MARKHAM

THOMASBROWN
ARCHITECTS

THE TOWN OF MARKHAM

CATHEDRAL FIRE STATION

LEED ™

LEED CATEGORIES

- ➢ SUSTAINABLE SITES
- ➢ WATER EFFICIENCY
- ➢ ENERGY & ATMOSPHERE
- ➢ MATERIALS & RESOURCES
- ➢ INDOOR ENVIRONMENTAL QUALITY
- ➢ INNOVATION & DESIGN

- ➢ SITE SELECTION
- ➢ PUBLIC TRANSPORTATION ACCESS
- ➢ BIKE STORAGE & CHANGING ROOMS
- ➢ STORM WATER RATE
- ➢ HEAT ISLAND MITIGATION
- ➢ LIGHT POLLUTION REDUCTION

WATER EFFICIENCY **5**

- ➢ REDUCE IRRIGATION BY 50%
- ➢ NO POTABLE USE OR NO IRRIGATION
- ➢ 20% WATER USE REDUCTION
- ➢ 30% WATER USE REDUCTION
- ➢ INNOVATIVE WASTE WATER TECHNOLOGIES

➢ OPTIMIZE ENERGY PERFORMANCE (3 - 7)

➢ OZONE PROTECTION

➤ ENERGY & ATMOSPHERE

➤ Mechanical System Comparison - 4 Options

IES Virtual Environment 5.8.1 Energy Simulation Software

Packaged Roof Top Units

RTU′S / Energy-Recovery Ventilators

Water-Source Multi-Split Variable Refrigerant Flow

Geothermal

➤ ROOF TOP UNITS (HIGH EFFICIENCY)

- Forced Air Heating & Cooling

- Gas-fired Burners, Electric Cooling w/ Economizers

- Ducted to Diffusers / Exhaust Fans

Complies with 2012 O.B.C. > 25% better than MNECB

➤ ROOF TOP UNITS (HIGHER EFFICIENCY)

- Forced air heating & cooling

- Gas-fired burners, electric cooling w/ economizers

- Energy-recovery ventilators

- Ducted distribution to diffusers / exhaust fans

Complies with 2012 O.B.C. > 25% better than MNECB

VRF

- Water-Source multi-split variable refrigerant flow

- Heating via gas-fired boilers

- Cooling via closed-loop cooling tower

- Delivered via ceiling-mounted fan coil units / diffusers

Complies with 2012 O.B.C. > 25% better than MNECB

➢ GEOTHERMAL / DV

- In-floor radiant heating & cooling

- 100% fresh air displacement ventilation via ERV

- Supplemental cooling via fan coil units

Complies with 2012 O.B.C. > 25% better than MNECB

➢ CAPITAL COST COMPARISON

➢ RTU	$171,000	*base case*
➢ RTU/ERV	$195,600	*>14%*
➢ VRF	$284,000	*>66%*
➢ GEOTHERMAL	$351,000	*>105%*

➤ ANNUAL ENERGY COST COMPARISON

$0.10 /kWh base electrical cost $13.72 /GJ base natural gas cost

RTU	$12,131	$1.21 /sf
RTU/ERV	$9,850	$0.98 /sf
VRF	$10,071	$1.00 /sf
GEOTHERMAL	$4,946	$0.49 /sf

LIFE-CYCLE OPERATIONAL & MAINTENANCE COSTS

~ 50 YEARS ~

RTU	$623,000	0
RTU/ERV	$551,000	> $7.20 sq.ft.
VRF	$571,000	> $5.20 sq.ft.
GEOTHERMAL	$319,000	> $30.40 sq.ft.

➢ ENERGY USE REDUCTION

➢ RTU   *base case*

➢ RTU/ERV   *19% reduction*

➢ VRF   *17% reduction*

➢ GEOTHERMAL   *60% reduction*

➤ ENERGY USE REDUCTION

➤ ~~RTU~~ ~~base case~~

➤ RTU/ERV 19% reduction LEED SILVER

➤ ~~VRF~~ ~~17% reduction~~

➤ GEOTHERMAL 60% reduction LEED GOLD

➤ DIVERT 50% FROM LANDFILL

➤ DIVERT 75% FROM LANDFILL

➤ 7.5% RECYCLED CONTENT

➤ 15% RECYCLED CONTENT

➤ 20% REGIONAL MATERIALS

➤ RAPIDLY RENEWABLE MATERIALS

➤ CERTIFIED WOOD

INDOOR ENVIRONMENTAL QUALITY **7**

- VENTILATION EFFECTIVENESS
- CONSTRUCTION IAQ MANAGEMENT PLAN (CONSTRUCTION)
- 0 VOC: ADHESIVES & SEALANTS
- 0 VOC: PAINTS & COATINGS
- 0 VOC: CARPET
- 0 VOC: COMPOSITE WOOD & LAMINATE ADHESIVES
- INDOOR POLLUTANT SOURCE CONTROL

INDOOR ENVIRONMENTAL QUALITY **5**

- ➢ CONTROLLABILITY OF PERIMETER SPACES
- ➢ CONTROLLABILITY OF NON-PERIMETER SPACES
- ➢ THERMAL COMFORT - COMPLIANCE
- ➢ DAYLIGHT 75% OF SPACES
- ➢ VIEWS 90% OF SPACES

➢ LEED EDUCATIONAL DISPLAY

➢ GREEN HOUSEKEEPING PROGRAM

➢ RAINWATER HARVESTING FOR TRUCK FILL

➢ LEED ACCREDITED PROFESSIONAL

INNOVATION & DESIGN PROCESS **4**

- ➢ LEED EDUCATIONAL DISPLAY
- ➢ GREEN HOUSEKEEPING PROGRAM
- ➢ RAINWATER HARVESTING FOR TRUCK FILL
- ➢ LEED ACCREDITED PROFESSIONAL

LEED ™ PROJECT TOTALS

Markham Cathedral Fire Station

LEED ™ Silver   37 Points   (33 - 38)

LEED ™ Gold   42 points   (39-51)

Financial Implications

➤ LEED ™ Silver Construction Cost

Base Building	$ 2,700,000	$ 270.00 sq.ft.
Green initiatives	$ 105,000	$ 10.50 sq.ft.

➤ LEED ™ Silver Design Cost

$ 17,500 $ 1.75 sq.ft.

➤ LEED ™ Silver CaGBC Reg. & Admin. Costs

$ 36,000 $ 3.60 sq.ft.

Financial Implications

➢ LEED ™ Silver Project Costs

Construction	$ 2,805,000	$ 280.50 sq.ft.
A&E Fees	$ 197,500	$ 19.75 sq.ft.
LEED™ Reg.	$ 4,000	$ .40 sq.ft.
Administration	$ 32,000	$ 3.20 sq.ft.
Total	$ 3,038,500	$ 303.85 sq.ft.

Financial Implications

➢ LEED ™ Gold Construction Cost

Base Building	$ 2,700,000	$ 270.00 sq.ft.
Green initiatives	$ 225,000	$ 25.50 sq.ft.

➢ LEED ™ Gold Design Cost

$ 25,000	$ 2.50 sq.ft.

➢ LEED ™ Gold CaGBC Reg. & Admin. Costs

$ 37,500	$ 3.75 sq.ft.

Financial Implications

➤ LEED ™ Gold Project Costs

Construction	$ 2,955,000	$ 295.50 sq.ft.
A & E Fees	$ 205,000	$ 20.50 sq.ft.
LEED™ R/C	$ 4,000	$ .40 sq.ft.
Administration	$ 33,500	$ 3.35 sq.ft.
Total	**$ 3,197,500**	**$ 319.75 sq.ft.**

Financial Implications

LEED ™ Silver	> 5.5%
Design	> 1.6 %
Construction	> 3.9 %

LEED ™ Gold	> 11%
Design	> 1.5 %
Construction	> 9.4 %

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