CASE STUDY: TIANJIN CTF FINANCE CENTRE

DOWSIL™ Technologies help solve technical glass façade challenges in high windload zones

The project

Located in the Tianjin Economic-Technological Development Area, a growing urban region near the port city of Tianjin, China, the Tianjin CTF Finance Centre was completed in 2019 and at a height of 530 metres and 96 storeys, is a striking landmark, ranked as the 5th tallest building in APAC and 8th tallest in the world.

The building's undulating curved glass panels conceal eight sloping mega columns that connect the centres and the corners of all four elevations which provide stiffness to the building frame and increase the structure's ability to respond to seismic events. The intricate design of the glass façade reinforces the curvature of the tower, the beauty of which is enhanced by its glittering textured exterior which is topped with an open-lattice crown.

Providing space for offices, luxury apartments and a hotel, the Tianjin CTF Finance Centre affords incredible city views and natural daylight for the well-being and engagement of its occupants. DOWSIL™ brand technologies were specified to help meet the architect's vision for an efficient, sustainable exterior design whilst addressing environmental and local climatic challenges.

City and country

Tianjin, China

Products

- DOWSIL™ 993N Structural Glazing Sealant
- DOWSIL™ 791 Silicone Weatherproofing Sealant
- DOWSIL™ 3362N Insulating Glass Sealant
- DOWSIL™ HPI 1400 Building Insulation Blanket

Key participants

Building owner
- Chow Tai Fook Enterprises

Design
- Skidmore, Owings & Merrill LLP

Architect of record
- Ronald Lu & Partners, East China Architectural Design & Research Institute

Structural engineer
- Skidmore, Owings & Merrill LLP

Engineer of record
- East China Architectural Design & Research Institute

Façade consultants
- Skidmore, Owings & Merrill LLP
- Arup
- Ronald Lu & Partners

Fabricator
- Beijing JANGHO Curtain Wall Co., Ltd

The challenge

A key architectural challenge was to design an efficient, sustainable curtain wall façade which could be constructed to provide maximum safety, considering the powerful wind force, which is prevalent in the coastal city of Tianjin, that can cause tall, slender buildings to sway and vibrate. The design of the tower was shown to assist in the disruption of the wind load as its tapered form and multi-storey wind vents combined with the tower's aerodynamic shape reduce vortex shedding, which in turn dramatically minimizes wind forces. The long-term safety, security and contribution to energy efficiency of the insulation, bonding and sealing of the glass façade required a collaborative and innovative approach to deliver original solutions that push the boundaries of design.

The solution

Sophisticated techniques were required to create the façade design. The exterior glass façade was designed using geometric fluid modelling resulting in the staggered placement of approximately 15,000 flat vision convex and concave insulating glass panels. BIM technology was employed to optimize construction, which required the use of materials that significantly reduce the energy consumption of buildings for a greener and more sustainable development.

Dow technical specialists and experts engaged with the project team at an early stage to provide expertise and support to help ensure the Dow curtain wall system products met the required standards of quality and efficiency. Dow technical support included blueprint reviews, laboratory testing of the substrates, qulity control training, and continued follow-up visits. Laboratory testing carried out at Dow recommended the high performance paint on the aluminium profiles to enhance the bonding properties of the structural silicone sealant to the substrate. Dow's required QC deglazing requirement was used to ensure the sealant adhesion, joint fill and quality of the structurally glazed production units was relevant specifications. Dow requires ongoing QC throughout production as part of it's 20 year warranty requirements.

Dow's technical personnel reviewed the insulated glass unit (IGU) requirements and recommended DOWSIL™ 3362N Insulating Glass Sealant for use as the secondary sealant for the insulating glass units, to manage the higher internal pressure requirement due to the high altitude usage with these units.

DOWSIL™ 993N Structural Glazing Sealant was recommended for the structural attachment of the glass panels to the curtain wall frame, to provide strong bonding performance, UV resistance and tensile strength as well as proper displacement capability to provide long-term security and stability. This fast curing 2 part technology also enabled rapid connection of the insulating glass units to the curtain wall frame connections.

The weatherseal movement joints of the glass façade were sealed to protect against the adverse effects of the extreme local weather and provide airtightness using DOWSIL™ 791 Silicone Weatherproofing Sealant. Other important product performance characteristics include long term flexibility, life expectancy and superior durability, particularly against prolonged ultraviolet exposure.

DOWSIL™ HPI-1400 Building Insulation Blanket was also specified to improve the thermal insulation performance and reduce the energy consumption of the overall building. When compared to traditional products used for insulation, it greatly improves the thermal resistance of adjacent substrates. Ultra-thin for ease of installation and offering outstanding flexibility and pressure resistance, it can be easily installed in areas where space is limited. DOWSIL™ HPI-1400 Building Insulation Blanket is easy to use and trim to size; this provided a perfect solution for insulating the complex and undulating shape of the curtain wall and sealed off entry points for moisture. Able to tolerate building movement, this new insulation blanket also offers fire resistance and long-term performance against the elements.

Designed to LEED Gold standards, the Tianjin CTF Finance Centre is testament to the fact that modern, high performing skyscrapers can be designed to meet the highest standards of sustainability.

DOWSIL™ 3362N Insulating Glass Sealant

A two-component neutral curing silicone specifically developed for use as a secondary seal in the manufacture of high performance, air and gas filled insulated glass units including those used for structural glazing. It meets the Chinese sealant requirements according to GB16776-2005, GB24266-2009 and the requirements of American ASTM C1184.

DOWSIL™ 993N Structural Glazing Sealant

With more than 50 years of expertise in structural glazing, DOWSIL™ 993N has been used on numerous projects around the globe. A two-component, neutral curing silicone, it has been developed for the structural bonding of glass, metal and other building components. It meets the Chinese sealant requirements according to GB16776 standard and the requirements of American ASTM C1184 and has been granted a European Technical Assessment based on independent testing in accordance with the current European structural glazing guideline ETAG 002.

DOWSIL™ 791 Silicone Weatherproofing Sealant

A one-part, premium performance weatherproofing silicone sealant designed for the weathersealing of structurally glazed façades, curtain walls and buildings constructed from traditional building products. Medium modulus, it conforms to China's JC/T882, GB/T14683 and ASTM C920 elastic sealant specifications.

DOWSIL™ HPI-1400 Building Insulation Blanket

A thin, flexible insulation material that insulates connection points in building construction. It helps to increase the thermal performance of a building and addresses thermal bridging. It can also be used to retrofit existing designs to meet new performance requirements.

For more information

Learn more about Dow's full range of High Performance Building solutions by visiting us online at **dow.com/construction.**

Dow has sales offices, manufacturing sites and science and technology laboratories around the globe. Find local contact information at **dow.com/contactus.**

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