

The Design of Tuberculosis Sanatoria in late Nineteenth Century Canada

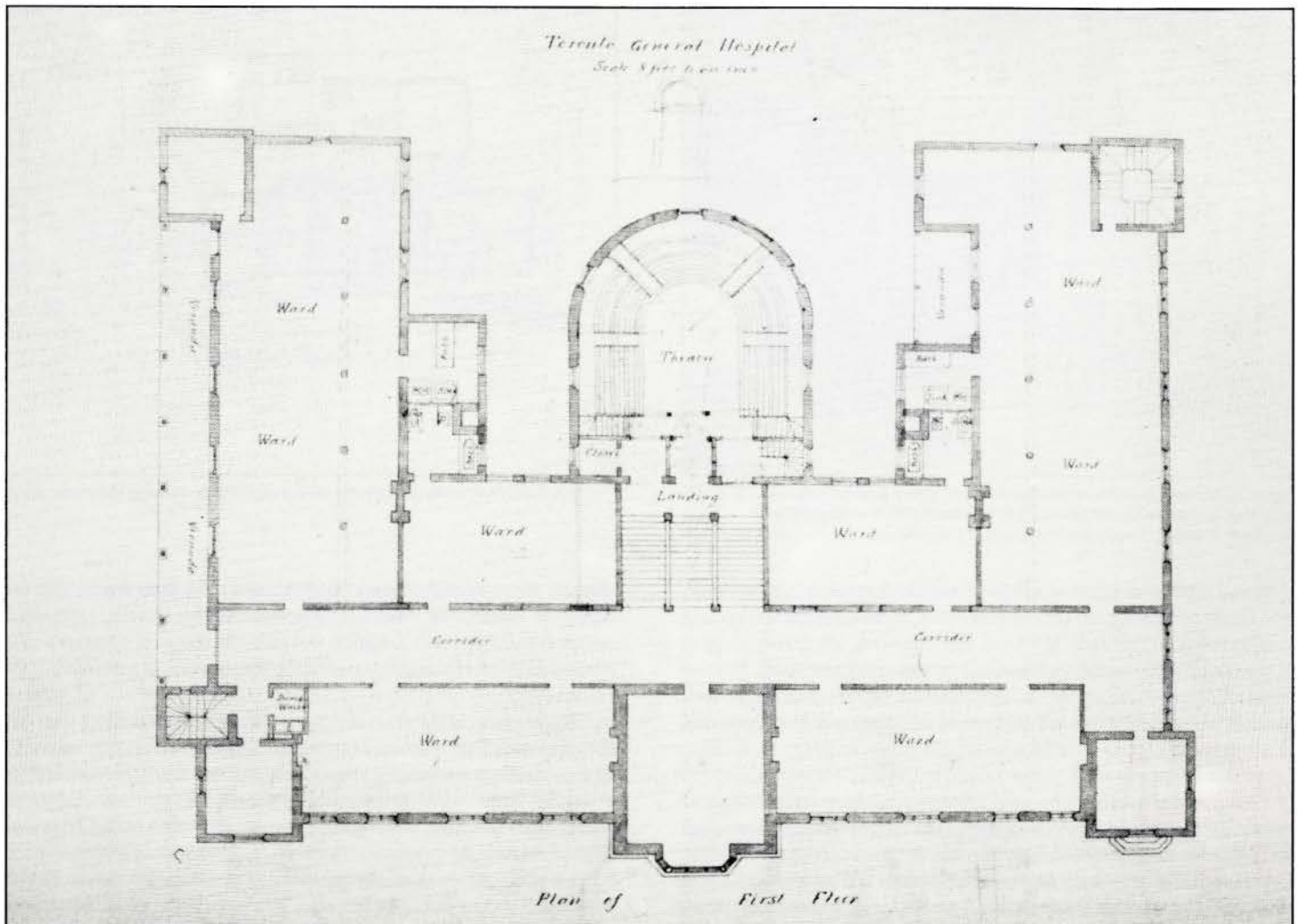


Figure 1. Plan of first floor, Toronto General Hospital, 1854. William Hay, architect. (Archives of Ontario)

By Leslie Maitland

The miracle of the empty beds, it has been called.¹ By the middle of this century, a doctor or nurse could look down the length of a ward or porch in a tuberculosis sanatorium and congratulate himself or herself on the number of empty beds. Canada's number one killer, consumption (or the white plague, as it was also known), had been brought under control. The battle against tuberculosis had many combatants: scientists, doctors, nurses, veterinarians, public health officers, teachers, legislators, philanthropists, and, of course, the patients themselves. This article examines the role played by architecture in the battle against tuberculosis, from the opening of the first sanatorium in Canada in 1897, until 1917, by which time it may be said that the building type reached the shape it would follow for the next thirty years. This paper shall examine the origins of the sanatorium building, note the principal sanatoria built in Canada, and conclude with a few remarks on the influence of sanatorium design upon architecture in general.

Tuberculosis is a bacterial infection. While the bacteria may invade any part of the body, the lungs are particularly susceptible. When the

tubercle bacteria invade the lungs, the body's immune system tries to contain the invasion by putting up a fibrous growth around the bacteria. As the body cannot keep up with the spread of the bacteria, the growths spread in the lungs, forming a large, curd-like mass. Eventually the lung tissue cannot support this mass. It bursts, spreading bacteria farther in the lungs, and causing the victim to cough germ-laden tissue. The bacteria is expelled into the atmosphere or, as was common one hundred years ago, was spat upon the ground, where it mixed with the dust, blew up in the eddying air currents, and then infected the next person.

Cushioned as we are by our medical and public health system, it is difficult for us to imagine the devastating effect tuberculosis had on society a hundred years ago. In the late nineteenth century, approximately 8,000 people died annually in Canada from this disease.² A diagnosis of tuberculosis was a death sentence; quickly or slowly, tuberculosis always killed. Pulmonary tuberculosis, which in the 19th century could only be diagnosed in an advanced state, was characterized by weight loss, listlessness, coughing, expectoration of bloody

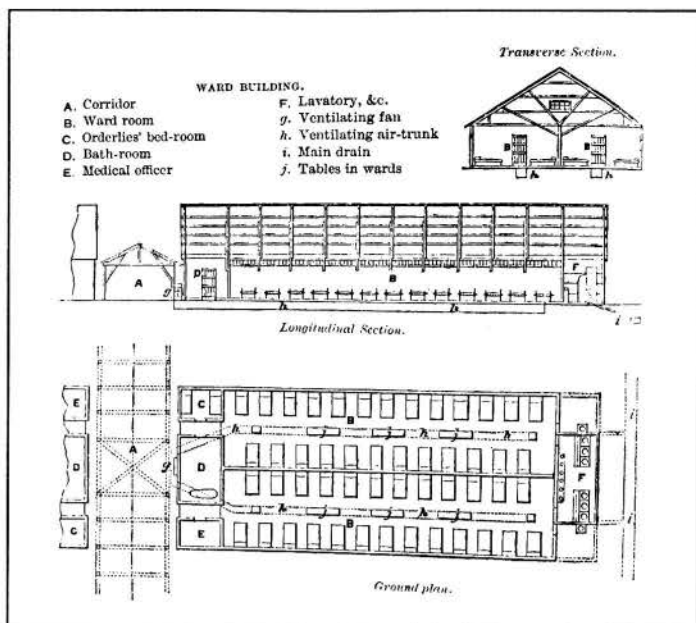


Figure 2. A Brunel pavilion, erected at Renkioi, Turkey. Isambard Brunel, engineer. (Isambard Brunel, *The Life of Isambard Kingdom Brunel: Civil Engineer* [London: Longmans, Green, 1870], p. 470)

matter, inability to resist secondary infections, haemorrhaging, fever, and finally delirium, suffocation, and death. Most affected were young people between the ages of fifteen and forty-five, when they were at the peak of their youth and earning power and most likely to have dependents. It is impossible to calculate the suffering of the victims themselves, and of those left parentless in a society with only charity as a safety net.

There was virtually nothing the medical profession could do for the consumptive. Before 1882, the cause of the disease was unknown, and in the absence of facts, dangerous myths guided treatment.³ The disease was thought, variously, to be hereditary, to result from a life of dissipation, to travel in the night air, or to be an emanation from damp ground. There was very little written about tuberculosis in Canada's medical journals, since there was nothing to say about a disease whose cause was unknown, and which always brought death. General hospitals refused to accept TB patients, not from fear of infection, since the contagiousness of the disease was not yet known, but because consumptives took an unreasonably long time to die, occupying a bed that might otherwise be given to someone whose medical problem was perhaps curable. The tubercular died at home, after passing on the disease to loved ones who had nursed him.

But in 1882 an event of tremendous significance took place, shaking the medical profession from its helplessness and giving hope to millions. In that year, a German scientist, Robert Koch, isolated the tuberculosis bacterium, proving that the disease was contagious. This was a shattering discovery which many refused to believe; there had been false claims made before in relation to TB and this was thought by the medical profession to be yet another. This business of bacteriology was relatively new, and many doctors did not grasp its significance. Koch's experiments were repeated again and again on both sides of the Atlantic, the results discussed in journals,⁴ at medical conferences, and in the popular press⁵ before the significance of his discovery was understood. But understood it was, by scientists and laymen alike: if TB was contagious, it could be controlled. In the treatment of the

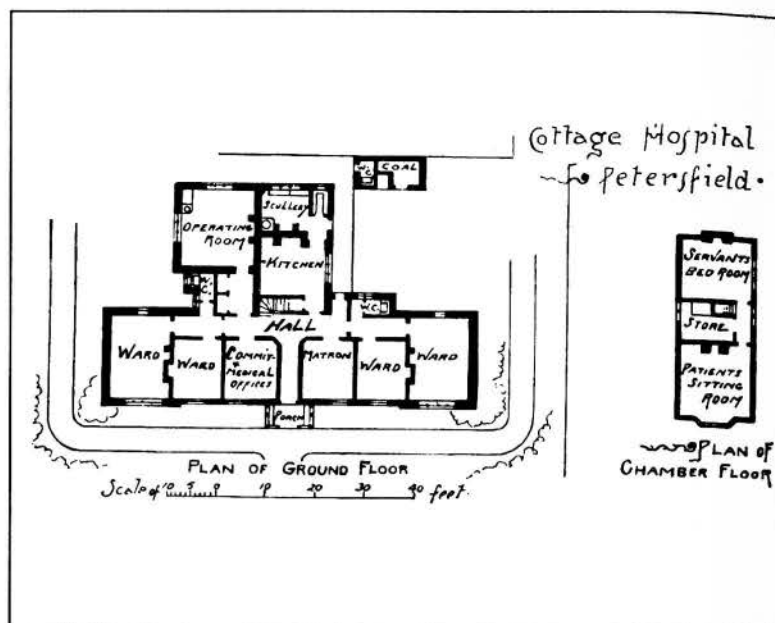


Figure 3. Petersfield Cottage Hospital. (Henry C. Burdett, *Cottage Hospitals: General*,

disease, those already ill could find remission for their illness in isolation from others, rest from labour and stress, a good diet, supervised exercise, fresh air, and sunshine. All of these things suggested a new kind of institution designed specifically for the TB patient.

Why were existing general hospitals incapable of dealing with the tuberculous? The reasons were both architectural and operational, and can be seen by looking at one hospital, the Toronto General,⁶ as it was in William Hay's design of 1854 (figure 1). The designs of mid-century hospitals were based on an unclear idea of the origins of disease, since germs were as yet unknown. Rather, they were designed according to the miasma theory of disease. Disease was thought to travel in damp or enclosed air, so a free circulation of air was desirable.⁷ Consequently, each ward in the General had many windows in order to encourage cross ventilation. This hospital also had a ventilation system of flues and ducts embedded in the walls to encourage an upward draft from the basement to the roof. Though touted as the latest thing in hospital design, it was found not to work.

In other regards, the construction of this building was like the construction of any other large public building of its time: brick exterior walls, lath and plaster interior finish, wood floors, deeply carved mouldings around doors and windows—all very difficult to clean. There was an awareness of a relationship between dirt and disease, but all that meant in the years before an understanding of bacterial infection was that the corridors were swept out occasionally and the sheets changed once a week. Only a wall separated ward from ward, and there was no kind of lobby or air lock to form a barrier between wards. The ward system allowed isolation by sex, and medical from surgical cases, but there was no significant physical barrier between the wards, and this, coupled with easy movement between wards and the ignorance of antiseptic methods, made such hospitals a principal source of contagion. For diseases known to be contagious, such as diphtheria, typhus, and small pox, special structures were erected only in the case of epidemic. There was no understanding that TB was contagious, and therefore no isolation for its victims. They were a



PLEASANT COTTAGE HOSPITAL

Fever and Convalescent, 3rd. ed. [London: Scientific Press, 1896], p. 250)

menace to others in such an institution, and a stay in such a place would have been of no benefit to them had they been admitted.⁸

Koch's discovery underlined the inadequacy of the general hospital in treating TB. Perceiving the need for a different type of institution, Canadian publisher William Gage called together a group of doctors and concerned philanthropists in Toronto in 1895;⁹ one year later they founded the National Sanatorium Association, whose aim was to build just such separate institutions in every part of the country, accessible to all.¹⁰ Finding encouragement for his project, Gage set out to study those few sanatoria that existed in England, Germany, and the United States, and to seek guidance in the construction of Canada's first TB sanatorium.

Isolation, fresh air, sunshine, supervised diet and exercise, and morale-boosting diversions: how were architects to design institutions that provided such things? Fortunately, they had some sources to turn to for inspiration. These sources were principally three: military hospital design, the cottage hospital movement, and recent innovations in building technology.

Medical advances are often made in wartime; this was especially true of the Crimean war. During this war, English engineer Isambard Brunel devised small, transportable, self-contained wards, called pavilions (figure 2), for service in the Crimea.¹¹ They were more permanent structures than Nightingale's tents, but the principles of fresh air, isolation, and greater sanitation guiding their design were the same. Although they were in service only a short period, their effectiveness was obvious, and quickly became well-known in medical circles. Each building or pavilion had plenty of windows, and furthermore it was well isolated from its neighbours and its sanitation was self-contained. Although pavilions had been used effectively before, such as at the Naval Hospital in Plymouth, built in the 1750s, it was the Crimean war that gave pavilion hospitals particular prominence and showed that a cheaply constructed building could be successful in containing disease. Both sides in the American Civil War used a

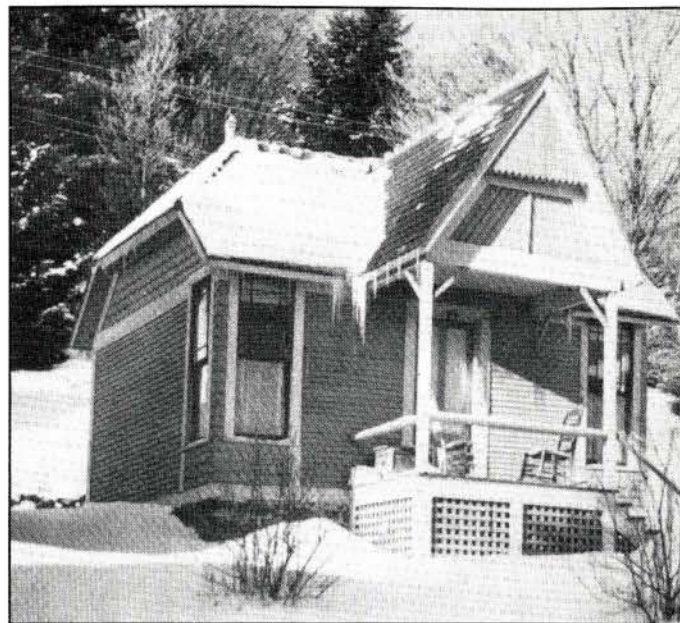


Figure 4. Adirondack Cottage Hospital, Saranac Lake, New York State. First cottage, called "Little Red," built in 1884. (National Archives, Records of the Canadian Tuberculosis Association, MG 28, 175, Vol. 20)

variation on the Brunel pavilion, and it became the model for isolation wards on both sides of the Atlantic.¹²

The second major source of influence in sanatorium design was the cottage hospital movement. Begun in England in 1859, this was an attempt to provide hospital care for the rural poor close to their homes, rather than transporting them great distances to crowded and unhealthy city hospitals. Cottage hospitals (figure 3) were small and locally-funded and run, and had an uninstitutional, homelike atmosphere.¹³ In Canada, in the second half of the nineteenth century, there were a number of cottage hospitals; in smaller centres they were in fact the general hospitals.¹⁴ What the National Sanatorium Association saw in the cottage hospital movement were small, relatively inexpensive structures, perhaps without surgical facilities, having aesthetically pleasing designs that would lift the morale of long-term patients. Architects could study their design in the several publications on cottage hospital design, notably Henry Burdett's *Cottage Hospitals*.¹⁵ More specifically, there was the Adirondack Cottage Sanatorium in Saranac Lake, new York, as an example to follow.

The Adirondack Cottage Sanatorium (figure 4) was founded by a New York physician named Edward Livingston Trudeau.¹⁶ In 1875 Trudeau was told he had TB. He decided to end his life in the out-of-doors that he so loved, in the countryside of northern New York State. To his amazement he got better, and while recuperating he read an article written by Dr. Behmer of Germany, who was having some success in the outdoor treatment of TB patients in Goebersdorf, Germany, at his sanatorium, which opened in 1856.¹⁷ Both Trudeau in the United States and Brehmer in Germany had, by an empirical understanding of the disease, hit upon the value of isolation, rest, moderate exercise, controlled diet, and diversion in the struggle against TB. Koch's discovery in 1882 served to underline the value of their approach. Two years later, Trudeau established his own sanatorium at Saranac Lake in a modest cottage (figure 4).¹⁸ He added nine more cottages by 1894.¹⁹ Through this institution passed a number of Canadian doctors, both as patients and as observers.

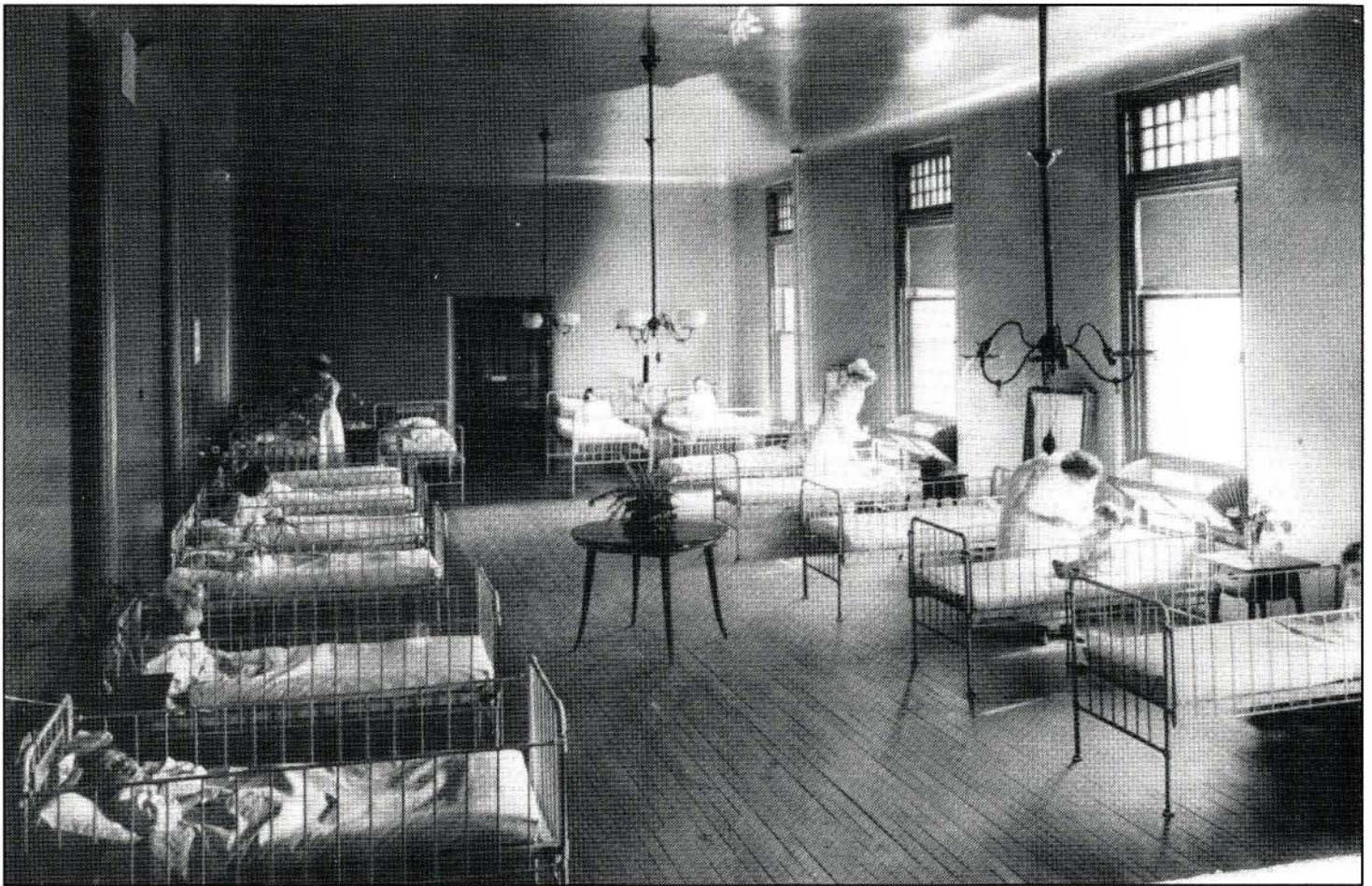


Figure 5. Ward in Sick Children's Hospital, Toronto, Ontario. (NAC, C 91313)

Military and cottage hospitals provided architects with models for small isolated buildings, well ventilated, relatively inexpensive to build and to operate, and visually satisfying in design. But Koch's discovery told them they needed a third element: they needed an interior architecture that could be easily and thoroughly cleaned to eliminate the tubercle bacillus in the dust, thereby reducing the dangers of reinfection. Hospitals had already made some advances in the introduction of dust-free environments in the 1880s, largely as a result of Sir Joseph Lister's work twenty years earlier on sepsis and antisepsis.²⁰ To minimize places where dust and therefore disease might lodge, architects designed interiors with as few mouldings as possible. Baseboards, cornices, chair rails, door and window mouldings, window sills, and other projections were eliminated as much as possible. The junctures of walls, ceilings, and floors were rounded to facilitate cleaning. Articles in architectural magazines and books on hospital design gave clear instructions on how this was to be done.²¹

New materials and improvements to existing materials entered the war against bacterial infection. What was needed were non-absorbent, scrubbable surfaces. Fine-graded portland cement, rather than plaster, was recommended for walls, because of its non-absorbent nature and resistance to knocks. New enamel paints applied to these walls were non-absorbent and scrubbable, unlike the wallpaper and tints of previous years. Linoleum and terrazzo were relatively new in the market, and their sanitary nature was quickly appreciated. Because of their expense they were at this time limited to operating rooms. Ordinary wood floors were still used elsewhere, but it was recommended that only hardwoods such as maple and oak be used, and that

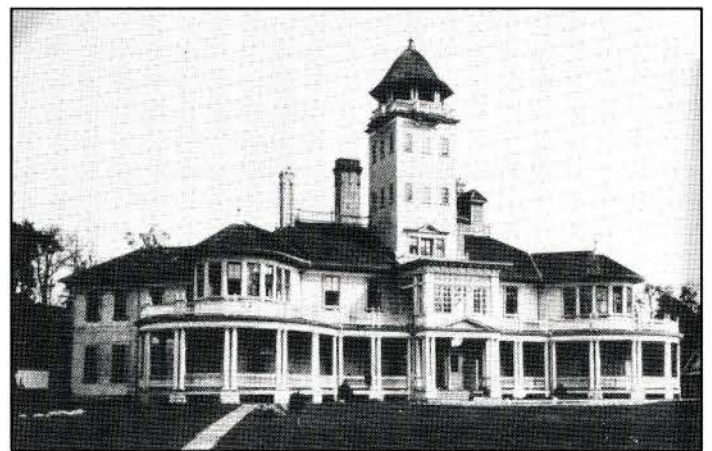


Figure 6. Main building, Muskoka Cottage Sanatorium, 1897. G.M. Miller, architect. (Archives of Ontario)

they be saturated with paraffin to seal the grain and the seams between the boards. Glazed tiles came into more common use in hospitals for operating rooms, kitchens, bathrooms, and corridors. The results of these changes in building technology were hospital wards such as those in Sick Children's Hospital, Toronto (figure 5). Here, one can see the recessed door and window mouldings, cove ceilings and corners, and the high gloss of the paint on the walls. The minimalist effect of this kind of interior design strikes our eyes as startlingly modern. These changes in new materials and in the use of existing materials were being made in hospitals in general. At the same time, improvements in the

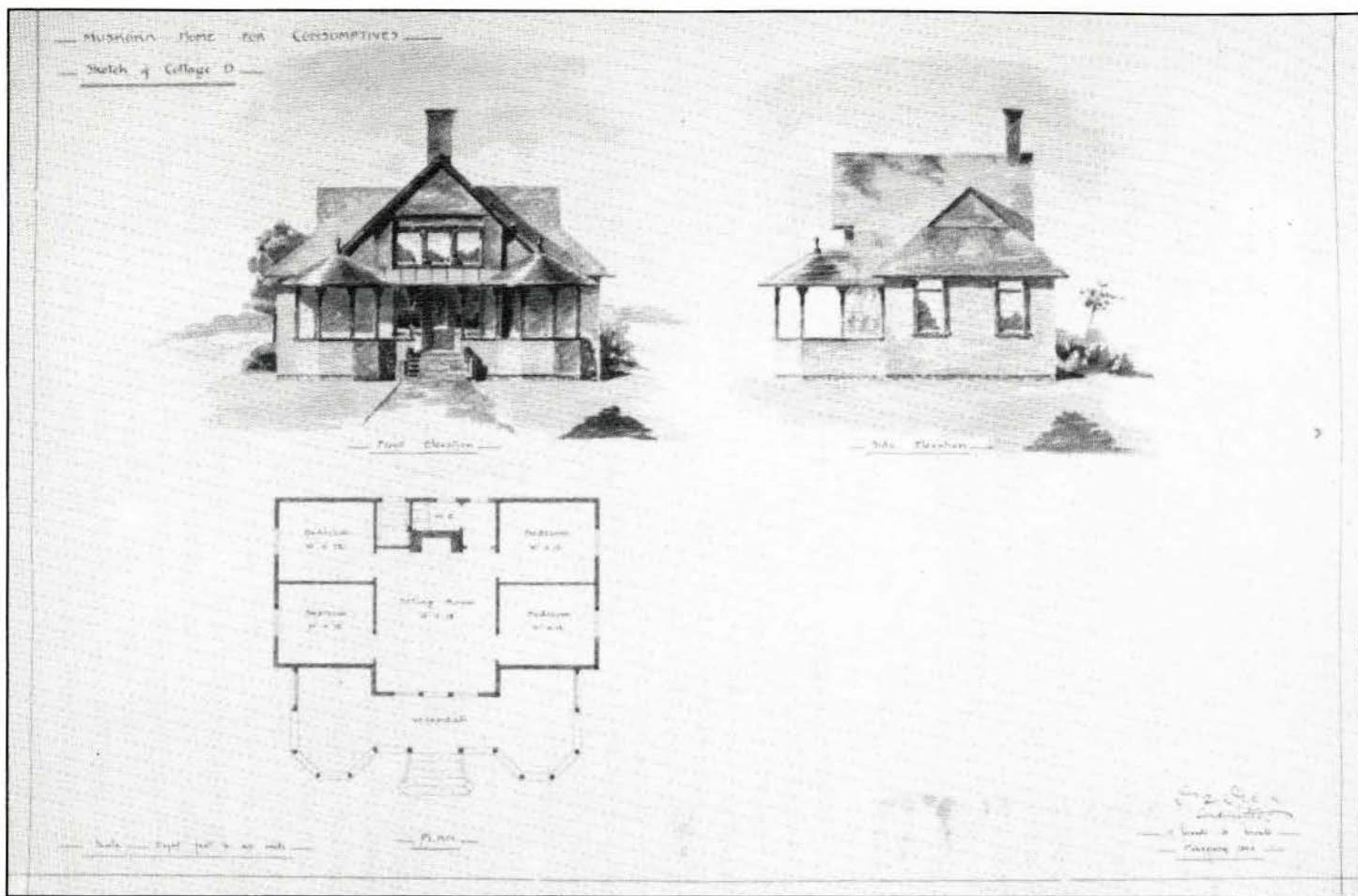


Figure 7. Plan of Cottage "D," Muskoka Cottage Sanatorium, 1898. D.B. Dick, architect. (Archives of Ontario)



Figure 8. Kentville Sanatorium, Kentville, Nova Scotia. J.M. MacGregor, architect. (Public Archives of Nova Scotia)

design of operating rooms, kitchens, sewage, water supply, and heating systems began to change hospital construction for the better as well.

The Muskoka Cottage Sanatorium (figure 6), the first institution built under the aegis of the National Sanatorium Association, opened in 1897, fifteen years after Koch's discovery. It may have been a long time coming, but its design had been well considered, and it quickly proved its worth. The central building, which contained administration, dining, operating, nurses' accommodation, and wards, was designed by Toronto architect G.M. Miller.²² The cottages (figure 7)

to either side were by D.B. Dick, and Burke and Horwood, also of Toronto. Located on the shores of a lake near Gravenhurst, it was well isolated from any populated area. Its northern exposure was protected from cold winds by a dense forest, and the southern exposure was faced with verandahs on two levels so that patients might spend days and nights outside. The wooden construction and the subdivision of patients by degree of infection were borrowed from the Brunel pavilion. More serious cases were confined to the centre building while those on the way to recovery stayed in the cottages, safe from reinfection.²³ The cottage hospital boasted the latest in linoleum and tile floors, and cement-lined walls. The architectural style of the building, like that of the cottage hospitals, was intentionally pretty, cottage-like, and cheerful, stylistically akin to the design of cottages and resort hotels of the period. Its wooden construction made it relatively less expensive to build than a masonry hospital, and it was felt that in case of fire, patients could be safely evacuated from a building limited to two storeys in height.

The institution contained all that was needed to repair the body and maintain the spirits during a stay that could last for years. Diversions for those on the way to recovery included canoeing and sailing, tobogganing and snowshoeing, as well as billiards, cards, handicrafts, and amateur theatricals put on by patients and staff.

In a short time, this institution could report remissions in many of the cases admitted.²⁴ These good results, achieved with a relatively small investment, encouraged other groups, besides the National Sanatorium Association, to erect cottage sanatoria along very similar



Figure 9. *Ninette Sanatorium, Ninette, Manitoba, 1910. (Manitoba Archives)*

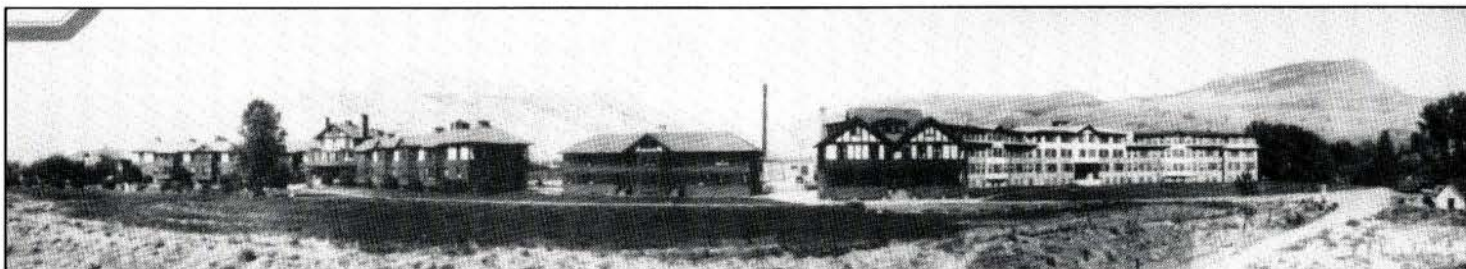


Figure 10. *Sanatorium, Tranquille, British Columbia, 1907. W. T. Dalton, architect. (NAC, PA 30768)*

lines. Some of these others were the Kentville Sanatorium, Kentville, Nova Scotia (**figure 8**);²⁵ Jordan Memorial in River Glade, New Brunswick; Ninette Sanatorium, Ninette, Manitoba (**figure 9 and cover**); the Lake Edward Sanatorium, Lake Edward, Quebec; the Laurentian Sanatorium, Ste-Agathe-des-Monts, Quebec;²⁶ the Niagara Sanatorium, St. Catharines, Ontario; and the Muskoka Free Sanatorium, also in Gravenhurst, Ontario. Most were laid out much like the Muskoka Cottage Sanatorium: central administration building for the bed-ridden, outlying cottages for the ambulatory, isolation from settlements, isolation within the institution, buildings oriented towards the sun and air with lots of verandahs and large windows, wooden construction, a home-like atmosphere, created in part by an architecture of studied picturesqueness.

While the cottage hospital sanatorium undoubtedly had good results, not everyone was convinced that it was the only route to success against TB. In planning the TB Sanitarium in Tranquille,

British Columbia in 1907, Dr. C.A. Fagan pointed out some of the problems of both the single building institution and the cottage hospital:

As regards the kind of building to be erected, there are many considerations to be taken into account. Should one adopt the ideas of Brehmer and Deitweiler, and have a closed institution in a single building, or adopt the ... cottage system, with its central administration building? The ... [closed institution in a single building] was supposed, at one time, to fulfill the requirements of both of the above, but it is undoubtedly open to many objections, chief among which may be mentioned, the institutional aspect it gives to life.

The cottage system, as carried on in this country, imparts to the atmosphere a home-like influence which is much to be appreciated, but the supervision

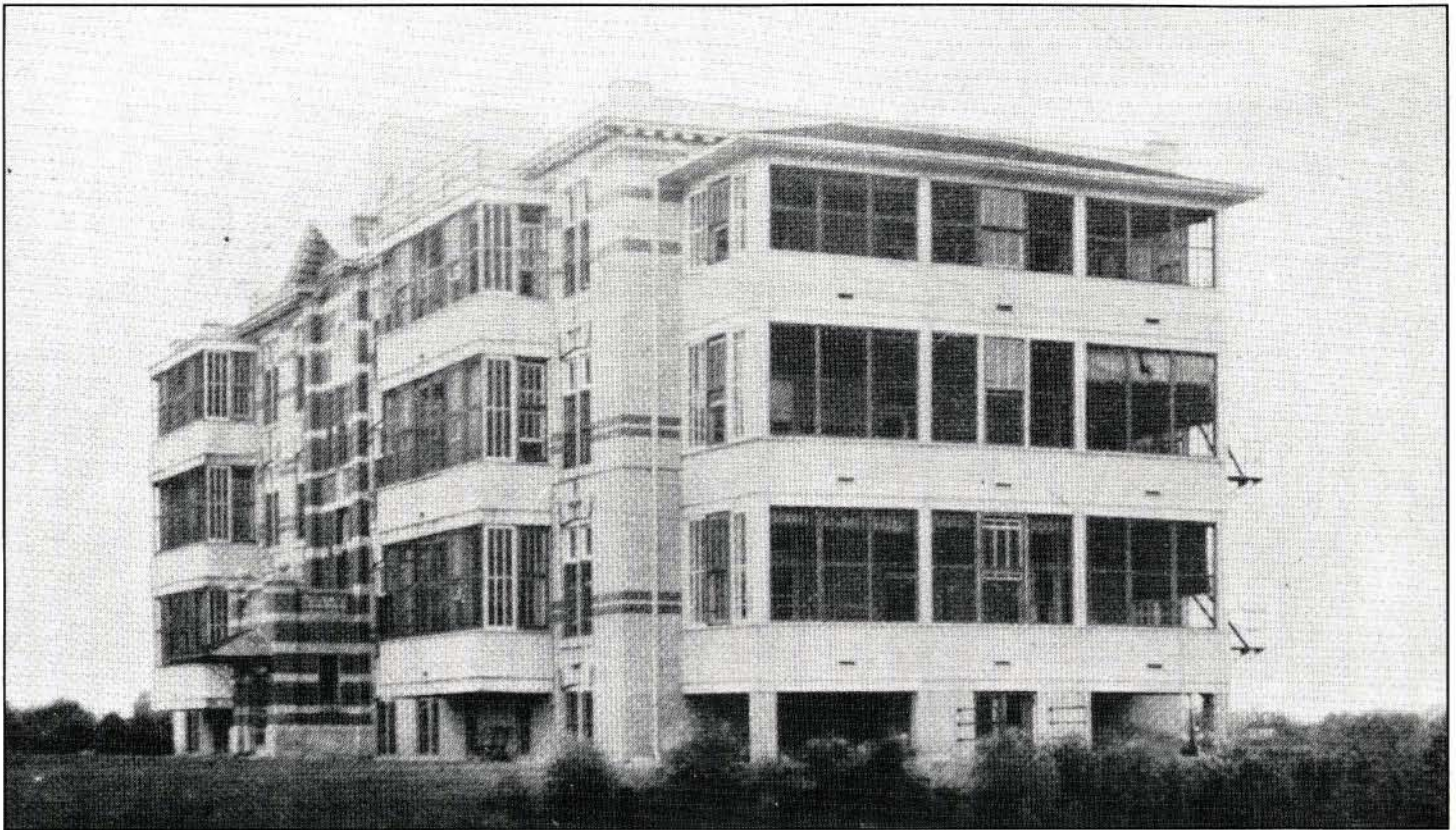


Figure 11. King Edward Memorial, Winnipeg, Manitoba. (Manitoba Archives)

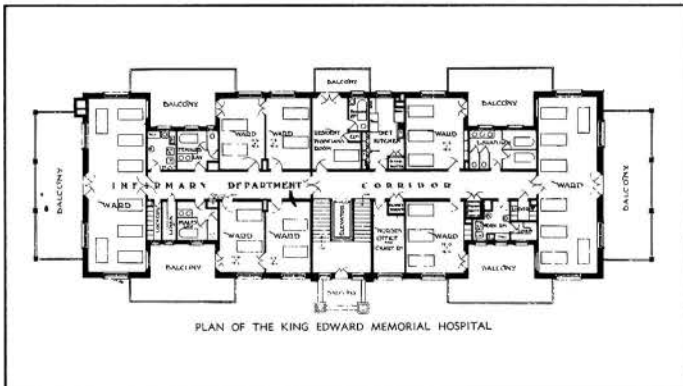


Figure 12. Plan of King Edward Memorial, Winnipeg, Manitoba, 1909. (Manitoba Archives)

cannot be nearly as thorough. The cost of maintaining the cottage system is considerably higher than in the closed institution with its single building.²⁷

Given these objections, doctors went on to demand the creation of yet another type of institution, a marriage of the cottage hospital tuberculosis "san" and the urban general hospital. These structures could be erected in suburban locations, accessible to cities, thereby making transportation of patients, family visits, and the daily life of medical staff easier.²⁸ The buildings themselves were still oriented towards the sun, still faced with as many verandahs as the design could accommodate, and still incorporated nonabsorbent, scrubbable materials with as few dust-catching mouldings as possible. Instead of many, small buildings there were fewer buildings, larger and more compact. **Figure 10** shows the sanatorium that was erected at Tranquille, British Columbia, as a result of Dr. Fagan's work on the

problem. This tighter plan facilitated heating, patient care, and supervision. Separation of types of TB patients was effected within these large buildings by the use of private or semiprivate rooms (**figure 12**).²⁹ In sanatoria, private and semiprivate rooms were introduced principally for this purpose, and not as a distinction of ability to pay. Newly-introduced electric bells made it possible for nurses to supervise patients in private and semiprivate rooms.

Many of these newer buildings were built of masonry, since they were more than two storeys in height and had to be more fire resistant. Some of these new suburban TB sans were the Mountain Sanatorium, Hamilton, by Stewart and Witton, 1913,³⁰ the expanded Niagara Sanatorium, St. Catharines; the Lady Grey and the Perley Institute, Ottawa;³¹ the King Edward Memorial San, Winnipeg (**figure 11**); and the Toronto Free, Queen Mary, and King Edward Sans, Weston. As the Weston Sanatorium illustrates, the doctors and architects sacrificed the psychologically positive effects of picturesque design for more efficient patient care.

Is it possible to evaluate how successful these institutions were? Exercise, good diet, rest, mild diversion, fresh air, and sunshine might have been beneficial to the desperately ill in almost any structure. But the records kept by these institutions show that many who otherwise did not expect to live walked away from them, sufficiently recovered to resume their normal lives.³² In isolating those known to be infectious, and in teaching the ill how to care for themselves without infecting others, these sans performed a great service to the health of the general public. In 1901, deaths due to tuberculosis were 180 per 100,000 of the population; by 1921, deaths due to TB were reduced to 87 per 100,000.³³ The sanatoria, along with the accomplishments of the public health movement, can take much of the credit.

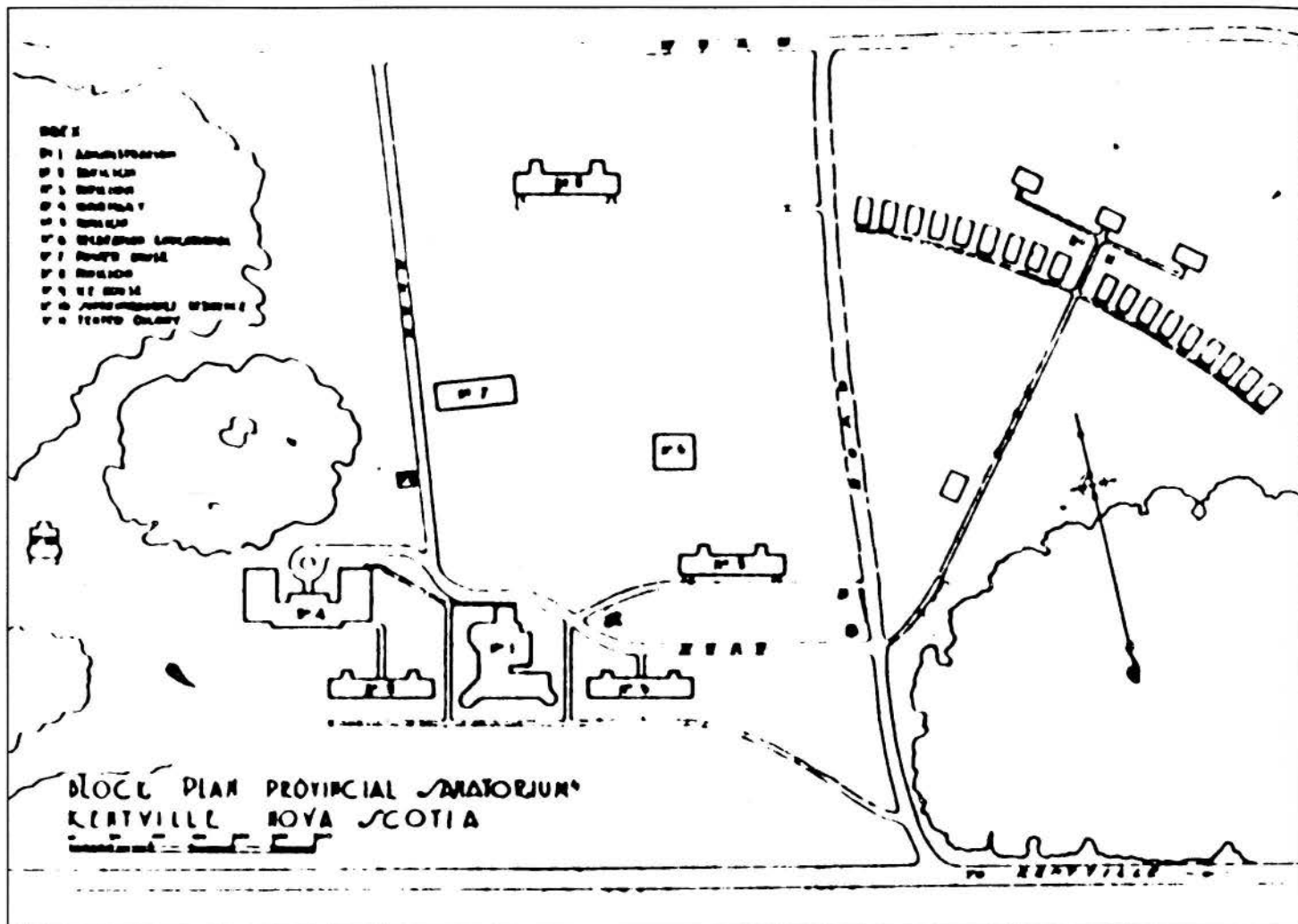


Figure 13. Site plan of Kentville Sanatorium, after expansion. (*Construction*, Vol. 10, No. 9 [September 1917] pp. 318-25)

As for the quality of the visual design of these buildings, there was a general attitude among those who set up the sanatoria that an attractive design was “a great aid to the cure of sickness, ... by diverting the mind from the pain of the body with cheerful and pleasant surroundings.”³⁴ The sanatorium is not the first instance in which buildings were designed aesthetically in a way meant to influence the psychological state of those housed within. Prison design was an earlier and better known case of architecture designed in a way meant to manipulate the mental state of those within its walls. One cannot state definitively that the attractive designs of the cottage sanatoria hospitals worked, but, subjectively speaking, one could come to one’s own conclusions whether one would prefer a protracted stay in the Muskoka Cottage Sanatorium or the Toronto General.

However successful the sanatoria were, their chief drawback was that there were not enough of them. But World War I took care of that. More soldiers died of disease (principally tuberculosis) in that war than of wounds inflicted by the enemy.³⁵ By 1916 a flood of desperately ill young men began to return home, and there was nowhere for them to go. Their return threatened to eliminate all the advances made in the fight against TB during the previous two decades. The federal government — until now responsible only for the health of Indians, immigrants, and domestic animals³⁶ — charged the Military Hospitals Commission³⁷ with construction of sufficient sanatorium accommodation for these young men. The architect in charge of this pro-

gramme was Captain Symons of Symons and Rae.³⁸ Many of the army doctors participating in this programme were the same doctors who had built the existing TB sans in the prewar years.³⁹ The sanatoria were taken over by the Commission, enlarged, and when the soldiers were well enough to return home, enough beds remained to treat those civilian TB sufferers for whom sanatorium treatment was advised (figure 13).⁴⁰

Construction of tuberculosis hospitals continued throughout the 1920s, 30s, 40s, and even into the 1950s. The buildings erected were based upon the principles established during the twenty-year period from 1897 to 1917. In 1943, a further advance was made in the battle against tuberculosis. In that year, the antibiotic streptomycin was found to be effective in eradicating the tubercle bacillus. This discovery made the TB sans largely unnecessary, and one by one the sans closed or were turned to other purposes.

But the lessons learned in the construction of tuberculosis sanatoria were applied elsewhere. The advances made by the TB san, especially in the field of sanitary construction, were quickly picked up in new general construction.⁴¹ The doctors who spearheaded the sanatorium movement were also the same doctors who led the public health movement, which pressed for the sanitary inspection of buildings. Once building inspection became an established practice, architects brought the lessons they had learned in san design to bear

upon the design of other types of public institutions where sanitary environments were now perceived as necessary. Schools, prisons, asylums, factories, even barns were now designed with a mind to the reduction of TB and other communicable diseases. The concern for a healthy living environment, clean, dust free, open to light and air, radically altered attitudes towards public sanitation, personal hygiene, parks, and virtually all types of building. House design changed as well. Houses of the early twentieth century⁴² featured sleeping porches,

more windows, more verandahs, improved plumbing and heating systems, and building materials that facilitated cleaning, such as linoleum, glazed tile, and enamel paints. It may well be that the reductionist approach to modern interior design can trace its origins partly to the public health movement. By the end of World War II, the sanatoria across the country were beginning to close, but the lessons learned in the 1897-1917 era form a foundation of the architecture with which we live today.

Endnotes

- 1 George Jasper Wherrett, *The Miracle of the Empty Beds: A History of Tuberculosis in Canada* (Toronto: University of Toronto Press, 1977). Wherrett covers the history of the battle against the disease in this book, while making only passing reference to the sanatoria buildings themselves.
- 2 This is a generally quoted figure. Statistics on deaths from tuberculosis in Canada were only available in Ontario and Quebec. Charles P. Lusk, "Statistics in Tuberculosis in Ontario," *Canada Lancet*, Vol. 35, No. 5 (January 1902), p. 350.
- 3 "Sir Alexander Chrichton, Practical Observations on the Treatment and Cure of Several Varieties of pulmonary consumption; and the effects of the Vapour of Boiling Tar in that Disease," [London: Loyd and Son, 1823] book review in *The Quebec Medical Journal*, Vol. 1 (April 1826), pp. 72-80.
- 4 J.E. Graham, "The Bacillus Tuberculosis in its Practical Bearing on the Diagnosis, Prognosis, and Treatment of the Disease," *Canada Lancet*, Vol. 15, No. 12 (August 1883), pp. 356-62.
- 5 John Furgusen, "Consumption — A Hopeful Outlook," *The Canadian Magazine*, Vol. 1, No. 8 (October 1893), pp. 628-33.
- 6 Description by W.G. Cosbie, *The Toronto General Hospital, 1819-1965: A Chronicle* (Toronto: Macmillan, 1975), p. 66.
- 7 John D. Thompson and Grace Goldin, *The Hospital: A Social and Architectural History* (New Haven and London: Yale University Press, 1975), p. 127.
- 8 Toronto hospitals did not admit TB patients until 1901. "Editorial notes," *Canadian Lancet*, Vol. 35, No. 4 (December 1901), pp. 272-73.
- 9 John J. Heagerty, *Four Centuries of Medicine in Canada* (Toronto: Macmillan, 1928), Vol. 2, p. 227; also, G.C. Brink, *Across the Years: Tuberculosis in Ontario* (n.pub.: n.pl., [1960]), p. 30.
- 10 Interview with Gage in *Calgary: The Denver of Canada; Its Adaptability as a Health Resort and as a Site for the Dominion Sanatorium for the Treatment of Consumptives* (Calgary: Calgary Herald, 1895).
- 11 Thompson, p. 153.
- 12 Such as the St. Paul Hospital, contagious wards, Montreal. "Montreal Notes," *Canadian Architect and Builder*, Vol. 18, No. 2 (November 1905), pp. 173-74.
- 13 Henry C. Burdett, *Cottage Hospitals: General, Fever and Convalescent* (London: Scientific Press, 1896), 3rd ed.; 1st ed. 1877.
- 14 [Lady] Tilley, *Victoria Cottage Hospital* (Saint John, N.B.: J. and A. Macmillan, 1888), p. 10.
- 15 Burdett, op. cit.
- 16 Philip L. Gallos, *Cure Cottages of Saranac Lake: Architecture and History of a Pioneer Health Resort* (Saranac Lake: Historic Saranac Lake, 1985), pp. 3ff.
- 17 Robert Taylor, *Saranac: America's Magic Mountain* (Boston: Houghton Mifflin, 1986). Brehmer's work was known in Canada at this time. See P.H. Kretzschmar, "Dr. Brehmer's Model Sanatorium [sic] for the Treatment of Phthisical Patients in Goerbersdorf," *The Sanitary Journal*, Vol. 4 (January/February 1880), pp. 132-39.
- 18 Taylor, p. 100.
- 19 S. Adolphus Knopf, *A History of the National Tuberculosis Association: The Anti-Tuberculosis Movement in the United States* (New York: National Tuberculosis Association, 1922), p. 316.
- 20 Thomas Roddick introduced antiseptic methods in the Montreal General Hospital in 1877. Heagerty, op. cit., Vol. 2, p. 185.
- 21 Albert J. Ochsner and Meyer J. Sturm, *The Organization, Construction and Management of Hospitals*, 2nd. ed. (Chicago: Cleveland Press, 1909), p. 154.
- 22 Toronto. University of Toronto, Fisher Rare Book Room. G.M. Miller Account Book.
- 23 Toronto. Ontario Archives. Architectural Plans, Horwood Collection, series 362.
- 24 J.H. Elliott, "Some Further Results in the Treatment of Pulmonary Tuberculosis," *Canada Lancet*, Vol. 36, No. 7 (March 1903), pp. 453-58.
- 25 National Archives. MG 28 I 75, Records of the Canadian Lung Association (hereafter NAC, Records), File No. 4, Nova Scotia 1907-1935. *Sixth Annual Report of the Kentville Sanatorium*, 1910.
- 26 NAC, Records. Annual Reports, 1904-12, Appendix 14, p. 131; and Dr. Camille Laviolette, *Montagne Tremblante, Laurentides, (Canada), Sanatorium d'Altitude pour la tuberculose* (Montréal: Eusebe Senecal et fils, 1894).
- 27 NAC, Records. *Transactions of the Seventh Annual Meeting, Canadian Association for the Prevention of Consumption and other forms of Tuberculosis* (Ottawa: James Hope, 1907), p. 83. See also British Columbia Provincial Archives, 74-A-234, Letter Book of the Anti-Tuberculosis Society, Secretary to Dalton, 28 January 1908; 14 February 1908; and 24 April 1908.
- 28 G.H. Cox and J.W. MacLeod, eds., *Consumption: Its Cause, Prevention and Cure* (London: Tri-County Anti-Tuberculosis League of Antigonish, Guysborough and Pictou, 1911), pp. 112-16.
- 29 "Toronto Free Hospital for Consumptives," *Construction*, Vol. 10, No. 6 (June 1917), pp. 210-13; see also Ochsner, p. 580.
- 30 "Infirmary of Hamilton Health Association," *Construction*, Vol. 10, No. 6 (June 1917), pp. 203-05; and "First Units of Mount Hamilton Hospital," *Construction*, Vol. 10, No. 6 (June 1917), pp. 196-202.
- 31 NAC, Records. *Annual Report, Association Canadienne pour l'Enrayement de la Tuberculose, 1913*, p. 202.
- 32 *Canadian Lancet*, Vol. 37, No. 7 (March 1904), pp. 655-56.
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