interior environment through the proper selection, design and assembly of building components and mechanical systems. Work to be carried out will include studies on the characteristics of building enclosures as environmental separators, the heat and moisture transport properties of insulations and other materials, the performance of environmental control systems and equipment, energy requirements for heating and cooling, and the quality of environmental conditions in relation to functional requirements.

The facility for testing building components over a wide range of temperatures will include three sets of "warm" and "cold" boxes. The "cold" boxes will be cooled by a low temperature chiller and the "hot" boxes will be heated electrically. The boxes will be designed primarily for testing wall and window assemblies up to a maximum size of 24 feet square.

The laboratory also will include new calorimeter facilities, not at present available in Canada, for determining cooling loads, lighting factors and environmental conditions with various arrangements of windows, luminaries and room air distribution systems.

Another special feature will be a central digital data logging station connected to the various laboratories. This system will be used for the control of research equipment, as well as for automatic recording of measurements for later processing.

Because of its special functions, the building will be air-conditioned. Its complex mechanical and electrical services will be in a basement that will be completely underground. Although the structure of the building is not experimental, the walls, roofs and windows will incorporate principles of design that the Division has been putting forward in publications and seminars.

Enclosure design has grown largely out of tradition and from practices in other countries, according to A. G. Wilson, Assistant Director of DBR. In the past, factors determining design requirements changed slowly and necessary compensating changes in practice could be based on long-term experience. In recent times, a number of new factors have been introduced relatively quickly, for example: the demand for humidification in winter; increasing height of buildings; use of large glass areas; new materials and components; increased industrialization and changing assembly processes; and demands for increased amenity, particularly with reference to air conditioning and lighting. There is a need to identify the principal elements of building science involved and to develop a comprehensive building technology so that the most rational choices can be made in design. This is one of the primary tasks of DBR.

As an example, Mr. Wilson points to the usual current practices of insulating buildings from the inside and putting the skeleton of the buildings – floor ends and most of the wall components – towards the outside and also to the practice of attempting to provide a perfect seal against both air and rain penetration at the exposed outer surfaces of joints. The seal on that one external surface has to cope with wind, rain and great extremes of heat and cold.

Mr. Wilson says that exposed structural load-bearing parts are being put to the worst kind of environmental conditions, offering ready paths and mediums for heat transfer, condensation and rain penetration, with all that implies in terms of deterioration of building materials. He says it appears that instead of one surface acting as the buffer to a host of environmental attacks there should, in fact, be an outer surface that sheds the rain without at the same time having to cope with wind pressure that will inevitably drive the rain into the main wall structure, and an inner air barrier which carries the wind loads.

DBR has identified several basic principles for the design of building enclosures (walls, windows, roofs) and there is a great interest in the application of these principles to practical design problems. Experimental and analytical studies are required to develop detailed design recommendations. At the present stage of building science, evaluating the adequacy of many designs, particularly the more complex ones, requires observation of performance of large-scale specimens under simulated use-conditions. The Environmental Laboratory is needed for this and other related studies.



Warm humid air inside buildings leaks through walls where water vapor condenses and leaches salt out of the brick. When the water evaporates, an ugly barnacle-like crust is deposited.

L'air chaud et humide passe à travers les cloisons. Ensuite, la vapeur d'eau se condense et extrait par lessivage les sels contenus dans la brique. Une fois l'eau évaporée, il se forme une croûte sur les murs.