An essay in glass

Six years ago, the Aga Khan presented architects with an unusual challenge: create for him a headquarters in Ottawa that was both transparent and translucent, pleasing and confusing, mysterious, esoteric and ethereal. The budget was impressive, and the demands were exacting. The stunning $54-million structure that resulted officially opens today. Here, according to Maria Cook, who has spoken with the designers and builders and toured the building, is how it came to be.

By Maria CookDecember 6, 2008 2:01 PM

A multi-faceted glass dome evokes rock crystal. It vaults over a large central atrium, seen in model below.

Photograph by : Jean Levac, The Ottawa Citizen

In October 2002, Fumihiko Maki, a distinguished architect, received an unusual letter at his Tokyo

office. It was written on behalf of Prince Karim Aga Khan IV, spiritual leader of the world's 15 million Ismaili Muslims. The Aga Khan, as he is known, had appointed Mr. Maki to design a building in Ottawa. It would be the first in the world to represent him and the Aga Khan Development Network, which supports social, economic and cultural projects in developing countries. The three-page letter, sent from his château outside of Paris, outlined the Aga Khan's vision.

"The goal is to create a building which causes the viewer to wonder how different elements and different planes relate to each other, how they work together to tickle the eye," the Aga Khan said, proposing that Mr. Maki take inspiration from rock crystal, the mineral quartz in its clear and colourless form. "In a rock crystal the cuts and angles permit both transparency as well as translucency," the letter said. "It pleases and confuses the eye by its internal planes running at different angles, creating a sense of visual mystery. The ... building in a sense should be somewhat mysterious and visually nearly esoteric. It should not be blatant but ethereal, not obvious but difficult to captivate."

The 80-year-old Mr. Maki has a searching mind and modest personality. He is a modernist who fuses eastern and western cultures in his meticulous architecture. He knew this was not going to be easy. Although his work includes numerous international projects, including a skyscraper at Ground Zero in New York, he had never before built in Canada. The site wasn't perfect; the climate hard on buildings.

And how would he achieve the precision and craft for which he is famous? The North American building culture, unlike Europe and Asia, typically favours speed and frugality over workmanship and durability. Indeed, a 2004 National Research Council study of the Canadian construction industry said "many of the sector's clients are not satisfied with the overall value of its products and the quality of its services." The cost per square metre for the proposed $54-million Ottawa building would be twice that of the new Canadian War Museum on LeBreton Flats. If this building were a suit, its tailoring would be more Savile Row than Sears.

Mr. Maki and his 47-year-old associate, Gary Kamemoto, read and re-read the Aga Khan's letter. They were moved by its beauty and they struggled to discern its meaning. Mr. Maki placed it on his desk in a plastic folder.

"It was not one-dimensional," says Mr. Kamemoto. "I found it to be extremely poetic and visionary. It invited a tremendous amount of creative imagination. This isn't the kind of letter that you receive and put away in a file. We all had it on our desks and we referred to it often. It was our job to convert this into a piece of architecture."

As word got out, people's curiosity grew. Who was the Aga Khan, and why was he setting up shop in Ottawa? Born in Geneva, he is a British citizen who divides his time between Switzerland and France. Comparisons have been made to the Dalai Lama, the head of Tibetan Buddhism, as well as George Soros, the global financier and philanthropist.

A 2002 article in the Independent newspaper in Britain said: "The Aga Khan seems to exist in another realm altogether -- self-styled citizen of the world, not quite royal but more than human, a man who is everywhere but comes from nowhere ... businessman, sportsman, jet-setter, philanthropist and quasi-diplomat with an indeterminate role in the current crisis between Islam and the West."

He enjoys personal wealth thanks to family inheritance and business investments. His philanthropic institutions, funded by his followers, spend about $600 million a year, mainly in Africa, Asia and the Middle East.

The significance of the Aga Khan's status is rooted in the history of Islam. The religion handed down to the prophet Mohammed has two main divisions, Sunnism and Shiism. Ismaili Muslims are the second-largest Shia community. Their imams, or spiritual leaders, are regarded as direct descendants of Mohammed.

They have carried the title "Aga Khan" (Lord Commander) since the Shah of Iran conferred it in the 19th century, and "His Highness" since Queen Elizabeth granted the title in 1957. The current Aga Khan, now 71, became the 49th hereditary imam when he was a 20-year-old student at Harvard University.

The Aga Khan's friendship with Canada goes back to the 1970s, when Pierre Trudeau's government welcomed Ismailis who had been expelled from Uganda. There are about 80,000 Ismaili Muslims in Canada.

The new two-storey building in Ottawa, which opens today, is called the Delegation of the Ismaili Imamat. Its function is secular, not religious. It will serve as the headquarters of Aga Khan Foundation Canada, a non-profit agency that supports social development projects in Africa and Asia.

It includes a library and offices, as well as a residence and office for the Aga Khan's use during visits. The building will host public seminars, receptions and exhibitions. About 100 people will work inside.

The Aga Khan's interest in architecture is far-reaching. His activities include the restoration of historic monuments and a triennial architecture award that bestows $500,000 upon creators of outstanding new designs in societies where Muslims have a presence.

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In May 2002, Mr. Maki stepped off the plane from Tokyo at the Ottawa airport and went directly to the building site on Sussex Drive. It faces the Ottawa River and is bounded by King Edward Avenue, the Embassy of the Kingdom of Saudi Arabia and Boteler Street in Lowertown.

The space Mr. Maki was investigating was irregular. From Sussex to Boteler it sloped four metres, a full storey. It was sunken below the level of Sussex Drive; putting traffic at eye level. And it sat beside the on- and off-ramps to the Macdonald Cartier Bridge between Ottawa and Gatineau.

Mr. Maki walked and drove around the area. As he analyzed and photographed the site from various vantage points, including from the Quebec side, he remembered his first visit to Ottawa in 1953. He had been working as a young architect in New York, and had taken the night train to spend Christmas with an uncle at the Japanese Embassy.

"People were skating on the canal and rivers and it was very quiet," he recalls.

The Aga Khan Foundation Canada bought the one-hectare site from the National Capital Commission in 2000 for $5.24 million. One of the few remaining undeveloped sites on Sussex Drive, it is a prestigious address shared with the residences of the prime minister and governor general, and located along the capital's ceremonial route, known as Confederation Boulevard.

Mr. Maki observed that a key characteristic of the site is visibility. Open on three sides, it can be seen from many directions and distances. "Gradually, we tried to interpret the idea to a design," he says. "Mostly, in architecture, it is a long search to arrive at the right sort of images."

He began to sketch. The building would sit on a horizontal granite podium to compensate for the

change in grade. It would have two main entrances, from Sussex Drive and Boteler Street. Instead of windows on Sussex, a second-floor terrace would present views of the Ottawa River and the Gatineau Hills, while reducing sight lines to the road.

"Rock crystal is only a metaphor," Mr. Maki thought. "It has a very hard surface. It should be reflective to light." He brought his wife's diamond ring to the office to demonstrate the effect of light, and the architects studied samples of rock crystal, or suisho in Japanese.

"What was very interesting to us is that it's a very ephemeral object," Mr. Kamemoto says. "It's constantly changing. What we observed is complete transparency in some areas and complete opacity in others. Then there are infinite numbers of translucency.

"The way the light interacts with it from different angles, you don't see an object. You see the light bounce within it. We thought that was, perhaps, the spirit of the building which he was asking us to provide." When Mr. Maki won the 1993 Pritzker prize, the highest honour in architecture, the jury said: "He uses light in a masterful way."

To create the feeling of rock crystal, he envisioned a building wrapped in a variety of types of glass. The main facades would be clad in white Neoparies, a crystallized glass material that has a soft, pure colour and smooth, marble-like texture. Made in Japan, its particles reflect surrounding colours.

"It gives a very hard edge and formal disposition, but also makes the building reflective to light," says Mr. Maki.

The side walls would be arranged in alternating bands of transparent and translucent glass. And the building would contain an atrium topped by an asymmetrical glass dome.

"It was so critically important to fully embrace and understand the essence of the rock crystal ... to create a somewhat contemplative as well as emotional experience in the final building," says Mr. Kamemoto.

On Dec. 27, 2002, they presented the design to the Aga Khan and his advisors at his estate in Aiglemont, France, in a boardroom that overlooks a landscaped courtyard.

"He felt that the vision was actually very close to what he was imagining," says Mr. Kamemoto. "So this became the starting point for the design process to unfold."

Almost immediately, they ran into a serious setback. The dome emerges from the building to an apex of 17 metres. But buildings on Sussex Drive are only allowed to be 11 metres high, a limit set by the National Capital Commission.

Mr. Kamemoto was dispatched to Ottawa early in 2003. He needed to understand the context for the new building.

Along Confederation Boulevard he snapped pictures of the panorama of varying architectural shapes from the past, including the Parliament buildings, the National Gallery of Canada, the Lester B. Pearson building. "What distinguished them was that they had unique roofs," he observed. "And they all serve to complement the silhouette of Parliament Hill, which is very vertical."

By then, Maki and Associates had selected their Canadian architecture partners, Moriyama & Teshima of Toronto, designers of the Canadian Embassy in Tokyo. Together, they presented their case to the NCC and to the City of Ottawa.

They argued successfully that the Delegation roof would add to the artistic character of the ensemble

on Sussex Drive. Furthermore, it would not block sight lines to Parliament Hill.

Several months later, in the spring, workers spray-painted an outline of the building onto the site. Posts were erected at the corners of the planned building, to the exact height of the walls. The arm of a mobile crane extended to what would be the height of the atrium.

The Aga Khan flew to Ottawa to confirm the layout and shape. It would be an 8,570-square-metre structure, including an underground parking garage.

With his approval in hand, the next step was to assemble a team of professionals and tradespeople who could make the project happen. Mr. Maki knew that collaborating with strangers is difficult: "To co-ordinate different trades is a very chaotic situation." Especially given the intricacy of the design.

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In contrast to the simple rectilinear building below, the glass dome is shaped by complex geometry. It is composed of multi-faceted angular planes. Within the dome is a layer of glass-fibre fabric that appears to float over the atrium.

John Kooymans, a 46-year-old structural engineer at Halcrow Yolles of Toronto, was assigned to design a structural skeleton to support the roof. He admits that, after the initial thrill of a challenging project, "there's a bit of anxiety about getting to the point where you want to be."

The solution wasn't obvious. The roof had to span 25 metres. It had to be strong enough to bear 40 tonnes of glass, plus the weight of snow and of window washers, and to resist the force of wind.

At the same time, the skeleton had to be slim and light for structural elegance. "This shape is not exactly structurally friendly," says Mr. Kooymans.

"It's not a perfect dome or a flat surface that you can span across with a simple truss. We weren't allowed to alter the geometry very much. We were challenged to try and make this shape stand up and minimize the amount of solid elements to do so."

After five or six tries, the engineering group proposed an innovative all-in-one system. They created a grid of solid steel bars braced with tension rods below. The glass panels attach to the grid with silicone. There are no window dividers, so the outer glass skin is flat and flush. Only the glass is visible.

Typically, glass is framed in aluminum first and then affixed to a supporting structure. "What's unusual in terms of standard practice in Canada is that we eliminated the aluminum frame system and integrated the glass and steel structure together in one system," says Mr. Kooymans.

Mr. Kooymans designed the roof for Ottawa's hot, humid summers, freezing winters and heavy snowfall. "A transparent building creates all kinds of problems for you," says Mr. Kamemoto.

The engineer specified three layers of glass for the roof to provide extra insulation; a low-iron glass for greater transparency, and glass printed with tiny ceramic dots to filter sunlight.

There are only a handful of companies in the world that can provide such sophisticated glazing, and Josef Gartner of Germany is one of them. However, its engineers said it was impossible to meet the tight schedule. They said it would take two years to make a steel roof structure of this type, supply 657 glass panels for the roof and walls, and deliver and install it all. The project managers in Ottawa wanted it done in less than a year.

Construction manager Tony Cook, of PCL Constructors, told them the atrium is tied to everything in the building. "Before we can do drywall or interior work, we need the roof."

A month later, in December 2006, Mr. Kamemoto was in Germany presenting the project to Josef Gartner staff at the firm's Wurzburg plant. An animated 3-D rendering made them feel like they were flying through the building in a plane. At the end, they applauded.

Although the company had produced glass for some of the biggest names in architecture (Herzog & deMeuron, Richard Rogers, Jean Nouvel), this was the first time an architect had come to them to explain the design.

"It was quite inspiring," says project manager Dirk Schreiter. "It gave us a real view of the architecture and the thinking behind every aspect of the building. It gave everybody the feeling they are really part of the team."

To save time, the Germans travelled once a month to Ottawa to meet with Mr. Kamemoto. He reviewed shop drawings and answered questions. Revisions and approvals were streamlined.

Mr. Cook kept three clocks in his office, to track time in Germany, Japan and Ottawa. "I was constantly thinking, 'Can I call Gary right now and expect a response?' You're getting questions from Germany coming to Canada that had to be answered in Japan."

The roof, he says, embodies the Canadian values of pluralism admired by the Aga Khan. "Originally designed in Toronto, engineered in Germany, steel manufactured in Poland, glass from Austria and put together by Canadian ironworkers. We have a pluralistic project."

It was a relief when the roof was installed before the first snow. But still the architects worried. They tried to anticipate problems and to take precautions, such as producing extra drawings. Mr. Kamemoto made 30 trips to Ottawa. A Moriyama & Teshima architect visited the site daily.

"The building of this was going to be equally as challenging as realizing the vision, and in the end they're a single thing," says Mr. Kamemoto.

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Four weeks before opening day, men in hardhats drill, hammer and saw. "I thought this was going to be a nightmare," admits 53-year-old carpenter Noel Schiller, crouched beside his tools and an unfinished door. "It was an adjustment to realize the degree of accuracy that had to be maintained.

"Everything is on a grid. The grout lines (tile joints) have to line up with the 10-millimetre reveal lines (grooves) in the panels.

"Usually buildings don't have that, so you can cheat. You can hold things out of plumb maybe an eighth of an inch. But here, everything has to be bang-on. Plumb, square, true.

"It's been a challenge for me," he tells Mr. Kamemoto.

"I've been doing this for 30 years and I've never worked on doors like this before. The high-end finishes, the hardware. I knew right away when I saw the concealed hardware what you were trying to achieve. A clean, crisp look, with fine lines, uncluttered."

Mr. Kamemoto looks pleased. "I think the precision you've brought to this building is extraordinary," he says.

"To have that connection to the workmen is very important," Mr. Kamemoto says later. "If you can actually tap the passion that they have. No one likes to think that they are just a component part of a process. Inherently, people have pride in what they do."

The architects decided to use wood extensively on the interior after learning that Canadians do fine millwork. Light-coloured maple appears in wall panelling, doors, cabinets and furniture.

Early in the design stage, the Canadian architects toured Mr. Maki's buildings in Japan to look at materials and building techniques. "We wanted them to advise us what is possible," says Mr. Kamemoto. "We didn't want to go down a route asking for the impossible."

The firms applying to be construction managers visited Japan to view the workmanship in Mr. Maki's buildings. Mr. Kamemoto asked them: "Does this scare you? Do you think that's possible?"

Once construction was under way, the architects worked closely with the crew. "It comes a little bit from our culture," explains Mr. Kamemoto. "Back home in Japan we still have a very close bond with the contractor and, typically, when a project goes under construction the architect sets up an office on site and we work together through the entire construction process."

Still, "there are some areas where we are not really satisfied," says Mr. Maki. "Some people didn't read our drawings carefully so we wasted time and money. Some people did not honour their word. They said they would finish by a certain date and they didn't. That's a different culture. That's one reason construction was delayed." The building was supposed to be finished at the end of July.

Like the carpenters, the stone contractor, Gem Campbell of Ottawa, worked with great precision. "In a regular project, you live with a little more tolerance, whereas here they were very strict," says Diego Rota, a 66-year-old marble mechanic.

"This is high-end, very fine work. I told our shop not to send anything that doesn't fit."

The stone-cutters changed the settings on their machines to carve more finely, and they took more time.

"You can't achieve quality by being fast unless you overlook a few things," says Mr. Rota.

He and Mr. Kamemoto travelled together to Italy to choose the stone: blue lapis lazuli from Namibia for the outside terrace; limestone from Croatia for the courtyard; basaltina for the entrance. By ordering in person, they avoided "screw-ups" such as receiving the wrong material, says Mr. Rota.

The architects wanted travertine marble in the courtyard, but when Mr. Rota told them it didn't weather well in Canada, they searched for a substitute with the same creamy colour.

"Maki's office, they listen to the person with the trowel in their hand," says Mr. Cook. "That's rare in North America."

Construction in Canada is big business; 12 per cent of GDP. But the National Research Council says the sector suffers from inconsistent profitability and invests too little in capital, human resources and research and development.

"Adoption of innovative solutions in the sector is widely known to be difficult," it says.

And there is a growing labour crisis and skills shortage. In Ontario alone, the Construction Sector Council predicts a shortfall of 82,000 workers by 2015, due to retirement and increasing labour demands. Industry spokesmen say federal and provincial authorities have paid too little attention to

problems in the industry.

Mr. Cook interviewed candidates prior to tendering the construction work. He asked: "Do you have the available tradespeople? What is your volume of work during the time we expect to be in construction?" He set the schedule accordingly.

"We're often-times not realistic enough in scheduling construction projects," says Mr. Cook. "We've just allowed more time because we know we have fewer people, and those fewer people can't work seven days a week, 24 hours a day."

Some 500 tradesmen worked on the building, trying to meet the exceptional requirements for accuracy. "In Canada there's a striving to be close," says Mr. Cook. "Here, everything lines up. The coordination of doing your roof parapet cap and making sure that joint lines up with the Neoparies joint on the exterior wall panel is not something you typically see in any other project.

"We used laser levels to set things up in janitor's rooms. There is no detail that Maki says doesn't matter. Every detail matters.

"There's nothing like it," he says. "I don't think I'll build one like it again."

Canadian clients aren't usually willing to pay a premium for materials and precision, he says. But that's not to say money was no object here.

"If we overspend, something else in the world that the Aga Khan is developing will suffer," says Mr. Cook. "That's not acceptable."

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The official opening ceremony takes place today. Prime Minister Stephen Harper is to be among the 350 guests. Will the Aga Khan be pleased with the building?

"It should be modern and contemporary, but he also wants to have a certain Islamic ambience, particularly the interiors," says Mr. Maki. "I tried to interpret his vision as much as possible."

The building rests on a podium of black granite. The Neoparies cladding has a softly translucent surface like porcelain or marble. "We're pleasantly surprised with the installation of the Neoparies," says Mr. Kamemoto. "I think it even surpassed what we can get in Japan."

The building is 43.5 metres wide and 87 metres long, so it would just fit on a football field. Offices and meeting rooms surround the large courtyards. Mr. Maki says these two spaces create an "inner sanctuary somewhat separated from the outside world." The crystalline dome that vaults over the first of these courts gives a distinctive silhouette to the building.

The Aga Khan did not want security and a fence to characterize the approach to the building. Part of the site remains accessible as a landscaped park, and preserves a public path between Lowertown and Sussex Drive.

The underlying organization of the building is informed by the heritage of Islamic architecture. Mr. Kamemoto notes that the central courtyard at the Alhambra, the splendid 14th-century palace in Spain, must be discovered. "We felt that's what the building should do. From the outside it looks dignified, quiet and stately, but once you got inside there was a sense of discovery, which was the atrium and the courtyard."

To enter the new building from the ceremonial entrance off Sussex Drive, you cross an open

forecourt to the shelter provided by the overhanging floor above. A terrace cuts into this floor, marking the location of the doors below.

The shadows made by this deep modelling set off the brilliance of the Neoparies. The vestibule leads into a hall, which opens into the atrium courtyard.

A floor of Canadian maple gives warmth and a note of welcoming domesticity to the moment of arrival. Maple strips make a pattern of 49 squares, a reference to the 49th Imam.

The space is filled with light and the play of shadows from the glazed roof. On your right the light streams in from a glass wall that joins the roof to the ground. To your left is a library.

Surrounding the atrium is a patterned screen of cast aluminum. It evokes the screens of carved marble and wood that filter light and view in historic Islamic architecture. Composed of 180 panels, the screen was made by Custom Aluminum Foundry, a family business in Cambridge, Ont. that makes sand castings for machine parts. This is their first work of art.

Continuing across the wood floor of the atrium, you have a view into the garden court. Its geometric layout recalls the chahar-bagh, or traditional Persian-Islamic walled garden, a representation of paradise.

Four paths intersect at the centre. Snow-dusted trees and shrubs stand in symmetrical rows in four raised planters. In winter, heaters in the floor will melt snow on the ground, leaving snow mounds on the planters.

"This will be the first Islamic garden with snow mounds," laughs Mr. Kamemoto.

Walking through the building there's an overall feeling of lightness and serenity. Furniture is either white or maple. Different types of glass have been combined to give the building an ethereal quality and varying degrees of transparency and opacity. This effect complements the dramatic play of solid and void between the courts and surrounding wings of offices.

A note of colour is provided by a wall of Venetian plaster in royal blue.

This essay in glass, the shifting translucence, luminosity and clarity that animate the building, is Mr. Maki's response to the crystal image, the metaphor of usefulness and beauty suggested by the Aga Khan.

Rock crystal was prized for these qualities and carved into vessels by the Aga Khan's ancestors, the Fatimids who founded Cairo in 969. "Rock crystal translucency seemed so remarkable a property that the stone was sometimes known as Busaq al-qamar, or 'Spirit of the Moon'," says Alnoor Merchant, of the Institute of Ismaili Studies in London, England.

Three other projects are underway in Canada: The Global Centre for Pluralism in Ottawa will foster policy and legislation to support the developing world. The Aga Khan Museum in Toronto, designed by Maki and Associates, will house exceptional collections of Islamic art. An Ismaili cultural centre is also being built in Toronto.

Two weeks ago, Mr. Maki inspected the Delegation building. "It came out better than I expected."

The Aga Khan saw it at the same time. "He was very delighted," reports Mr. Maki.

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A multi-faceted glass dome evokes rock crystal. It vaults over a large central atrium, seen in model below.

Photograph by : Jean Levac, The Ottawa Citizen