



Water Positive Buildings & Sewage Water Heat Recovery

Low Carbon Case Examples

Thurs April 16, 2020 | 2:00 - 3:00 PM ET

Bruce (BF) Nagy & Lynn Mueller



Clean Air Partnership

CLIMATE SOLUTIONS WEBINAR SERIES





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WEBINAR SERIES - UPCOMING:

- Retrofit housing & passive house (Hamilton & Boston)
- Energy, batteries, micro-grids & new kinds of storage (Goderich & beyond)
- Electric municipal fleet vehicles & buses (NY & Vancouver)
- And much more...

BRUCE (BF) NAGY CLIMATE SOLUTIONS

- Columnist & features
- Consultant
- Author 200+ articles on climate solutions
- Author *The Clean Energy Age*, Rowman & Littlefield



Climate solutions
Expert best practices
Case examples
Clear priorities



SOLUTIONS, PRIORITIES, CASE EXAMPLES



BUILDINGS

NEW & RETROFIT TECHNOLOGY & PROGRAMS



TRANSPORTATION

ELECTRIC FLEETS, INFRASTRUCTURE & TRANSIT VEHICLES



POWER GENERATION & STORAGE

TECHNOLOGY, PLANNING & ECONOMICS

AGENDA

INTRODUCTION	5 MINUTES
WATER CHALLENGES, WATER POSITIVE BUILDINGS IN SEATTLE, ONTARIO & ELSEWHERE	25 MINUTES
SEWAGE WATER HEAT RECOVERY IN WASHINGTON DC	25 MINUTES
DISCUSSION & WRAP	5 MINUTES



GROWING IMPORTANCE OF WATER MANAGEMENT

WATER BODIES AND AQUIFERS UNDER STRESS FROM INDUSTRY, AGRICULTURE, POPULATION GROWTH & CLIMATE BREAKDOWN.

MUST ADDRESS DEMANDS ON POTABLE WATER SUPPLY, CONCERNS ABOUT WATER POLLUTION, UNTREATED SEWAGE FLOWS, 100 YEAR-OLD INADEQUATE, CRUMBLING STORM/SEWAGE SYSTEMS. BUILDING OPERATIONS AND SEPTIC SYSTEMS MUST ALSO BE MODERNIZED.

THE FEDERATION OF CANADIAN MUNICIPALITIES ESTIMATES \$51 BILLION INFRASTRUCTURE UPGRADES NEEDED IN CANADA.

US GOVERNMENT ACCOUNTABILITY OFFICE SAYS 40/50 STATE WATER MANAGERS DEALING WITH POTABLE WATER SHORTAGES, OR EXPECT THEY WILL WITHIN 5 YEARS. MORE INTENSE FLOODING, STRESSING STORM SYSTEMS & FRUSTRATING WATER TREATMENT.



GROWING IMPORTANCE OF WATER MANAGEMENT

AMERICAN WATER WORKS ASSOCIATION SAYS SINCE 2000 WATER RATE INCREASES HAVE AVERAGED 5.5% AND WASTEWATER RATE INCREASES ABOUT 6.1%.

IN GROWTH AREAS GOVERNMENTS WANT TO REDUCE RATHER THAN ADD TO CHALLENGES. PLANNERS REQUIRE DEVELOPERS TO INSTALL CATCHMENT TANKS & PERMEABLE SURFACES TO REDUCE RUNOFF.

CITY BY-LAWS REQUIRE DISCONNECTION OF DOWNSPOUTS FROM PUBLIC STORM SYSTEMS.



WATER IN BUILDINGS - PROJECT EXAMPLES

BULLITT CENTRE IN SEATTLE

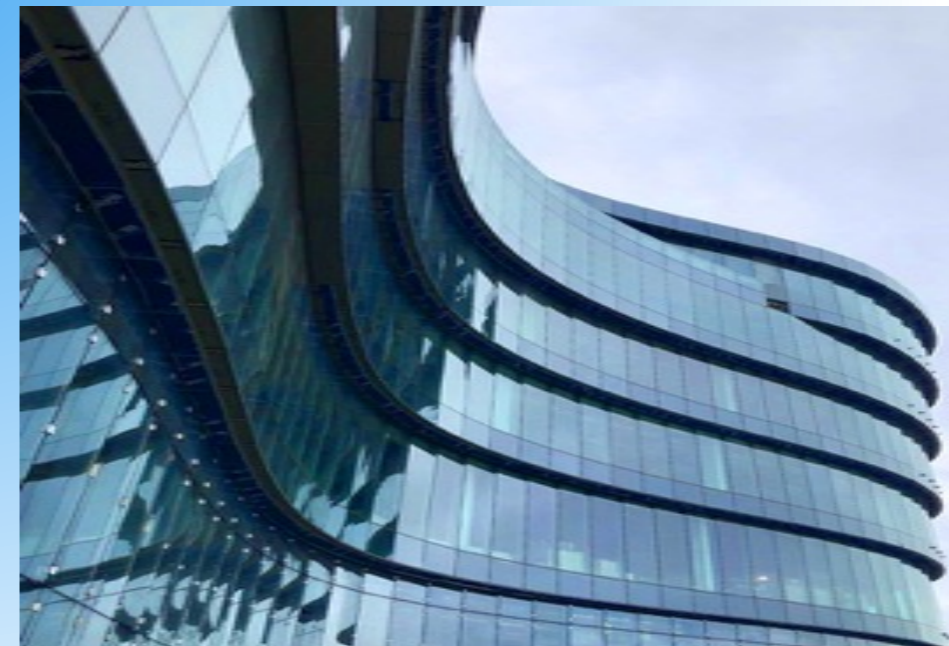
RAINWATER, GREY WATER, BLACK WATER SYSTEMS

OTHER CASE EXAMPLES OF PROGRESSIVE WATER
SYSTEMS IN BUILDINGS

SEWAGE HEAT RECOVERY IN WASHINGTON DC

OTHER EXAMPLES OF SIMILAR SYSTEMS

PLEASE DON'T HESITATE TO ASK FOR CONTACT INFORMATION
RE CASE EXAMPLES, TECHNICAL DETAILS.
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NET-ZERO WATER & WATER-POSITIVE BUILDINGS

THE AMOUNT OF WATER THAT IS CAPTURED ON-SITE IS EQUAL TO OR MORE THAN THE AMOUNT USED ON THE SITE.

CERTIFICATION BODIES AND GOVERNMENTS CARE ABOUT VOLUMES USED AND THE QUALITY OF WATER WHEN IT IS RETURNED TO THE NATURAL ECOSYSTEM, OR EXPELLED THROUGH MUNICIPAL SYSTEMS.



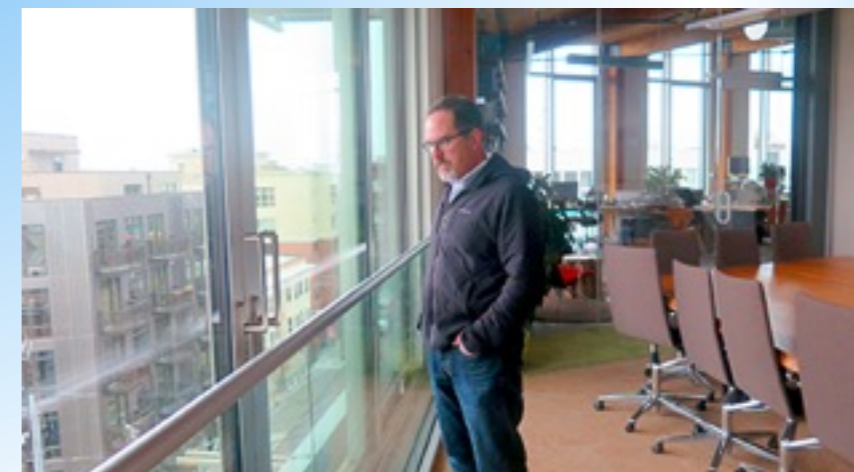
SEATTLE BULLITT CENTRE

SIX-STORY OFFICE, LIVING BUILDING CHALLENGE (LBC) CERTIFIED. OFFICES OF THE BULLITT FOUNDATION (DENIS HAYES). INCLUDES SHOWERS, NO PARKING LOT. OCCUPANTS ENCOURAGED TO TRAVEL BY BICYCLE OR PUBLIC TRANSIT.

HARVESTS ENOUGH WATER TO MEET THE NEEDS OF THE BUILDING, WITHOUT 'VIOLATING THE NATURAL HYDROLOGY OF THE SITE, THE WATER NEEDS OF NEIGHBORS, AND THE ECOSYSTEM.'

SEATTLE IS EXPANDING GEOGRAPHICALLY AND THE POPULATION IS INCREASING. THE CITY'S TWO RESERVOIRS ARE BOTH PRESSED TO CAPACITY.

WITH HOTTER TEMPERATURES AND LESS SNOW PACK THE BEST RESOURCE IS MOTHER NATURE...EVAPORATED SEA WATER DEPOSITED ON THE BULLITT CENTRE ROOF.



RAINWATER

RAINWATER IS COLLECTED IN A CISTERN, FILTERED AND PASSED THROUGH AN ULTRA-VIOLET DISINFECTION SYSTEM, USED IN BATHROOM SINKS, SHOWERS, AND KITCHENETTES.

SOME IS FILTERED BUT NOT DISINFECTED, FOR USE IN FOAM-FLUSH TOILETS AND IRRIGATION.

THE CISTERN HAS ENOUGH CAPACITY FOR 4 - 6 WEEKS OF DRINKING WATER FOR THE BUILDING, OR 52,000 GALLONS,



GREY WATER

ABOUT 30,000 GALLONS PER YEAR OF GREY WATER (FROM SINK DRAINS AND SHOWER DRAINS) IS COLLECTED IN BASEMENT HOLDING TANKS.

PUMPED TO A CONSTRUCTED WETLAND ON THE THIRD FLOOR GREEN ROOF AREA. BIOSWALES REMOVE PATHOGENS, THEN IT'S RELEASED INTO THE NATIVE SOIL BELOW. BECAUSE IT STARTS AS RAINWATER, THE GREY WATER DOESN'T CONTAIN HEAVY METALS.

SOME USED IN UNDERGROUND DRIP IRRIGATION (NOZZLES ABOUT 12 INCHES APART) IN A LANDSCAPE AREA 6 FEET X 40 FEET. SOME USED IN FOAM FLUSH TOILETS - ABOUT TWO TABLESPOONS PER FLUSH.

PARTS PER MILLION ARE MONITORED SO THAT IT'S RETURNED TO THE NATURAL CYCLE WELL BELOW PERMISSIBLE LEVELS.

COVERED BY AN URBAN WASTEWATER SEPTIC PERMIT.



"This building actually changed city and state standards. When we started about five years ago, there wasn't much on the books regarding rainwater, grey water and black water. We had to patiently educate and negotiate with the planning department and inspectors."

BLACK WATER

BLACK WATER FROM THE TOILETS AND URINALS IS TREATED IN BASEMENT COMPOSTING UNITS.

A MIXTURE OF BIOCOMPATIBLE SOAP AND WATER CLEAN THE TOILETS AND URINALS WITH EACH FLUSH. NO ODOUR.

WASTE MOVES THROUGH A CONVENTIONAL 4" PIPE TO A COMPOSTING TANK.

THE COMPOSTING UNITS IN THE BASEMENT PRODUCE A DEHYDRATED, CONDENSED SOLID, AND KING COUNTY REGULARLY REMOVES THIS LEACHATE TO A FACILITY WHERE IT IS USED TO RESTORE A NATIVE WETLAND.



“if we had it to do all over again, I think we would reconsider the compost toilets. I’m not sure if the benefits justify the labour intensity of the compost removal and logistics.”

BILL FISCH FOREST STEWARDSHIP & EDUCATION CENTRE

ABOUT 1,000 SQUARE FEET, ON THE OAK RIDGES MORaine NORTH OF TORONTO NEAR STOUFFVILLE. LBC CERTIFIED BUILDING AND LEED PLATINUM.

TRADITIONAL SMALL RURAL PRINCIPLES WITH MODERN TECH. A WELL AND UV FILTER PROVIDE POTABLE WATER. RAINWATER IS HARVESTED FOR USE IN TOILETS AND URINALS.



TECH:

ROOF DRAINS COLLECT RAINWATER IN AN UNDERGROUND CISTERN. TREATED WITH A BRAE SYSTEM WITH SUBMERSIBLE, VARIABLE SPEED TRANSFER PUMP. USED IN WATER CLOSETS AND URINALS. IF THE CISTERN IS EMPTY, THE ON-SITE WELL PROVIDES MAKEUP WATER.

ULTRA-VIOLET IRRADIATION, SELF-CLEANING STRAINERS, TOUCHSCREEN CONTROLLER, DRY-RUN PROTECTION, SOFT-STARTING, REMOTE MONITORING & ALARMS FOR VOLTAGE OR PRESSURE ANOMALIES.



BILL FISCH CENTRE - GROUNDWATER PROTECTION

ULTRA-MODERN SEPTIC SYSTEM EMPLOYS A 3000 LITRE PER DAY WATERLOO BIOFILTER TO REMOVE POLLUTANTS FROM GREY WATER & BLACK WATER BEFORE RETURNING IT TO THE GROUND.

TECH:

ITS TRICKLE FILTER USES ABSORBENT FOAM INSTEAD OF THE SAND COMMONLY FOUND IN A TILE BED. THE FOAM HOLDS 10 TIMES THE AMOUNT OF WATER, REDUCING THE SIZE OF THE SYSTEM NEEDED FOR THE SAME VOLUME. IT PROVIDES AEROBIC, ANAEROBIC, AND ANOXIC ENVIRONMENTS WITHOUT AIR COMPRESSORS OR AEROBIC SLUDGE PRODUCTION.

BENEFICIAL BACTERIA COLONIZE THE FILTER MEDIUM, PROTECTED FROM PREDATORS, DESICCATION, AND FREEZING. MICROBES DEGRADE AND OXIDIZE ORGANIC POLLUTANTS, COLIFORM BACTERIA, AMMONIUM, AND OTHER CONTAMINANTS. AIR PASSIVELY CIRCULATES THROUGHOUT, SO THERE'S NO NEED FOR FORCED AERATION. IT WORKS DOWN TO -50°C AND RESULTS IN SAND FILTER QUALITY EFFLUENT (< 10 MG/L CBOD & TSS) THAT IS CLEAR AND ODOURLESS.



OTHER CASE EXAMPLES



LEARNING CENTRE IN ST. LOUIS: RAINWATER, GREYWATER, CONSTRUCTED STREAM-BED AND RAIN GARDEN, COMPOST TOILETS, POINT OF USE WATER HEATING, SOLAR & MORE. LBC CERTIFIED, NET-ZERO ENERGY AND NET-ZERO CARBON.



COOLING TOWER INNOVATION: NREL USA/JOHNSON CONTROLS/SANDIA NATIONAL LABS. NEW WET/ DRY SYSTEM SAVES 56% ON WATER. COOLING TOWER AT HOTEL, GOLF RESORT IN CALIFORNIA USES VPT. ONE LOCATION SAVES 1.8 MILLION GALLONS OF WATER/YEAR.



ELEMENTARY SCHOOL IN AUSTIN SAVES \$10K YEAR CAPTURING RAINWATER FROM CORRUGATED METAL, POLY-LINED ABOVE GROUND CISTERNS FOR BATHROOMS AND LANDSCAPING.



RAINWATER-BASED DRIP IRRIGATION SYSTEM IN ATLANTA.

THE EAST BAY MUNICIPAL WATER DISTRICT STUDY ON HOW SMART METERS SAVE NON-REVENUE WATER (LEAKAGE).

DC WATER & OTHERS WITH LYNN MUELLER



SWITCH TO LYNN



QUESTIONS & DISCUSSION

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THANK YOU

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