

# Exploration Works!



By Nicole Collie & Elna Albano

## Building Description

Exploration Works! Is an innovative, hands-on Museum of Science and Culture. The museum incorporates many sustainable design practices and renewable energy technologies. Hot water preheat units on the roof and a PV array on the site reduce energy needs. A straw-bale wall on the west side acts as a demonstration piece in addition to acting as a heat sink. Daylighting throughout reduces the need for electric lighting in many areas.



## Building Description

Location: Helena, Mt

Building Size: 13,500 sq.ft + outdoor space

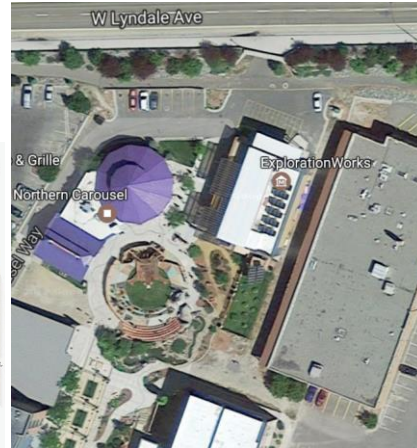
Project Budget: \$2.5 million

Opening Date: November 2007

LEED Certification.



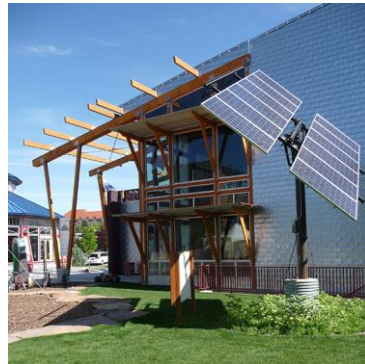
Great Northern Town Center



## Sustainability Features

Project's Distinguishing Features:

- Super-insulated building shell
- Grid-ties solar system
- In-floor radiant heat
- Wind turbines
- Passive solar design
- Evaporative cooling towers
- Integrated day lighting/artificial lighting systems
- High-efficiency mechanical component.
- Outdoor Garden



# Question A – Malcom Well’s Checklist

ExWorks! is more regenerative than degenerative.

They lack in use in storm water management and material reuse, but does great in natural daylighting

## Regeneration-Based Checklist for Design and Construction

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	Project:								
	degeneration		sustainability			regeneration			
	-100 always	-75 usually	-50 sometimes	-25 a bit	0 balances	25 a bit	50 sometimes	75 usually	100 always
the site									
pollutes air									
pollutes water									
wastes rainwater									
consumes food									
destroys rich soil									
dumpes wastes unused									
destroys wildlife habitat									
imports energy									
requires fuel-powered transportation									
intensifies local weather									
excludes daylight									
uses mechanical heating									
uses mechanical cooling									
needs cleaning and repair									
produces human discomfort									
uses fuel-powered circulation									
pollutes indoor air									
is built of virgin materials									
cannot be recycled									
serves as an icon for the apocalypse									
is a bad neighbor									
is ugly									
cleans air									
cleans water									
stores rainwater									
produces food									
creates rich soil									
consumes wastes									
provides wildlife habitat									
exports energy									
requires human-powered transportation									
moderates local weather									
uses daylight									
uses passive heating									
uses passive cooling									
maintains itself									
provides human comfort									
uses human-powered circulation									
creates pure indoor air									
is built of recycled materials									
can be recycled									
serves as an icon for regeneration									
is a good neighbor									
is beautiful									

negative score: 2200 possible **225**

positive score: 2200 possible **700**

final score: **475**

# Question A – LEED Checklist



## LEED v4 for BD+C: New Construction and Major Renovation Project Checklist

Project Name:  
Date:

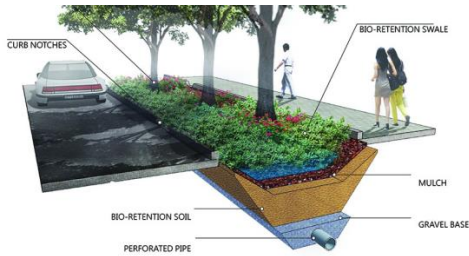
Y ? N	Credit		Points
		Integrative Process	1
<b>11</b>	<b>0 0</b>	<b>Location and Transportation</b>	<b>16</b>
		Credit: LEED for Neighborhood Development Location	16
	X	Credit: Sensitive Land Protection	1
	X	Credit: High Priority Site	2
4		Credit: Surrounding Density and Diverse Uses	5
5		Credit: Access to Quality Transit	5
		Credit: Bicycle Facilities	1
1		Credit: Reduced Parking Footprint	1
	X	Credit: Green Vehicles	1
<b>6</b>	<b>0 0</b>	<b>Sustainable Sites</b>	<b>10</b>
Y		Prereq: Construction Activity Pollution Prevention	Required
		Credit: Site Assessment	1
	X	Credit: Site Development - Protect or Restore Habitat	2
1		Credit: Open Space	1
	X	Credit: Rainwater Management	3
2		Credit: Heat Island Reduction	2
1		Credit: Light Pollution Reduction	2
<b>8</b>	<b>0 0</b>	<b>Water Efficiency</b>	<b>11</b>
Y		Prereq: Outdoor Water Use Reduction	Required
Y		Prereq: Indoor Water Use Reduction	Required
Y		Prereq: Building-Level Water Metering	Required
2		Credit: Outdoor Water Use Reduction	2
4		Credit: Indoor Water Use Reduction	6
2		Credit: Cooling Tower Water Use	2
	X	Credit: Water Metering	1
<b>10</b>	<b>0 0</b>	<b>Energy and Atmosphere</b>	<b>33</b>
Y		Prereq: Fundamental Commissioning and Verification	Required
Y		Prereq: Minimum Energy Performance	Required
Y		Prereq: Building-Level Energy Metering	Required
Y		Prereq: Fundamental Refrigerant Management	Required
	X	Credit: Enhanced Commissioning	6
6		Credit: Optimize Energy Performance	8
1		Credit: Advanced Energy Metering	1
	X	Credit: Demand Response	2
	X	Credit: Renewable Energy Production	3
1		Credit: Enhanced Refrigerant Management	1
2		Credit: Green Power and Carbon Offsets	2
<b>2</b>	<b>0 0</b>	<b>Materials and Resources</b>	<b>13</b>
Y		Prereq: Storage and Collection of Recyclables	Required
Y		Prereq: Construction and Demolition Waste Management Planning	Required
	X	Credit: Building Life-Cycle Impact Reduction	5
	X	Credit: Building Product Disclosure and Optimization - Environmental Product Declarations	2
5		Credit: Building Product Disclosure and Optimization - Sourcing of Raw Materials	2
	X	Credit: Building Product Disclosure and Optimization - Material Ingredients	2
	X	Credit: Construction and Demolition Waste Management	2
<b>9</b>	<b>0 0</b>	<b>Indoor Environmental Quality</b>	<b>16</b>
Y		Prereq: Minimum Indoor Air Quality Performance	Required
Y		Prereq: Environmental Tobacco Smoke Control	Required
	X	Credit: Enhanced Indoor Air Quality Strategies	2
3		Credit: Low-Emitting Materials	3
	X	Credit: Construction Indoor Air Quality Management Plan	1
	X	Credit: Indoor Air Quality Assessment	2
	X	Credit: Thermal Comfort	1
2		Credit: Interior Lighting	2
3		Credit: Daylight	3
1		Credit: Quality Views	1
	X	Credit: Acoustic Performance	1
<b>6</b>	<b>0 0</b>	<b>Innovation</b>	<b>6</b>
5		Credit: Innovation	5
1		Credit: LEED Accredited Professional	1
<b>0</b>	<b>0 0</b>	<b>Regional Priority</b>	<b>4</b>
	X	Credit: Regional Priority: Specific Credit	1
	X	Credit: Regional Priority: Specific Credit	1
	X	Credit: Regional Priority: Specific Credit	1
	X	Credit: Regional Priority: Specific Credit	1
<b>61</b>	<b>10 39</b>	<b>TOTALS</b>	<b>Possible Points: 110</b>
Certified: 40 to 49 points, Silver: 50 to 59 points, Gold: 60 to 79 points, Platinum: 80 to 110			



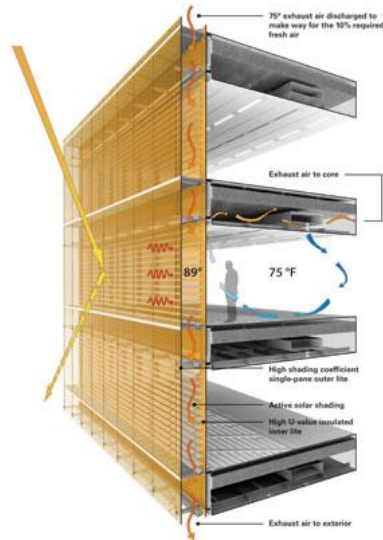
## Question B – Redesign



GREEN ROOF



BIO-RETENTION SWALE



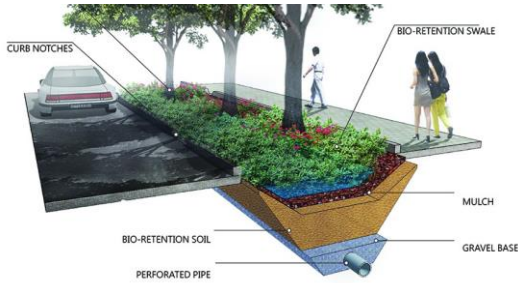
DOUBLE SKIN GLAZING

## Question B – Redesign



Helps reduce rainwater waste by sustaining green roof plant life. It creates a habitat for possible wildlife such as insects and birds.

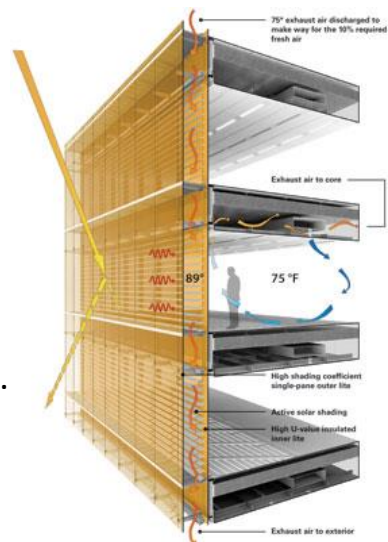
## Question B – Redesign



Having no system for storm water management, adding a bio-retention swale to the design of the landscape will help prevent storm water run off from going straight into the sewer system.

## Question B – Redesign

Exploration Works! focused on daylighting and great views for their design. They did not have a good system for passive cooling and heating. With a double skin glazing façade, this will allow for better passive cooling and heating.



# Question B – Redesign

With the redesign, ExWorks! Has a better storm water management system.

There is nothing we can do about the material reuse in the construction of the building, but any further use of materials will be recyclable.

### Regeneration-Based Checklist for Design and Construction

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Project: \_\_\_\_\_

	degeneration		sustainability		regeneration			
	100 always	75 usually	50 sometimes	25 a bit	0 balances	25 a bit		
the site							cleans air	
							cleans water	
							stores rainwater	
							produces food	
							creates rich soil	
							consumes wastes	
							provides wildlife habitat	
							exports energy	
							requires human-powered transportation	
							moderates local weather	
	the building							uses daylight
								uses passive heating
							uses passive cooling	
							maintains itself	
							provides human comfort	
							uses human-powered circulation	
							creates pure indoor air	
							is built of recycled materials	
							can be recycled	
							serves as an icon for regeneration	
							is a good neighbor	
							is beautiful	

negative score: 2200 possible: **100**

positive score: 2200 possible: **1250**

final score: **1150**

# Question B – LEED Checklist



### LEED v4 for BD+C: New Construction and Major Renovation

Project Checklist

Project Name:  
Date:

Y	?	N	Credit	Points	
			Credit	Integrative Process	1
11	0	0	16	<b>Location and Transportation</b>	16
		X	Credit	LEED for Neighborhood Development Location	1
		X	Credit	Sensitive Land Protection	1
		X	Credit	High Priority Site	2
4			Credit	Surrounding Density and Diverse Uses	5
5			Credit	Access to Quality Transit	5
1			Credit	Bicycle Facilities	1
1			Credit	Reduced Parking Footprint	1
		X	Credit	Green Vehicles	1
8	0	0	10	<b>Sustainable Sites</b>	10
	Y		Prereq	Construction Activity Pollution Prevention	Required
1			Credit	Site Assessment	1
2			Credit	Site Development - Protect or Restore Habitat	2
1			Credit	Open Space	1
3			Credit	Rainwater Management	3
2			Credit	Heat Island Reduction	2
1			Credit	Light Pollution Reduction	1
10	0	0	11	<b>Water Efficiency</b>	11
	Y		Prereq	Outdoor Water Use Reduction	Required
	Y		Prereq	Indoor Water Use Reduction	Required
	Y		Prereq	Building-Level Water Metering	Required
2			Credit	Outdoor Water Use Reduction	2
5			Credit	Indoor Water Use Reduction	5
2			Credit	Cooling Tower Water Use	2
1			Credit	Water Metering	1
16	0	0	33	<b>Energy and Atmosphere</b>	33
	Y		Prereq	Fundamental Commissioning and Verification	Required
	Y		Prereq	Minimum Energy Performance	Required
	Y		Prereq	Building-Level Energy Metering	Required
	Y		Prereq	Fundamental Refrigerant Management	Required
		X	Credit	Enhanced Commissioning	6
9			Credit	Optimize Energy Performance	18
1			Credit	Advanced Energy Metering	1
		X	Credit	Demand Response	2
3			Credit	Renewable Energy Production	3
1			Credit	Enhanced Refrigerant Management	1
2			Credit	Green Power and Carbon Offsets	2
9	0	0	13	<b>Materials and Resources</b>	13
	Y		Prereq	Storage and Collection of Recyclables	Required
	Y		Prereq	Construction and Demolition Waste Management Planning	Required
5			Credit	Building Life-Cycle Impact Reduction	5
		X	Credit	Building Product Disclosure and Optimization - Environmental Product Declarations	2
2			Credit	Building Product Disclosure and Optimization - Sourcing of Raw Materials	2
		X	Credit	Building Product Disclosure and Optimization - Material Ingredients	2
2			Credit	Construction and Demolition Waste Management	2
16	0	0	16	<b>Indoor Environmental Quality</b>	16
	Y		Prereq	Minimum Indoor Air Quality Performance	Required
	Y		Prereq	Environmental Tobacco Smoke Control	Required
2			Credit	Enhanced Indoor Air Quality Strategies	2
3			Credit	Low-Emitting Materials	3
1			Credit	Construction Indoor Air Quality Management Plan	1
2			Credit	Indoor Air Quality Assessment	2
1			Credit	Thermal Comfort	1
2			Credit	Interior Lighting	2
3			Credit	Daylight	3
1			Credit	Quality Views	1
		X	Credit	Acoustic Performance	1
6	0	0	6	<b>Innovation</b>	6
	5		Credit	Innovation	5
	1		Credit	LEED Accredited Professional	1
0	0	0	4	<b>Regional Priority</b>	4
		X	Credit	Regional Priority: Specific Credit	1
		X	Credit	Regional Priority: Specific Credit	1
		X	Credit	Regional Priority: Specific Credit	1
		X	Credit	Regional Priority: Specific Credit	1
75	10	15	110	<b>TOTALS</b>	Possible Points: 110

Certified: 40 to 49 points, Silver: 50 to 59 points, Gold: 60 to 79 points, Platinum: 80 to 110

## Conclusion

Although the exciting Exploration Works building is more regenerative than not it can be improved upon. Improvements include the addition of a green roof, bioswale, and a double skin glazing. This helped improve the scores of both the Malcom Well's checklist and the LEED checklist.

