approach does not detail the need for follow-through in construction phase, but it has become recognized as a requirement.

[23] IDP Overview
[24] Ibid.
[25] Ibid.

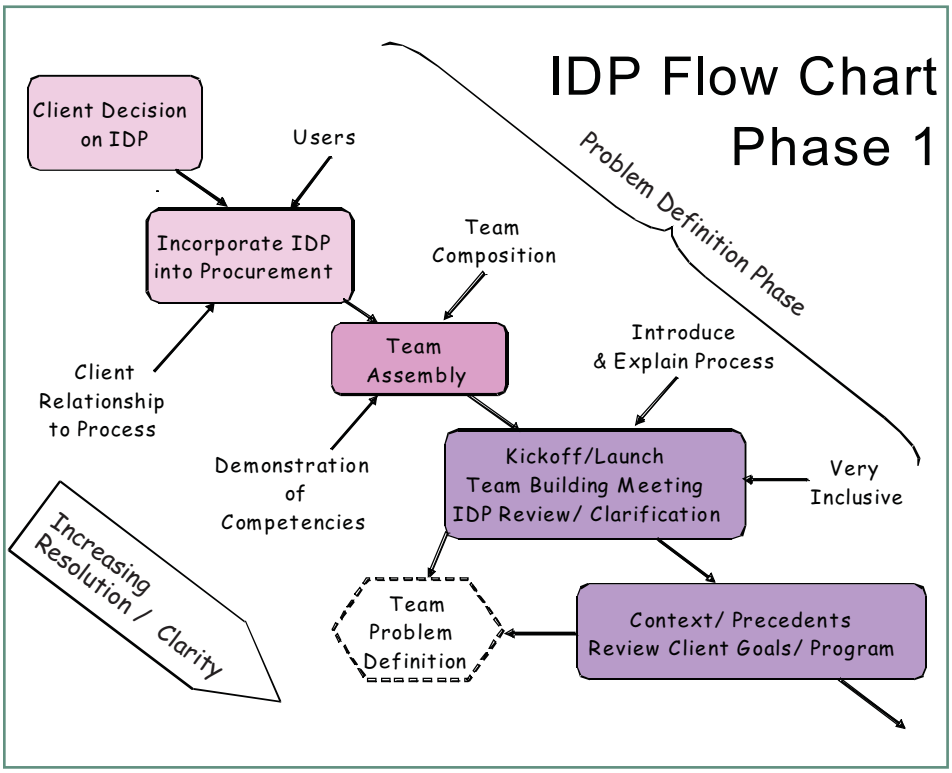


Figure 7 – Toronto IDP Workshop Approach – Phase 1

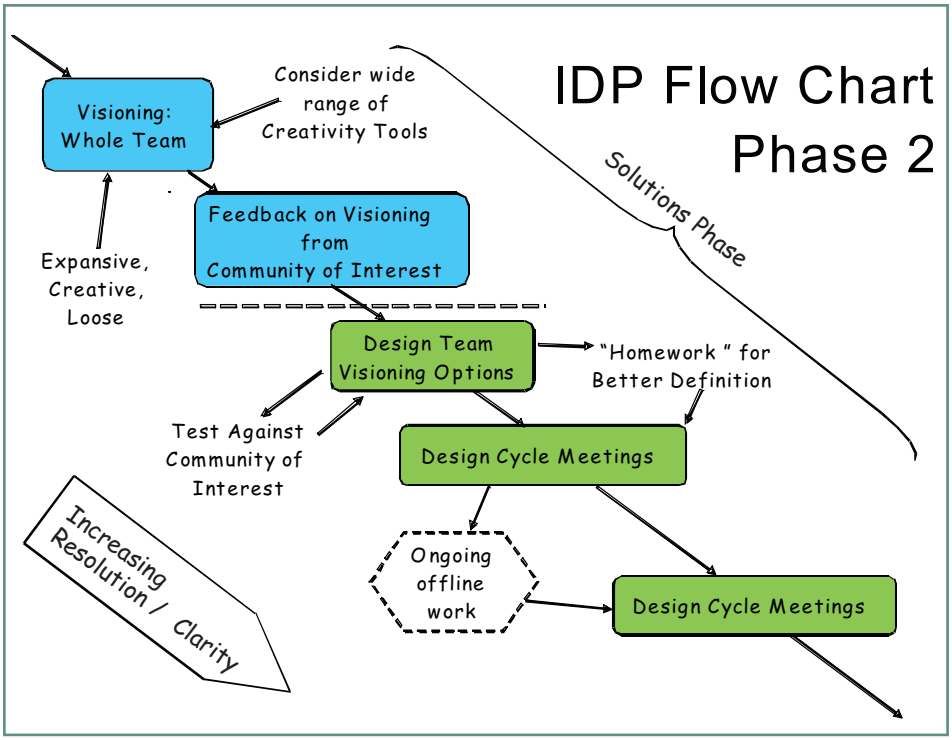


Figure 8 – Toronto IDP Workshop Approach – Phase 1

Kickoff Meeting/Charrette

A key feature of all IDP is the kickoff meeting or charrette. This launch is crucial for:

- getting the project off to a good start
- getting agreement on goals
- team building
- getting the big issues and concerns out in the open early on to avoid re-design later.

A key objective for the charrette team is to come to a common vision or understanding of what it is trying to accomplish. This is such a truism that its importance tends to get overlooked. All great teams in any endeavour have a common vision of the goal. A good charrette will establish that common vision and will unleash the creativity inherent in all teams and focus their efforts on reaching it.

The scope of the charette will vary, but it should be facilitated and carefully planned. You don't need to invent how to do this. There is an excellent resource that was developed expressly for IDP charrettes: *A Handbook for Planning and Conducting Charrettes for High Performance Buildings*, free from the U.S. Department of Energy website.[26] This handbook provides everything from the rationale, how to get started, how to plan and develop the charrette, how to conduct it and what the follow-up and next steps should be. It also provides checklists, sample agendas, reports and every other sample document you might need.

Another free resource is the *Sustainable Community Planning and Development Design Charrette Planning Guide*, available from Canada Mortgage and Housing Corporation.[27]

What Else is Needed for Successful IDP?

Earlier, some of the elements that characterize IDP were presented, but it is also worthwhile considering a few overarching factors that need to be present for a successful integrated design process.

Client Buy-in

The client has to be fully aware of how IDP is better and has to be fully committed to it.

This commitment includes an understanding that while the potential rewards from pursuing integrated design are great, the process will distribute the design teams time differently and most likely produce designs that are different than what they have been used to seeing.

IDP should be a net time saver but upfront time will take longer and late stages will take less. Specified equipment and systems are likely to be different, and the most successful projects are those the client understands and shares potential risks arising from new approaches.

The client needs to make it clear who the decision-maker(s) are and commit to having decision-makers present at all the key meetings.

The client has to change the way the team gets paid. IDP is not commodity-based design, by which I mean, design where the team gets paid by the pound (or a percentage of building cost, which amounts to the same thing). This form of compensation assumes that all design is pretty much the same, with the effort expended being directly related to building cost. Instead, the team should be compensated for brains, not stuff.

If compensation is not changed, working harder or smarter only to see your fee reduced, limits the enthusiasm and creativity of even the most dedicated professional. There are several ways of changing compensation. One approach that some IDP practitioners have found to be successful is to negotiate a separate fee for the early, creative phase, where the effort involved is relatively independent of project size. The later phases, which allow to complete the design and drawings, are more closely related to project size and the fees can be more properly linked to size.

Clients also need to be prepared to share at least some of the potential risks when they demand extremely high performance or technologies that do not have a long track record. In these cases the client should not expect the designers or contractors to assume the risk and expect the building to cost the same as a regular building with lower risk. This is not a common IDP situation, but it has happened.

> We cannot solve our problems with the same kind of thinking we used when we created them.
>
> *– Albert Einstein*

Mindset

The importance of the right mindset or attitude for *all* team members is hard to exaggerate. Some key attributes of the required mindset are as follows:

- Commitment to the process and ownership for your part in it.
- Thinking in *whole system* terms to optimize the project as a whole, not value-engineer individual components.
- Willingness to measure, benchmark and quantify performance.
- Active listening and openness to learning from other team member.
- Asking the right questions, in an open-ended way, that will lead to new answers, rather than arriving with preconceived answers.
- Awareness and respect for team roles and dynamics, valuing all contributions.

[26] *A Handbook for Planning and Conducting Charrettes for High Performance Projects*, 2003, U.S. Department of Energy, http://www.eere.energy.gov/buildings/highperformance/pdfs/charrette_handbook/33425rep.pdf

[27] CMHC (http://www03.cmhc-schl.gc.ca/b2c/b2c/init.do?language=en&shop=Z01EN&areaID=0000000037&productID=00000000370000000063)

Goal Setting

Critical to success are clear and measurable goals based on a shared understanding and vision of what is to be achieved. Not every goal need be a BHAG (Big Hairy Audacious Goal) but they should be SMART; *Specific, Measurable, Achievable, Realistic, Time-bounded.*

> "If you don't know where you are going, any road will take you there."
>
> *– Lewis Carroll*

President Kennedy's "man on the moon" speech in the early 1960s is often cited as an example, for good reason. It was inspirational because it had all the right characteristics. It was specific and measurable (put a man on the moon and bring him back safely) and time-bounded (by the end of the decade). No one was completely sure at the beginning whether it was achievable or realistic, but as a stretch goal that was not too far ahead of what was thought possible, it created its own momentum. Goals like these are motivational.

In green building terms, the goals should be set at a whole building level, such as a LEED Gold standard, but also for specific performance attributes that make sense for a project. Some real-world examples of goals that have been set (and met) on Canadian green building projects include:

- 60 per cent better energy performance than MNECB – EMS Fleet Centre, Cambridge, ON
- 95 per cent diversion of construction waste from landfill – Vancouver Island Technology Park
- Zero discharge of sewage waste water – MEC Winnipeg Store
- 50 per cent of all materials supplied from within 800 km – BC Cancer Research Institute
- 75 per cent of the new building constructed from materials from the old building on site – MEC Winnipeg Store
- Elimination of mechanical air-conditioning system, while retaining occupant comfort – Liu Centre, Vancouver

Objections to IDP

It is worth discussing some of the standard objections that are raised to the Integrated Design Process. The objections usually are phrased as the following:

"We've always done IDP" – That may be true, and if so, keep doing it. Usually the people who say this, however, have remarkably few green buildings to show as evidence.

"If you want me to do something different, that implies I've been doing it wrong all these years" – Well no, it doesn't. This is the 21st century, with an entirely new situation for human society, and new problems and demands for the profession to respond to. Think of IDP as a new tool to add to the toolbox to address this new situation.

"The client won't pay for it" – Possibly not, especially the first time when the value has not been demonstrated to the client, but that's exactly what is the intent of NRCan's Commercial Building Incentive Program.

"It affects the schedule and budget" – It may do, but the benefits should more than outweigh the impacts. Experienced teams are finding that the time spent is merely shifted from the latter stages of the design process to the earlier stages. Design costs may or may not be greater. It depends on how well the team manages the project and captures inherent synergies. It is not as if traditional projects always come in on time and under budget. The BC Cancer Agency's new laboratory in Vancouver, a LEED Gold building, was designed with an IDP process and came in on time, and $10 million under the $100 million budget.

"It means a loss of creative control as an architect" – Not from what I have observed. After all, what generates more creativity—a blank sheet of paper or fitting the program to a tricky site? An integrated design process often generates more creative ideas and solutions. A good analogy is that the architect goes from being a soloist to being the conductor. In any performance the conductor is always visible, and wears a different suit and often his name is in the spotlight.

Additional IDP Resources

Canada Mortgage and Housing Corporation
Healthy Highrise – a design guide to innovation in multi-unit residential buildings
http://www.cmhc.ca/en/inpr/bude/himu/hehi/index.cfm

Sustainable Community Planning and Development Design Charrette Planning Guide.

Full document can be ordered online at www.cmhc.ca

Natural Resources Canada
Buildings Group, Integrated Design Process Page:
http://www.buildingsgroup.nrcan.gc.ca/projects/idp_e.html

Buildings Group, C2000/IDP Case study Publications:
http://www.buildingsgroup.nrcan.gc.ca/publications/publications_e.html#commercial

Paying for IDP: Commercial Buildings Incentive Program
http://oee.nrcan.gc.ca/commercial/financial-assistance/new-buildings/index.cfm

SBIS IDP Documents
http://www.sbis.info, search under Documents section of database for Integrated Design:

1. IDP Overview, Nils Larsson, Executive Director, iiSBE
2. The Integrated Design Process: Report on a National Workshop held in Toronto in October 2001

IEA Task 23 Documents
IDP Guidelines and other supporting documents
http://www.iea-shc.org/task23/

U.S. Department Of Energy:
A Handbook for Planning and Conducting Charrettes for High-Performance Projects
http://www.eere.energy.gov/buildings/highperformance/pdfs/charrette_handbook/33425rep.pdf

High Performance Commercial Buildings: A Technology Roadmap
http://www.eere.energy.gov/buildings/tech/roadmaps.html

Royal Architectural Institute of Canada
Sustainable Design for Canadian Buildings (SDCB) courses – 2006 series is titled "Green to Green: Opportunities for more Energy Efficient Building Retrofits" and was focused on integrated design
http://www.raic.org/index_e.htm

Green Buildings BC
Guide to Value Analysis and the Integrated Green Design Process
http://www.greenbuildingsbc.com/new_buildings/resources_guide/2.0_general_resources.html

Greater Vancouver Regional District
"Why Build Green – LEED BC "Roadmap" Workshop Summary"

Page with further links:
http://www.gvrd.bc.ca/Buildsmart/integrated-design.htm

Whole Building Design Guide:
http://test.wbdg.org/newsevents/news_wbdg_approach.php

BC Hydro
Paying for it: Design Assistance
http://www.bchydro.com/business/facilities/facilities1005.html

BuildingGreen.com
Paid subscription service: articles on green design and IDP: Green Topics, Process
http://www.buildinggreen.com/

Questions

1. What are 6 of the 10 common elements of most integrated design processes that differentiate IDP from traditional design?

2. What are buildings' contribution to primary energy consumption and greenhouse gas production in Canada?

3. List at least three benefits to employing an integrated design process.

4. What is the role of the facilitator in IDP?

5. What other expertise is critical to include on the core IDP team?

6. Although there is not a common definition of all the process steps in an IDP process, what are three of the key process steps from your perspective?

7. What is one of the key objectives of the kick-off charrette?

8. What are the three key success factors in an Integrated Design Process?

9. How would you structure an IDP for your next project? Who would participate? How could the meetings be facilitated to encourage everyone's participation?