

**RECOMMENDATIONS ON THE FUTURE OF  
THE R-2000 INITIATIVE**

Submitted by  
the  
**Canadian Home Builders' Association**

July 2006

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## EXECUTIVE SUMMARY

The R-2000 Initiative has had significant positive impacts on housing quality in Canada. These impacts include direct results of the R-2000 Initiative measured in terms of the energy savings and other environmental benefits of the R-2000 houses built and certified under the Initiative, and far broader impacts, including the following:

- The R-2000 Initiative provides the basis for the delivery and success of a number of higher volume initiatives such as EnerGuide for Housing, and Built Green in Alberta and British Columbia.
- The R-2000 Initiative helps to accelerate the commercialization of new technologies and products.
- The R-2000 Initiative provides quality assurance to consumers.
- The R-2000 Initiative increases the capacity and professionalism of the housing industry to build high quality, technically advanced houses.
- Advanced construction techniques developed under the R-2000 Initiative have diffused throughout the housing industry, resulting in better housing in all of Canada.

These impacts are due to the attributes of the R-2000 Initiative that have transformed the housing industry's approach to the construction of energy efficient and environmentally sensitive housing in Canada.

The Canadian Home Builders' Association's (CHBA's) recommendations are intended to establish conditions and procedures to continue and increase the positive impacts of the R-2000 Initiative. The recommendations are:

1. That the R-2000 Initiative be continued because of its actual and ongoing beneficial impacts on housing in Canada.
2. That a governing body, such as an R-2000 Board, be established to maintain, improve and implement the Initiative effectively.
3. That the government commit to provide stable and predictable funding for the Initiative.
4. That the existing infrastructure of the R-2000 Initiative be updated, refined and continued.
5. That delivery agencies make the R-2000 Initiative a priority and principal focus.
6. That Natural Resources Canada (NRCan) and CHBA execute a Memorandum of Understanding (MOU) to ratify key conditions and procedures for successful future implementation of the R-2000 Initiative.
7. That the R-2000 Board direct the preparation and implementation of a strategic plan based on the MOU.
8. That the R-2000 Board direct the preparation and implementation of work plans and financial plans based on the results of the strategic plan.
9. That the R-2000 Board maintain effective communications with the Initiative's participants.

## **INTRODUCTION**

The R-2000 Initiative has existed for almost 25 years. Over that time, it has had significant positive impacts on housing quality in Canada. Its interrelated elements have transformed the housing industry's approach to the construction of energy efficient and environmentally sensitive housing in Canada. Renewal of the R-2000 Initiative will continue to increase the capacity of the housing industry to improve the quality and performance of both new and renovated housing in Canada.

This report explains key features of the R-2000 Initiative, highlights its impacts and makes recommendations on its future.

## **DESCRIPTION**

### **Well Recognized Basic Features of the R-2000 Initiative**

The R-2000 Initiative is owned by the federal government and is managed by Natural Resources Canada (NRCan) in cooperation with others. The Canadian Home Builders' Association (CHBA) is a principal supporter of, and major participant in, the Initiative.

The objective of the Initiative is to encourage the building of energy-efficient houses that are environmentally friendly and healthy to live in, at a standard of energy efficiency that significantly exceeds that of conventionally built homes.

R-2000 dwellings must comply with a technical standard. The technical standard is primarily performance-based. It sets criteria for how a house must perform rather than specify exactly how it must be constructed. The builder is free to choose the best and most cost-effective approach for each R-2000 house. The main features of the standard are summarized below:

- Energy efficiency requirements achieved through specific elements of the building envelope and mechanical systems, using a performance target.
- Air quality control achieved through requirements for mechanical systems and the selection of materials that have limited or no emissions of noxious substances.
- Environmental responsibility, i.e., resource efficiencies and reduced environmental impacts achieved through: the selection of reduced water-usage plumbing fixtures; energy efficient appliances; energy-efficient lighting; and, products that are made of recycled and/or waste materials.

The R-2000 technical standard applies to various forms of low-rise housing. Most R-2000 houses are detached houses, but the technical standard also applies to semi-detached and row houses, as well as apartment buildings of less than four storeys in height, with either separate or shared heating and ventilation systems.

R-2000 is delivered through provincial delivery agents, such as CHBA's provincial home builder associations, and service providers who offer a range of services to ensure that R-2000 dwellings meet the R-2000 technical standard. The delivery agents' functions and funding are covered by contribution agreements with NRCan. In most cases, service providers are paid on a fee-for-service basis by builders who build R-2000 houses. The delivery of the R-2000 Initiative also reflects significant commitment and effort by R-2000 builders who have contributed their expertise and resources to keep it active.

## Attributes of the R-2000 Initiative

The R-2000 Initiative contains many additional interrelated attributes that have a wide range of positive impacts on R-2000 houses specifically, as well as housing in general. An overview of additional attributes of the Initiative is presented below.

- **Collaborative approach:** The intended approach throughout the Initiative’s history has been to develop and deliver R-2000 as a government-industry collaborative effort, rather than a typical government program in which government sets terms and industry follows them.
- **Voluntary, market-driven approach:** This approach encourages innovation, offers builders the opportunity to differentiate themselves and supports the development of cost-effective solutions in a competitive business marketplace.
- **Systems approach:** R-2000 requirements reflect a house-as-a-system approach to the design and construction of buildings. This approach is the foundation for the technical standard and the Initiative’s quality assurance measures. The systems approach recognises that a building is comprised of interrelated components and equipment that determine how it performs. For example, the Initiative ensures good indoor air quality and a safe environment for home owners by requiring the ventilation system be balanced and measures be taken to prevent off-gassing of materials and back-drafting of combustion appliances.
- **Quality assurance measures:** The R-2000 Initiative includes a broad set of conditions and procedures to control and assure compliance with the R-2000 technical standard. The quality assurance measures also yield superior housing performance and quality. They focus on the following measures:
  - Requirements for people who build, work on and examine R-2000 houses to have specified qualifications and corresponding training requirements.
  - On-site inspection of R-2000 houses by qualified, independent third-party inspectors.
  - Consistent use of credible procedures and equipment.

These measures can also be described in terms of key participants’ functions and/or requirements:

Participants	Functions and/or Requirements
New home builders	Builders must be licensed and therefore meet licensing requirements. The licensing requirements include the following: <ul style="list-style-type: none"> <li>- Complete R-2000 training requirements.</li> <li>- Build a certified R-2000 house within two years of training completion.</li> <li>- Meet training updating requirements.</li> <li>- A company with an R-2000 license must designate at least one person in the company who is trained as an R-2000 builder.</li> <li>- Promote R-2000.</li> <li>- Comply with the R-2000 Code of Ethics.</li> </ul>
Ventilation system installers	Must be certified by a specified association as a residential mechanical ventilation designer or installer, or be recognized as an equivalent.
Service providers	This term refers to plan evaluators, inspectors and airtightness testers.
- Plan evaluator	Evaluates house plans using software to test for selected house attributes, e.g., insulation levels, appropriateness of air and vapour barriers, compliance of ventilation systems, and space and water heating appliances with specified standards, and provides the results to the builder and inspector.
- Inspector	Confirms the house as built conforms to required details, including R-2000 requirements for the heating, ventilation and air conditioning system.
- Airtightness tester	Tests the airtightness of house in accordance with prescribed methods; also conducts a depressurization test if required.

- **Test methods, tools and equipment:** Ventilation equipment must be certified by a specified organization. Service providers must use approved software and equipment, and follow prescribed procedures in their tests, as follows:
  - A current version of the computer software (HOT2000) must be used to test energy efficiency at the plan stage.
  - Airtightness tests must be performed using approved equipment and specified procedures.
  - Depressurization tests, if required, must use approved equipment and specified procedures.
- **Training:** Participants must take specified courses which are generally provided through delivery agents and pass corresponding exams, in particular:
  - New home builders: The training includes building science theory and applications of that theory in house construction to achieve energy and resource efficient dwellings that meet the R-2000 technical standard.
  - Service providers, i.e., plan evaluators, airtightness testers and inspectors.
  - Designers and installers of ventilation systems.
  - Training is also available for sales agents.
- **Marketing support:** Over the life of the Initiative, promotional materials have been developed for builders, consumers and others. This includes materials produced by R-2000 builders and initiatives by CHBA, such as the EnviroHome Initiative, a marketing effort developed to promote R-2000.
- **Ongoing evolution of the R-2000 technical standard to ensure that R-2000 houses are “leading-edge” houses:** “Leading-edge” houses refers to houses that are energy efficient, resource efficient, minimize impact on the environment, provide a healthy indoor environment, are viable from a business perspective and affordable to consumers. This attribute incorporates the following factors:
  - Advancement of the R-2000 technical standard on an ongoing basis.
  - Ensuring that the technical standard is based on proven technologies and products that can be used cost-effectively by builders operating in a competitive marketplace.
- **Research and development:** For much of the life of the R-2000 Initiative, it has been the focus for research and development on a wide range of technical housing issues. This attribute allows the continuous advancement of the R-2000 technical standard to occur on the basis of sound building science and construction viability.

## IMPACTS OF THE R-2000 INITIATIVE

The full impact of the R-2000 Initiative on housing quality reflects the combined influence of all its attributes. This section discusses the impacts of the R-2000 Initiative in two parts: impacts of R-2000 houses and impacts of the R-2000 Initiative.

### Impacts of R-2000 Houses

About 11,000 R-2000 houses have been built and certified to date. The rate of certification in recent years is about 400 to 500 R-2000 houses per year. Each R-2000 house yields the following benefits:

- Reduced energy consumption relative to conventional housing.

- Reduced greenhouse gas (GHG) emissions.
- Increased resource conservation.
- Reduced environmental impact.
- Improved healthy indoor environment.

### Impacts of the R-2000 Initiative

The full impact of the R-2000 Initiative must recognize all of its attributes.

- **The R-2000 Initiative provides the basis for the delivery and success of a number of higher volume initiatives:** In the past seven years, a number of energy efficiency and/or environmental housing initiatives have been developed and implemented in Canada, including the following:
  - EnerGuide for Housing.
  - EnerGuide for New Housing.
  - Built Green in Alberta and British Columbia.
  - Energy Star for New Homes in Ontario.
  - PowerSmart in Manitoba.
  - Novoclimat in Quebec.
  - Green Home in the Yukon.

Each of these initiatives utilizes elements of the R-2000 Initiative or modifications of them, including technical requirements, software, testing equipment and procedures, quality assurance measures, service providers and training, i.e., the “infrastructure” of R-2000. Without R-2000, much of this infrastructure required to support these initiatives would not exist. The maintenance and evolution of this infrastructure will contribute to the ongoing delivery and evolution of these initiatives.

R-2000 technology also underpins the Super E Initiative developed to promote exports of housing technology and products in a number of countries, such as China, Japan and England. R-2000 also provides a useful basis for the requirements of forward-looking demonstration projects, such as the Net Zero Healthy Housing Initiative.

- **The R-2000 Initiative helps to accelerate the commercialization of new technologies and products:** R-2000 has stimulated considerable investment by the private sector in new goods and services. The Initiative’s commitment to leading edge houses and its corresponding commitment to research and development encourage this investment. Consequently, R-2000 contributes to the progressive advancement of housing technology, construction techniques and product development.
- **The R-2000 Initiative provides quality assurance to consumers:** The R-2000 Initiative’s quality assurance measures confirm the quality of an R-2000 house by independent third-party service providers, and the R-2000 certificate is offered and backed by the Government of Canada.
- **The R-2000 Initiative increases the capacity and professionalism of the housing industry to build high quality, technically advanced houses:** This impact is due, in part, to the technical training provided under the Initiative. Over 10,000 individuals have been trained in a variety of areas including building science, testing and evaluation techniques. This has led to the licensing of highly qualified builders and service providers.

The impact is also due to the extensive interaction between R-2000 builders and service providers. Service providers communicate new information on building science, construction details and other topics to R-2000 builders. The impact of this training is broader because of the interaction between these trained people and others in the housing industry, and their influence on them. This contributes to an expanding knowledge base and learning which, in turn, increases builder capacity throughout the new home construction and renovation industry.

- **Advanced construction techniques developed under the R-2000 Initiative have diffused throughout the housing industry, resulting in better housing in all of Canada:** This diffusion extends to the new home building industry and the residential renovation industry, beyond the other energy and environmental housing initiatives listed above. It improves the housing quality in Canada and contributes to various government policy objectives, particularly the reduction of GHG emissions. This benefit accrues because of the voluntary, market-driven approach of the R-2000 Initiative in a competitive market and the increased capacity and professionalism of the industry. This approach “raises the bar” for construction, and encourages new home builders and renovators to adopt new advanced practices in a safe and efficient manner.

In summary, the R-2000 Initiative provides an extremely effective approach and resource. The R-2000 infrastructure and the network of highly qualified people involved in the R-2000 Initiative enable the housing industry to deliver energy efficient and environmentally responsible housing on a national basis.

## RECOMMENDATIONS

The recommendations made in this report deal with three issues:

- Overall recommendation for the R-2000 Initiative.
- Key conditions and procedures for successful implementation of the R-2000 Initiative.
- Actions required to achieve a successful R-2000 Initiative.

### Overall Recommendation for the R-2000 Initiative

- **Recommendation 1: That the R-2000 Initiative be continued because of its actual and ongoing beneficial impacts on housing in Canada.**

### Key Conditions and Procedures for Successful Implementation of the R-2000 Initiative

- **Recommendation 2: That a governing body, such as an R-2000 Board, be established to maintain, improve and implement the Initiative effectively.** This recommendation includes the following subsidiary recommendations:
  - Recommendation 2.1: That the authority and responsibility of the governing Board include making and implementing decisions on the planning and delivery of the R-2000 Initiative.
  - Recommendation 2.2: That the members of the governing Board be representatives from NRCan and CHBA.

The rationale for NRCan’s representation is that it manages the R-2000 Initiative on behalf of the federal government. The rationale for CHBA’s representation is that it represents builders who build R-2000 houses. Representation from CHBA will include R-2000 builders.

- Recommendation 2.3: That the roles of each of the two organizations in the governing Board reflect their respective responsibilities:
  - NRCan will support and facilitate operational requirements of the R-2000 initiative.
  - CHBA will advise on conditions and procedures to secure the infrastructure necessary for builders to participate successfully in the R-2000 Initiative on the basis of expert advice from R-2000 builder representatives.
- Recommendation 2.4: That the governing Board develop and implement reporting requirements designed to assess the performance of R-2000 on a regular basis.
 

These reports will guide the governing Board in managing and developing plans for the R-2000 Initiative.

- **Recommendation 3: That the government commit to provide stable and predictable funding for the Initiative.**

This commitment is essential for R-2000 to be operational. It is also a condition for builders, utility companies, manufacturers and others to invest in the R-2000 Initiative. Without this commitment, builders and other parties will not perceive the Initiative as a viable business prospect and will likely decline to participate.

- **Recommendation 4: That the existing infrastructure of the R-2000 Initiative be updated, refined and continued.** This recommendation includes the following commitments:

- Recommendation 4.1: That the R-2000 technical standard be advanced on an ongoing basis to ensure that R-2000 houses remain leading edge.
- Recommendation 4.2: That research and development in support of the continuous advancement of the R-2000 technical standard be carried out.
- Recommendation 4.3: That quality assurance measures be updated.
- Recommendation 4.4: That training materials be kept current and training capabilities be in place.
- Recommendation 4.5: That a national marketing plan be developed and implemented to attract new R-2000 builders and increase consumer demand.

- **Recommendation 5: That delivery agencies make the R-2000 Initiative a priority and principal focus.**

This recommendation is made to ensure that existing and prospective R-2000 builders have the opportunity to build and certify R-2000 houses, that consumers have the opportunity to obtain an R-2000 house, and that R-2000 is retained as a leading initiative that “paves the way” for the evolution of the other energy/environmental housing initiatives.

### **Actions Required to Achieve a Successful R-2000 Initiative**

The actions recommended below are intended to ensure conditions that will result in the successful delivery of the R-2000 Initiative on a voluntary, market-driven basis and continue its positive impacts. The proposed actions are phased because some tasks need to be completed before others can be carried out.

- **Recommendation 6: That NRCan and CHBA execute a Memorandum of Understanding (MOU) to ratify key conditions and procedures noted above for successful implementation of the R-2000 Initiative.**

The MOU will include the following provisions:

- Organizational and governance conditions, including authorities of the R-2000 Board to make and implement decisions, representation on the governing Board, roles and responsibilities of CHBA, NRCan and delivery agencies, and reporting requirements.
  - A commitment to the continuous advancement of the R-2000 technical standard.
  - A commitment to update and maintain the infrastructure of the R-2000 Initiative, including quality assurance measures and training materials.
  - A commitment to market the R-2000 Initiative.
  - A commitment to ensure that delivery agencies receive appropriate direction on, and give necessary prominence to the delivery of, the R-2000 Initiative as their priority and principal focus.
- **Recommendation 7: That the R-2000 Board direct the preparation and implementation of a strategic plan based on the MOU.**

The coverage of the strategic plan is expected to focus on the following areas:

- The status of the R-2000 Initiative: This includes the completeness, currency and appropriateness of the following elements:
    - R-2000 technical standard.
    - Plan evaluation software (HOT2000).
    - Quality assurance measures, including the preparedness of service providers to provide plan evaluations, inspections, depressurization tests and airtightness tests.
    - Training, including the currency and availability of trainers and training materials.
    - Operating/procedures manuals.
    - Marketing plans and materials.
  - The capacity of provincial delivery agencies to fulfill their responsibilities: Addressing this issue should detail their responsibilities and authorities, and assess their preparedness to fulfill them.
  - The context in which the R-2000 Initiative operates and its relationship with other energy efficiency and environmental initiatives.
- **Recommendation 8: That the R-2000 Board direct the preparation and implementation of work plans and financial plans based on the results of the strategic plan.**

Work plans will address the following topics:

- Updates to elements of the R-2000 Initiative.
  - Enhancements to the capacities of provincial delivery agencies.
  - The development of marketing plans to attract new R-2000 builders and increase consumer demand for R-2000 housing.
- **Recommendation 9: That the R-2000 Board maintain effective communications with the Initiative's participants.**

## **EXPECTED RESULTS OF THE RECOMMENDATIONS AND PROSPECT FOR THE FUTURE**

Implementation of the recommendations will provide the national and uniform platform and resources to ensure that the housing sector continues to improve its performance in terms of energy efficiency and reduced environmental impact. The commitment to advancement of the R-2000 Initiative will lead to further achievements in new areas.

The following specific benefits are expected over time from implementing the recommendations:

- Increased numbers of active R-2000 builders.
- More R-2000 service providers.
- Increased consumer awareness of, and demand for, R-2000 houses.
- More R-2000 houses.
- Increased production of housing under other energy and environmental initiatives.
- Increased industry capacity.
- Progressive improvement of housing quality in general as a result of increased diffusion of environmentally responsible construction techniques throughout the housing industry.
- Increased industry engagement in, and support for, innovation.
- Increased commercialization of new technologies and products for new home construction and renovation.
- Improved retrofit systems and technologies for existing houses.
- Advancements and achievements in new areas, such as on-site energy generation from solar, wind and geothermal technology.
- Healthier homes.
- Improved homes and homeowner satisfaction.