

SUSTAINABLE CONCRETE CONSTRUCTION

THE CORE - TOMLINSON GROUP



PROJECT CREDITS

OWNER

Tomlinson Group of Companies

ARCHITECT OF RECORD

Christopher Simmonds Architect Inc.

ENGINEER OF RECORD

Cleland Jardine Engineering Limited

GENERAL CONTRACTOR

R.W. Tomlinson Ltd.

FORMING CONTRACTOR

Bellai Brothers Construction Ltd.

MATERIAL SUPPLIERS

Tomlinson Ready Mix

ADDITIONAL PARTICIPANTS

- BASF Canada
- Carpenters Union Local 93
- Continental Price Electrical Contractors
- D&G Landscaping
- Doublespace Photography
- Giatec Scientific Inc.
- Interstar Materials Inc.
- O'Leary's Limited
- Optimum Mechanical Solutions
- Tal-Co Building Innovations Ltd.

PROJECT FACTS

LOCATION Ottawa, Ontario

COMPLETION June 1, 2018

LENGTH OF CONSTRUCTION 36 months

FOOT PLATE 19,202 sq ft

AREA OF FACILITY 84,703 sq ft

TOTAL CONCRETE 7,000 m³

PROJECT FACTS

Specialty Concrete Mix Designs:

- Architectural Self-Consolidating Concrete for feature walls and retaining walls
- High Slump Silica Fume Columns
- LEED Positive mixes
- Integrally coloured concrete
- Non-chloride accelerated mixes for cold weather concrete
- Smart Concrete™ – real time strength and temperature monitoring





OVERVIEW AND INTENT OF BUILDING

The Tomlinson Group of Companies is a family-owned business, originally founded in 1952 with one single-axle dump truck. Through six decades of growth and innovation, Tomlinson Group is a fully integrated corporation providing construction materials, construction services, and environmental services throughout North America. To support the Tomlinson Group's growth, and its unique ability to offer turnkey solutions for civil and municipal infrastructure projects, operations were centralized in Spring 2018 into a new corporate headquarters: The CORE (Central Operations for Results and Excellence). The CORE allows Tomlinson to deliver its full suite of services from a centralized location, fostering innovation between business units and enhancing operational efficiency.

Tomlinson used the design and construction of the new headquarters as an opportunity to establish a unique and distinctive identity, in a building that embraces Tomlinson's core values of quality, environment, innovation, people, excellence, teamwork, and customer focus. With a focus on sustainable design, The CORE integrated natural and built landscapes into its planning. The location of the head office was selected based on its importance as the southern 'gateway' to the City of Ottawa and drew design inspiration from the local limestone outcrops, mature woodlands, fencerows, and rural aesthetic. To align the rural context with Tomlinson's corporate history, The CORE appears to emerge from the ground, alongside berms planted with wild grass, into a restored, re-naturalized landscape.

Tomlinson is a multi-disciplinary company that provides various services, materials and products. The CORE acts as a touchstone for each division in the company: ready mix concrete, asphalt, aggregates, infrastructure, construction, and environmental services. The exposed concrete structure, and its design, is critical in the expression of Tomlinson's identity. Exposed concrete is an architectural feature that is present in all areas of the CORE's design and build. From the entrance walkways and exterior retaining walls, to the exposed interior columns, core walls, stairwells, ceilings and multiple common areas throughout the building. Concrete is the material of choice for its structural strength, durability, sustainability and aesthetic appeal.

A three-storey interior atrium supports the development of a strong community between company members and internal

divisions. The large open lobby provides a town-square setting, encouraging interaction between staff and visitors. Large meeting areas and breakout rooms on each floor to provide common meeting points between all divisions. Fluidity of access between areas and floor were integral to provide an open meeting space and encourage community within the company.

ARCHITECTURAL MERIT

Tomlinson's involvement in mineral extraction, earthwork, and infrastructure formed the basis of the building's design. To achieve this, the building was inserted into an undulating, one-storey landscaped berm, which extends over the entire property. Openings at each entrance bisect the berms supported by concrete "wingwalls". Sloping, architecturally finished concrete line the entrances. This architectural concrete was formed with rough plank pinewood to give a unique finish. The spacing and surface of the wood formwork created a natural-look and feel to the surface of the exposed concrete wall.



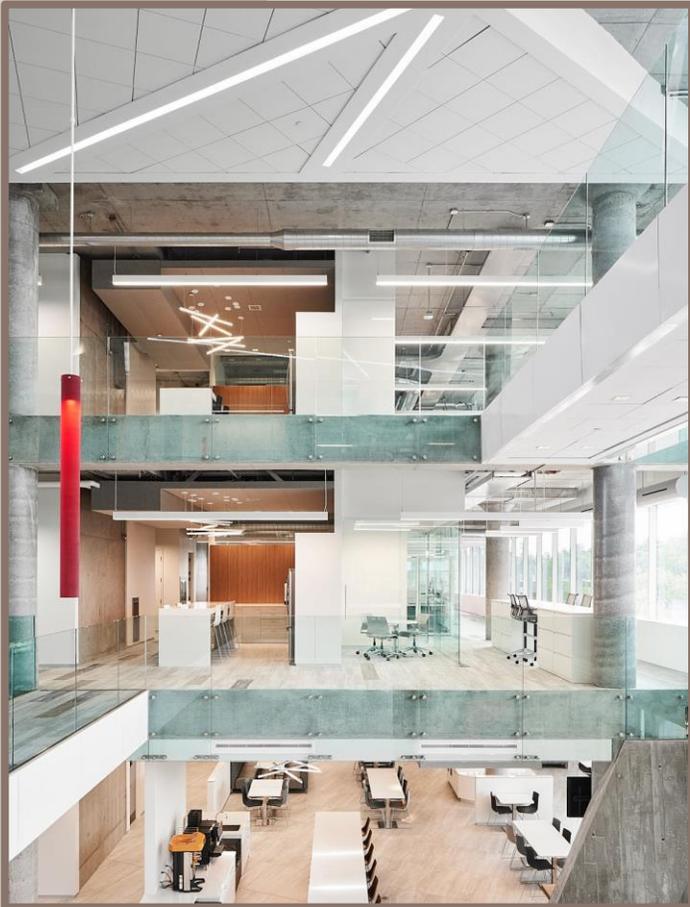
Natural look products and finishes were utilized throughout The CORE to represent Tomlinson's materials divisions. The design of the building, and its construction into the berm, expresses the natural and raw characteristics of earthwork and reflects the licensing process that Tomlinson undergoes for its quarries from mining to end-of-life rehabilitation. Rehabilitation of quarries require thorough investigation and consideration of the land, the vegetation, and wildlife with efforts made to protect the natural environment and endangered species. The ground floor was embedded into the landscaped berm and opens into a three-floor open lobby and atrium.

ARCHITECTURAL HARDSCAPE

The CORE's interconnection with the adjacent O'Keefe Creek Greenway encouraged the development of natural pathways, creation of a wider network of greenways, and construction of distinctive pathways and entrances that matched the naturalized, rural aesthetic.

The entrance walls of the building extend into the interior lobby, reflecting the natural environment into the building's design. On the exterior of The CORE, exposed retaining walls are contained within the green berms that span the first floor of the building. The entrance walls feature architectural concrete finish to mirror a wood plank surface.

Concrete curbs and sidewalks line the exterior of the buildings parking lot and property. Integrally coloured concrete creates a natural stone-like finish and provides permanent colour for the concrete patios at the building entrances. A concrete basketball/sports court was installed adjacent to the company gym. Saw cuts were used to provide a clean distinct jointing pattern in the concrete slabs to give a beautiful architectural finish as well as provide relief for any potential cracking that could occur in the concrete.



STRUCTURAL DESIGN INNOVATION

The CORE acts as a bridge between all divisions within Tomlinson and was designed to visually unify the surrounding rural and built landscapes. The berms at the entrances are

angled and supported by concrete to resemble wingwalls. The first-floor lobby appears below-grade, with the floors emerging and spanning the length of the berm. A roof overhang links the corporate headquarters with the onsite Material Testing Facility, which remains connected, yet separated, to showcase our commitment to quality.

The open structure of the building, and the amount of exposed concrete required careful consideration for the placement and utilization of materials. Additional flooring space was added to the fourth-storey to reinforce the structure rather than continue the open atrium through to the fourth-story ceiling. This change allowed for the reduction of reinforcing steel in the roof slab ultimately reducing the thickness of the roof slab which allowed for a more standard floor plate to accelerate the construction schedule.

The fourth-floor concrete slab required a complex and extensive shoring system that spanned from the ground floor to the fourth floor. This engineered shoring system supported large volumes of concrete for the fourth floor and rooftop slab in the atrium center of the building.

The berms that travel the length of The CORE required structural innovation to secure the exposed concrete retaining walls to the footing. The height of the exterior retaining walls posed a challenge when backfilling with traditional soils. A lightweight fill and soil strengthening solution was designed to mitigate any potential or future stress on the wall.

SPECIALTY CONCRETE CONSTRUCTION

Concrete was the predominant material featured in the CORE's design and construction. Concrete provides the durability and additional reinforcement and strength needed for the design that other materials could not perform. Forming the cast-in-place concrete to match the aesthetic and design envisioned for the building required the use of several specialty concrete mix designs to allow for the creation of unique and nature-inspired finishes. Specialty concrete mixes were produced to meet the accelerated construction schedule and leverage the potential sustainability benefits of concrete. The use of specialty concrete allowed work to continue through the winter while reducing the amount of greenhouse emissions with the use of supplementary cementing materials.

The CORE used several specialty concrete mixes throughout the building, including architectural Self-Consolidating Concrete for feature walls and retaining walls and High Slump Silica Fume for the columns. Furthermore, to maintain the construction schedule throughout the winter and during off-season construction months, non-chloride accelerated concrete mixes were used to reduce set times to maintain standard stripping and construction schedules.

The concrete columns throughout the building were designed using high-range water reducing admixture with silica-fume cement to create high-strength columns. The use of silica-fume

concrete provided the column with a darker colour, created an architecturally smooth finish, and improved sustainability by reducing cement requirements.

High volume supplementary cementing materials were used for the large raft slab footing mixes to mitigate heat of hydration in the structure while minimizing the total cement required.

Tomlinson is the only licensed ready-mix producer in Eastern Ontario who can integrate Smart Concrete™ into their specialty concrete mixes. Smart Concrete™ sensors were installed into the concrete elements to provide real-time strength and temperature monitoring of the curing process. Data from the sensors wirelessly transmitted to a smartphone app to display real-time concrete strength based on a pre-established mixture calibration. The use of Smart Concrete™ on this project accelerated the construction process by minimizing field-cured cylinder testing, allowing for real time strengths and stripping of concrete formwork.

SUSTAINABLE CONCRETE CONSTRUCTION

Tomlinson's core values of quality, excellence, and environmental consciousness were the forefront of the design and construction considerations for The CORE. Sustainable concrete construction techniques were used to maintain Tomlinson's high quality standards.

The CORE was designed as a LEED Silver targeted building, with expected certification in 2019. Concrete was chosen for its low albedo and heat retention to reduce the building's energy costs. A concrete roof slab was selected for its longevity and ability to reduce the spread of water and fire damage to the building. Floor-to-ceiling windows were installed on each floor to provide sustainable lighting for staff. Daylighting design was incorporated into the architectural design to increase the natural light throughout and regulate indoor temperatures.

Almost 27% of Post Industrial Recycled Content was supplied for the building's concrete. Specialty concrete mixes were used throughout the building to lower the amount of cement in concrete mixtures without reducing performance and workability. For example, slag and silica fume minimized the amount of GU cement, while superplasticizers reduced the amount of water in concrete mixes, ultimately lowering the total cement required for the concrete and lowering the amount of carbon dioxide created during production. Exposed concrete walls and ceiling decreased the amount of new material used throughout the building. Smart Concrete™ technology added to the concrete mixes produced accurate temperature readings to calculate the strength of the concrete earlier and minimize heating costs during winter.

