

BUILDING THE URBAN FRONTIER HOUSE

(From the Wife's Perspective)



Janna Hafer

For our children

“Here’s to the crazy ones. The misfits. The rebels. The troublemakers. The round pegs in the square holes. The ones who see things differently. They’re not fond of rules. And they have no respect for the status quo. You can quote them, disagree with them, glorify or vilify them. About the only thing you can’t do is ignore them. Because they change things. They push the human race forward. And while some may see them as the crazy ones, we see genius. Because the people who are crazy enough to think they can change the world, are the ones who do.”

Rob Siltanen

Apple Inc.

CONTENTS

Introduction	1
Land for Sale at Auction	2
Goals and Program	4
Selling the Big Tin House	6
Prepping the Site	8
ILBI Membership	10
Passive House Modeling	12
Was 2013 the Year for Groundbreaking?	14
What Did You Do On Your Vacation?	16
What Did You Do About the Water?	18
Tilting at Windmills	20
Financing	22
Building Permit	24
And So It Begins	26
Not Everything Runs Smoothly	28
It's All About the Insulation	30
Waiting for FSC Wood	32
The Wood Arrives and Our Contractor Goes on Vaca	34
Structural Insulated Panels	36
We Have Walls!	38
Two Beam or Not Two Beam	40
Moving On Up	42
'Dem Bones	44
Raising the Roof	46
My Front Porch	48

Let the Sun Shine	50
Why Are We Covering Up the Windows???	52
The Speaking Circuit	54
The “RED LIST”	56
Interior Doors	58
The Garden Room	60
Where Is “Away?”	62
Skylights and Roofing	64
Windows and Doors	66
Time	68
Tilting at Windmills – Part 2	70
Sustainability Revolution Tour	72
Clash in the Kitchen	74
Barnwood and Beadboard	76
BioPCM	78
Gingerbread House	80
Sheetrock	82
Scavenger	84
Brotherly Love	86
Operations Control Central	88
The Wall of Many Colors	90
Rain Gutters and Rain Barrels	92
Weekend Warriors	94
Gravelpave	96
Wood Flooring	98
Insect and Fungus	100
Alkylphenols	102

It Looks Like a Toilet	104
Being First Is Not Easy	106
The Fridge Fiasco	108
Reinforcements	110
The Governor's Innovate Montana Symposium	112
What's That Smell???	114
The Water Test Results Are In!	116
My Moving Day	118

INTRODUCTION

By Randy Hafer, FAIA

This quest to build a sustainable urban house, our little house on the high plains, the Urban Frontier House, began a long time ago in the early 1970's. In the fall of that year, I packed a trunk and flew off to the Bay Area to study architecture at a university that I had never seen before. For a kid from Montana, that was a pretty big shock. I went from a place that I felt I knew well, a place with friends and family, big skies, long views, and few cars to a place where I didn't know anyone, a place with a very different climate, and lots of cars.

Then, as it happened, in the fall of 1973, my second year in California, the first Arab oil embargo – the first Energy Crisis – occurred. I was very impressed with the disruption, anxiety, and uncertainty that quickly developed in the car centered world of the Bay Area around me. While that first energy crisis was a political crisis and not a real shortage crisis, the swift and negative impacts of the shortage and price increases got me thinking. What if oil really was in short supply? What if gasoline was expensive? Could that even happen? Those questions had never occurred to me before that time.

I began exploring those questions. Clearly, as a society, we were then and are now dependent on readily available, inexpensive fossil fuels to power our transportation systems, heat, cool and light our buildings, manufacture the stuff of everyday life, and produce food. And if we are still dependent on those fossil fuels, are we not then also vulnerable to real shortages and price increases? And since the fossil fuels that produce the energy we depend upon come out of the ground, can they run out, and, if so, when? Is there another way?

URBAN FRONTIER HOUSE

7/16/08

Land for Sale at Auction

Randy and I were driving through the North Park neighborhood of Billings in the summer of 2008 and noticed a small corner parking lot with a fluorescent pink sign posted on the property. Of course, Randy jumped out to check it out. Randy didn't like to think that something might be happening in his town that he didn't know about. As it turned out, the State of Montana was selling this corner at auction on July 16, 2008 "on the steps" of the Yellowstone County Courthouse. We called for more information and showed up on July 16 ready to bid. Fortunately for us, no one else showed up so we got the property for the minimum bid. The State of Montana had purchased this property on December 15, 1967 for \$10.00 and had owned it for 40 years. Needless to say, we did not get it for \$10.00 but we felt good about our purchase and as of October 3, 2008, we had the location for the Urban Frontier House.



Parking lot for sale

URBAN FRONTIER HOUSE

11/03/08

Goals and Program

Whenever a new client comes into our architectural office with dreams of a new house, Randy asks them to write down their Goals and Program. Randy did the same thing for the Urban Frontier House and then gave them to me for input. I only added two things; it seemed like we were on the same page. It's a good thing we wrote them down because we have had to revisit the lists several times. It is soooooooooooooooooo easy to dream big because dreaming doesn't cost anything. House plans can get way out of control in the planning stage and it happened to us. We added a little bit here and a little bit there and the first plan got way too big. When we finally added up the total square footage and put a reasonable price per square foot to it (we weren't talking extravagant finishes either), we had to reel ourselves in and get more realistic. Let me just say that this process was VERY frustrating at times because we didn't always agree. Shocking isn't it to think that a husband and wife might not agree on something. Nevertheless, we took off a little bit here and a little bit there until it was where we needed it to be. The number one item on the list was: Net off the grid. That was very important to Randy; HOWEVER, nowhere on the lists did it say no city water, no city sewer, no heat, gray-water recycling, dc micro-grid, and composting toilets. I like to think I'm the adventurous type but what have I gotten myself into???



Floorplan for the Urban Frontier House

URBAN FRONTIER HOUSE

08/26/09

Selling the Big Tin House

Before we could build the Urban Frontier House, we had to sell the Big Tin House. The Big Tin House is where Randy and I were married and all of our seven children lived in that house at one time or another. We had many memories in that house so selling it was somewhat bittersweet but it was very big. (My definition of “very big” is: How many bathrooms do I have to clean on cleaning day?) The youngest child was a senior in high school and soon would be heading off to “seek her fortune.” We put the house on the market but knew that it might take awhile to sell since it would take a buyer wanting a big house. Every time the realtor called for a showing, it was a mad dash to “spiff up” the house and then vacate the premises. Then one day we got “the” offer. The buyer would like to close in 30 days. Yikes! The race was on! Sorting, giving away, packing fourteen years of accumulated “stuff” was daunting. The night before the closing, Randy and I mopped our way out of the house at 1:00 a.m. with the last load in the car and drove away from the Big Tin House for the last time. We sold the Big Tin House on August 26, 2009.



Randy, Janna and their seven children

Wedding Day May 17, 1998

URBAN FRONTIER HOUSE

07/13/10

Prepping the Site

There were steps to be taken in order to prep the site for a house. Even though we were not ready to start construction, we could make some changes to the property that would have to be done eventually. First, on July 13, 2010, we wrote a letter to the City Engineer requesting removal of the curb cut to the parking lot and replacement with curb and gutter. Also, the sidewalk across the entrance to the parking lot was in need of repair. The tasks were added to the City's Curb, Gutter, and Sidewalk program. The price would ultimately end up on our tax bill, but it was a start! Second, a lone light pole stood on the property shining its light across the now empty parking lot every night. We weren't paying for it but someone was. I contacted the electric company to have it removed. They first had to contact the person paying the electric bill every month to determine if it was okay with them. I surmise that our tax dollars were still paying that electric bill. Needless to say, the light pole was removed. And last, the existing trees on the property had been neglected for some time and were in need of a "haircut." The dead branches were removed and the trees were trimmed up nicely. After 40 years as a parking lot, the site had started its transformation back to a contributing member of the residential neighborhood.



Replacing the curb cut to the parking lot

URBAN FRONTIER HOUSE

03/01/11

ILBI Membership

Some day, at sometime, Randy read something about Living Building Challenge. The challenge was to live, not just net off the grid, but totally off the grid. Randy loves a challenge. After all, how hard could it be??? The answer is **HARD!** There is currently no Living Building Challenge certified house. So, the gauntlet was thrown and Randy accepted. On March 1, 2011, we became members of the International Living Building Institute so that we could register the Urban Frontier House as a project seeking to ultimately become a Living Building Certified house. For those of you who are old enough, even though our house will be in the city, it somewhat reminds me of the “Green Acres” television sitcom back in the 60s and 70s where the husband and wife leave the city and decide to “work the land.” Actually, the husband relishes the “chores” and the “fresh air” while the wife is not so sure about leaving her city life. Am I living a sitcom? We will see. In the meantime, I am on board and very curious how this is all going to turn out – haha! Stay tuned!



21st Century American Gothic a lá Billings, Montana

URBAN FRONTIER HOUSE

08/02/12

Passive House Modeling

As if Living Building Challenge was not enough of a challenge, Randy was intrigued with the Passive House energy modeling program. Could the Urban Frontier House meet the Passive House criteria as well? On August 2, 2012 we signed an agreement with a Passive House energy consultant to assist us with modeling of our new house. The “gist” of the program is to make the house extremely well insulated without too many thermal breaks in order to significantly reduce the energy demand for either heating in the winter or cooling in the summer. That seemed like a good idea – easier said than done. The consultant ran our house measurements, number of windows, number of doors, etc. through the Passive House calculation software. The maximum “air changes per hour” is 0.6. Our house design exceeded that threshold. Bummer! Back to the drawing board. I can’t even remember how many times we tweaked the plan and held our breath waiting for the results. Each time was a “Close, but No.” An apparent flaw in the system is that the Passive House modeling software could not “understand” and address certain aspects of our house design such as the airflow through the garden room. Perhaps in time that will change. The good news is that by going through the process, we became more cognizant of such things as real insulation needs including insulation under the basement slab and window sizes on the north side of the house versus window sizes on the south side of the house. Therefore, we feel that all was not lost and the house design is better because of it.



The “Thinker” at the kitchen table

URBAN FRONTIER HOUSE

01/11/13

Was 2013 the Year for Groundbreaking?

After the double dog dare of Living Building Challenge and Passive House, we also registered the Urban Frontier House on January 11, 2013 with the US Green Building Council in hopes of having the house certified at the Platinum level. In March 2013, we signed an agreement with Acuity Power to assist us with determining our energy loads and the possibility of using a DC micro-grid. What is a DC micro-grid? Was that on the Goals or Programs list? Do I still get to use “essential appliances” such as my curling iron, hair straightener, and hair dryer??? Randy and I have had many discussions about what is an “essential appliance.” He has assured me that I don’t need to worry. Just for the record, as far as we know there is no other occupied residence operating with a DC micro-grid in the world. In April 2013, the lot was surveyed to determine the corners of the property in order to site the house. In May 2013, we made a trip to Minnesota to check out a house with a self-contained water treatment system (and take in a Twins game with our son and daughter-in-law). On June 2, 2013, our close friends in town painted a shovel gold, filled the trunk of their car with margaritas, and picked us up for the ground breaking of the Urban Frontier House. Let me just say that it is not easy to have a ground breaking in an asphalt parking lot. Not to be deterred, we gave it the old college try, tailgated with margaritas, and photographed the event. Nevertheless, 2013 was ultimately not the year for the “official” groundbreaking of the Urban Frontier House.



Attempting to “break ground” in an asphalt parking lot

URBAN FRONTIER HOUSE

08/01/13

What Did You Do On Your Vacation?

I have a dear friend who I met at Girl Scout Camp in the summer after the fifth grade. Every summer, we visit her and her husband at their cabin at Swan Lake in northwestern Montana. Sometimes we take all of our kids. Sometimes all of their kids are there as well. We water ski, hike, swim, eat well and basically have a wonderful vacation. In August of 2013 while on our annual vacation at Swan Lake, Randy and I invited these very good friends to accompany us on a field trip to Advanced Composting Systems in Whitefish, Montana. It was not on their “bucket list,” but they went with us just the same. Advanced Composting was not a very high tech operation, but then, composting is not high tech; it is biology. The owner gave us a personal tour and we left with the knowledge that this was where we would purchase the composting system for our new house. Was a composting system on the Goals or Program list? I don't think so but if I was going to have a composting system in my house I had to see it for myself. Let me just say, that I am **WAY OUT OF MY COMFORT ZONE** on this one but don't let it be said that I'm not a team player.



My BFF

URBAN FRONTIER HOUSE

09/01/13

What Did You Do About the Water?

While we ultimately decided to not use the water treatment system we saw in Minnesota, we learned **A LOT** during the tour which gave Randy the extra confidence that our self contained water treatment system could definitely work! There was, however, one major problem. The state of Montana has a requirement that any residence within proximity of a municipal water supply must hook up and pay the price to do so. As a result of our trip to Minnesota, Randy approached the City Public Works Director to ask for release from that requirement. The beauty of living in Montana is that the Public Works Director said that he didn't think that would be a problem and would even approach the Montana Department of Environmental Quality on our behalf. The answer was that we needed to write a letter stating that we would hook up to city services if our system proved a failure. We wrote the letter. We now have plans for 9,000 gallons of rainwater storage and a composter in our basement. So, what's in your basement???



Seven water tanks that hold 1500 gallons each

URBAN FRONTIER HOUSE

01/31/14

Tilting at Windmills

As you might expect, we plan to take advantage of what the sun has to offer and have plans for a 2.16kw photovoltaic panel array on the roof. However, the sun doesn't shine at night and sometimes it is cloudy. Enter Taisei Techno, a Japanese company producing wind turbines which even has a fabrication plant in Billings, Montana. Currently Taisei Techno has two vertical axis wind turbines in town – one very large one on the university campus and one rather small one that operates lights for a crosswalk. There are no residential wind turbines in Billings and would the city officials even allow one to be built? Randy and the Taisei representatives paid a visit to the office of Planning/Zoning/Code Enforcement. According to Randy, the City Planner was somewhat reluctant at the beginning. She assumed the wind turbine would be much taller and much larger than it is. However, it is within the height restrictions of the neighborhood and would not require a variance. And, it could be painted any color. In the end, she approved the project and we signed up for our “windmill” on January 31, 2014.



Checking out the small wind turbine in town

URBAN FRONTIER HOUSE

05/08/14

Financing

We have the house plan; we have the contractor; we have jumped through a “zillion” hoops to make this house a reality. We do not have a bottomless pit of money. We needed a loan. What bank wouldn't want to be a part of this “Urban Frontier House” project? Come to find out, there were a number of banks that did not want to be a part of our “Urban Frontier House” project. It was too scary. It was too different. Fortunately, there was a bank in town with which we had worked that had a few financing requirements but that ultimately stepped up to the plate and gave us a chance. On May 8, 2014 we signed the loan documents to help finance the building of the Urban Frontier House.



Signing loan docs

URBAN FRONTIER HOUSE

08/07/14

Building Permit

Now what? Oh yeah, we still don't have the building permit. The drawings have been at the Building Department for months. What is taking so long? There are a lot of structural questions. Okay, we have a structural engineer who can address their concerns. What else? There are a lot of electrical questions. Okay, our electrical consultant is still finalizing the electrical system and we will provide a delayed submittal with the final electrical plan. What else? Oh, there is no egress window in the basement. The only things in the basement are rainwater tanks, a water treatment system, and the composter. Why do we need a window? Well, there is a second exit requirement because the square footage in the basement exceeds the limit. But, we don't want a window in the basement. Okay, how about a pull down stair in the basement that opens up on the first floor next to an egress window? Okay, that can work. On July 11, 2014, we received our building permit. We went to the Building Department and took pictures. The people in the Building Department said they didn't remember ever having their pictures taken while giving out a building permit. And, on August 7, 2014, we "officially" broke ground on Urban Frontier House.



Randy picking up the building permit

URBAN FRONTIER HOUSE

08/27/14

And So It Begins

What happens first? Since the property was a parking lot for 40 years, there were wheel stops that needed a new home. The parking lot next to our architectural firm was in need of wheel stops. Thus, a new home was found for the wheel stops and they were moved first. Then the asphalt needed to be removed, at least where the basement was to be located. Of course, the asphalt was recycled. An old basement was uncovered while our basement hole was being dug. Of course, that was recycled as well. The rigid insulation for under and around the basement was delivered. During this time, I had to make several trips to the local grocery store to purchase cases of borax. As it turns out, borax is a substance that retards the set time of fly ash concrete. Fly ash is a waste product of burning coal. The cement trucks arrived and the footings were poured on August 27, 2014. So far, all seemed to be going well.



Setting the footings for the basement

URBAN FRONTIER HOUSE

09/12/14

Not Everything Runs Smoothly

The footings were poured; the basement wall forms were set; the cement trucks were coming. On September 12, 2014 the first truck of fly ash concrete arrived; everything was going fine. Same with the second truck. Same with the third truck. Then, the fourth truck arrived and immediately had to turn around because the fly ash concrete was setting up in the truck. The load had to be dumped out. The batch was remixed. It, too, was setting up in the truck and had to be dumped out. The decision was made to mix the next batch with Portland cement just to finish the basement walls. Nobody is sure what went wrong but it was a very expensive day for us.



Basement walls just after pouring

URBAN FRONTIER HOUSE

11/07/14

It's All About the Insulation

I am well aware that insulation is a good thing but how much insulation do we really need? When I thought of building a new house, I contemplated the kitchen layout, the location of bedrooms and bathrooms, and how many closets. I'm not opposed to insulation but it was not on my radar screen as a priority. That was not the case with Randy. He was all about the insulation. It's everywhere; it's everywhere! It's under the basement slab; it's around the basement; it's under the front slab. The walls will be made of structural insulated panels filled with 12 inches of rigid insulation and the roof will also be structural insulated panels filled with 18 inches of rigid insulation. Insulation is not necessarily sexy or inexpensive but once it's there, it does its job every minute of every day. So, the correct answer is: I love insulation!!!



Piles of rigid insulation filled the job site

URBAN FRONTIER HOUSE

1/1/15

Waiting for FSC Wood

It is a new year! The Urban Frontier House is under construction, but nothing's happening!!! We are waiting for FSC wood (wood from a sustainably harvested forest). That makes sense; why wouldn't everyone choose to use wood from a sustainably harvested forest. Maybe it's because it's **NOT EASY!!!** In fact, it's darn right **DIFFICULT!** For example: no, we couldn't go down to our local hardware store and buy FSC 2 X 4s and construction grade plywood. The closest supplier for us is about 200 miles away but, no, we didn't want to buy a train car load of lumber and that was the smallest quantity we could order. So, the search continued and continued and continued. Of course, our Project Architect is documenting all of her efforts. Finally, we placed four orders from four different suppliers in four different states. And, so, we wait. No wonder there are currently no Living Building Challenge certified homes. There is a reason it is called "challenge" because it certainly is. However, Randy (call him crazy) loves a challenge! And, so we wait.



Not much going on here

URBAN FRONTIER HOUSE

1/22/15

The Wood Arrives and Our Contractor Goes on Vaca

Timing is everything! We have been waiting and waiting for the FSC wood and finally on January 22, 2015, the first shipment arrives. Wahoo! Now the floor over the basement can be built. Then the walls can go up. Things are going to start happening now. However, it's getting close to February 1st which is typically a slow time for construction in Montana. February tends to be sketchy when it comes to good construction weather which is why in February our contractor takes his family to Hawaii for a little R&R. Really??? No one should work all the time and everyone deserves a break, but can this really be happening??? The weather this year is supposed to be extremely nice for February. Fortunately, he has an excellent crew, so, work will continue. Whew! So, Aloha, Andrew; have a wonderful vaca! We'll look forward to seeing you when you return!



Construction resumes even with snow on the ground

URBAN FRONTIER HOUSE

1/28/15

Structural Insulated Panels

Randy is a **BIG** fan of structural insulated panels (SIPs). SIPs are expanded polystyrene insulation sandwiched between two sheets of OSB (oriented strand board). They are fabricated in the shop according to the design of the house and then shipped to the construction site. We are fortunate to have a supplier of SIPs (Big Sky Insulation) with whom we have worked a lot located a little over two hours from Billings. Jim is our “go-to guy.” He is very patient when Randy calls him up and says, “Jim, I’ve got an idea!” Randy didn’t want any thermal breaks anywhere in the house and he had a design idea how to accomplish that. Also, Randy didn’t want any grade stamp markings on the interior of the OSB panels which would require extra effort on the part of our supplier during fabrication. And, could we purchase additional FSC OSB through their shop instead of trying to find a supplier “from who knows where?” Jim made it happen and the SIPs started arriving on January 28, 2015. Thank you, Jim!



Contractors pondering the architect's intentions

URBAN FRONTIER HOUSE

2/11/15

We Have Walls!

Structural insulated panels (SIPs) are large and unwieldy. They have to be lifted into place with a crane. However, one of the many really nice features of SIPs is that after they arrive, they can be tipped up in place, secured, and Voila! There are walls! They have a finished flat surface on the exterior and the interior that is plumb. They are flatter, straighter, and consume far less wood fiber than conventional framing. (I had a little help with that one!) The insulation is already in the walls along with the raceways for the electrical wiring. The door and window openings are already in place. Thus, a future resident can look out her bedroom window (opening) for the first time. It's pretty exciting!



On the inside looking out

URBAN FRONTIER HOUSE

2/25/15

Two Beam or Not Two Beam

The perimeter walls on the main level are in place. The next items in the sequence to be installed are the beams. We purchased some large wood beams that had been removed from the former Lane Deer Elementary School. Two of those large wood beams were cut, planed, and installed where the east and west ends of the second floor would rest. We also needed two steel beams that would be located near the center of the house which would support the middle of the second floor and the east and west end of the “crow’s nest” on the third floor. We knew the source of the wood beams but where were the steel beams fabricated? The local supplier could supply two steel beams and he thought they were fabricated in Texas but he would confirm. Not so fast! One of the beams had been fabricated in Mexico. You might ask, “What difference does it make where it is fabricated?” Part of the Living Building Challenge is to source the materials as close to the site as possible so as to limit the environmental impact caused by hauling materials from all across the globe. Ultimately, our supplier was able to supply the second beam as well so construction could continue.



Beams from the old Lane Deer School

URBAN FRONTIER HOUSE

3/1/15

Moving On Up

The east and west “bookends” (gables) of the second story are triangular in shape. Four sections of structural insulated panels (SIPs) were fit together like a puzzle, secured, and lifted into place, resting on the two large wood beams. It was about this time that March decided to “roar in like a lion” bringing with it some very strong gusts of wind. The contracting crew was prepared by bracing and tying down the gable ends until such time that the second floor could be built. Each time we drove by the property we held our breath and were pleasantly surprised that the gable ends were still erect. Yeah! Onward and upward!



SIP gable ends for the second floor

URBAN FRONTIER HOUSE

3/7/15

'Dem Bones

Any new construction project usually starts out as an idea. When it actually starts to take shape, that idea is becoming a reality. When the interior framing started appearing, I could walk around on the first floor (no stairs yet) and visualize where each room was going to be. I could look up and imagine the rooms on the second floor. I'm not the architect so I don't know how the architect "sees" how the parts fit together so I was quite amazed how something that I had seen on paper many, many times was now coming together – each wall, each window opening, each doorway, how the second floor depended on the structure on the first floor. It was fascinating to say the least! I did mention to my architect that I thought one window should be a little bigger and one doorway a little taller. I don't want him to think I'm not watching. However, all in all, I simply love my architect!



Starting the second floor floor

URBAN FRONTIER HOUSE

3/24/15

Raising the Roof

There is going to be a small room (crow's nest) at the very top of the new house on the third floor. It will have windows all around and a small deck so that Randy can observe the weather. Randy loves to watch the weather! One time there was a weather alert; the forecast announcement suggested that everyone take cover in an interior room. Randy's first thought was to race up to the roof to see what was going on. I ultimately had to intervene. The other purpose of the crow's nest is natural ventilation. (Don't you remember someone in your past teaching you that "hot air rises?") Anyway, once the crow's nest was in place, the roof (also made of structural insulated panels) was "raised" into place.



It's starting to look like a house!

URBAN FRONTIER HOUSE

04/03/15

My Front Porch

One thing that I have really missed from the Big Tin House is my front porch. We frequently sat on the porch swing to chat with our granddaughters or to observe the weather or to gaze at the stars or to appreciate the flowers or to sip a drink or to watch the world go by or The list is endless. The Urban Frontier House will also have a front porch. The porch posts are cut from reclaimed timbers found in a historic building downtown. Around the beginning of April I could stand under the roof of my new front porch and imagine the good times to come. I am so looking forward to once again sitting on the porch to chat with our granddaughters or observe the weather or to gaze at the stars or to appreciate the flowers or to sip a drink or to watch the world go by or You get the picture☺



The future front door

URBAN FRONTIER HOUSE

04/18/15

Let The Sun Shine

Up to this point, the contractor has only been focusing on the house portion of the Urban Frontier House. Around mid-April, the footings were poured on the alley-side (west) of the house for the garage and garden room. (Notice the chunks of concrete from a previous foundation found on the property that are being used as fill.) The garage will be accessed off the alley. The garden room is between the house and the garage and faces south (almost). The street grid in this part of town is 32° off of south so my architect (Randy) had to figure out a way to maximize the sun exposure to the garden room. This was done by placing the house as close to the south setback limit as possible and by placing the garage as close to the north setback limit as possible. Thus, the garden room is skewed on the property. Windows will fill the south-facing side of the garden room and the photovoltaic panels (solar panels) will occupy the roof of the garage and garden room and face south. All this had to be calculated up front in order to garner the most benefit from the sun. Even though we live in a northern climate, we are fortunate to have an average of 205 sunny days and sunshine is FREE! Therefore, let the sun shine!



Footings for the garage and garden room

URBAN FRONTIER HOUSE

04/21/15

Why Are We Covering Up The Windows???

I anticipate that some inquiring minds would like to know why we are covering up the windows and door openings. The walls and roof are constructed of Structural Insulated Panels (SIPs) and have an R-value of 24 for the walls and an R-value of 48 for the roof. However, by putting another layer of insulating panel (which is called nail base) around the entire house, we can increase the R-value of the walls to 48 and the R-value of the roof to 72. While the SIPs are pre-engineered according to the design of the house, the nail base is shipped in 4' X 8' panels, installed on site, and then the window and door openings are cut in the nail base according to the window and door openings visible from inside the house. Remember, we will NOT have a heating or cooling system in this house, so the better the R-value on those cold winter nights and hot summer days, the Better!



Another layer of insulation called nailbase

URBAN FRONTIER HOUSE

05/12/15

The Speaking Circuit

In January of 2014, Randy was selected to present a TEDx talk at the newly opened Billings Public Library. His talk was about our proposed new off-the-grid house. It seemed to spark some *interest*; however, at that time, it was *still* in the planning stages. Now that we have broken ground and are actually building the house, it has peaked considerable *interest*. (Perhaps the *interest* is more along the lines of, “Have you heard about the wacky house that Randy Hafer is building now???”) Nevertheless, in the last month alone, Randy has been asked to present at a middle school “World of Work” class, to 3rd through 6th graders at the Boys & Girls Club of Yellowstone County, to the board of the Burton K. Wheeler Center for Public Policy, and to an audience at In Conversation at Toucan Art Gallery. Randy is excellent at public speaking; I’m better at writing (thanks to my high school Creative Writing teacher, Mr. Nesbit.) That’s why Randy is on the speaking circuit and I’m writing the blog☺



Randy rocking the world of the TEDx attendees

URBAN FRONTIER HOUSE

05/18/15

The “RED LIST”

It's the middle of May and we have just recently ordered the windows and doors. Everything takes longer when we have to check all purchases against the “RED LIST” to make sure nothing was harmed in the making of the product and no toxic chemicals escaped into the atmosphere. The “RED LIST” contains the names of chemicals and materials to avoid if one is attempting to meet the Living Building Challenge. This is just one of the requirements of the challenge but this requirement not only intends for the building to be healthy for the occupants, but also hopes to encourage the manufacturers to consider any possible adverse effects to employees or the environment during the production process. Anya, Project Architect for our house, is extremely diligent when it comes to vetting any and all potential building materials for the house and she has provided the following further explanation:

The most challenging aspect of tracking “RED LIST” compliance is simply getting manufacturers to disclose what is in their product, especially complex products assembled from many sub-components. Beyond the standard Material Safety Data Sheets (MSDS), many manufacturers are unaware of the chemical makeup of their product or sub-components, or they may use proprietary ingredients that they are unwilling to disclose. Our requests for additional information are often met with hesitation; understandably, as it requires additional work and can become fairly complex. The Living Building Challenge offers a few allowable tolerances and temporary exceptions, and recognizes advocacy as a tool to shift the market, but all of these avenues take time, diligence, and patience. The good news is that the combined effort of everyone committed to the Living Building Challenge is beginning to shift the market, as evidenced by the leading manufacturers who are already doing their part in providing total ingredient transparency and eliminating “RED LIST” chemicals. Many of these manufacturers can be found on the Declare product database.

<http://www.declareproducts.com/product-database>

Below is additional information from the Declare website:

“The Red List represents the “worst in class” materials, chemicals, and elements known to pose serious risks to human health and the greater ecosystem.” Red List Summary (these 14 common names represents over 800 specific chemical compounds):

- Asbestos
- Cadmium
- Chlorinated Polyethylene and Chlorosulfonated Polyethylene
- Chlorofluorocarbons (CFCs)
- Chloroprene (Neoprene)
- Formaldehyde (added)
- Halogenated Flame Retardants
- Hydrochlorofluorocarbons (HCFCs)
- Lead (added)
- Mercury
- Petrochemical Fertilizers and Pesticides
- Phthalates
- Polyvinyl Chloride (PVC)
- Wood treatments containing Creosote, Arsenic or Pentachlorophenol



URBAN FRONTIER HOUSE

06/1/15

Interior Doors

We are having a heck of a time trying to find interior doors which meet the FSC wood requirement (or equivalent), that are within the distance requirement, and are reasonably priced (which is our requirement). We have checked retailers far and wide without much success. We have checked The Restore for salvaged doors. We are drawing a blank; when, lo and behold, we hear about a small operation that makes furniture and other items mostly out of beetle-killed or fire-killed logs harvested from eastern and central Montana forests. We are well aware of the devastation to the forests by the pine beetle and of the fire season which strikes Montana forests every year but we were not aware that someone was repurposing some of the dead logs practically in our own backyard. We did some investigating and found “Country Pine” located within blocks of our building site. Let me tell you, Ken and his crew are quite the craftsmen! And, Ken is willing to tackle our interior doors. Who knows? We might have some other projects for him as well. And to think we might never have found “Country Pine” if we hadn’t taken on the Living Building Challenge.



Randy admiring the wood panels for our interior doors and cabinets

URBAN FRONTIER HOUSE

05/22/15

The Garden Room

As a child, I often played the board game Clue with my friends. If you are familiar with that game, you might recall that one of the rooms in the house was the Conservatory. I don't know about you but when I was growing up we never had a conservatory as one of the rooms in our house. So, what is a Conservatory anyway???

conservatory – *n.* 1. a private greenhouse usually attached to a dwelling, for growing and displaying plants

Wikipedia explains: “Conservatories originated in the 16th century when wealthy landowners sought to cultivate citrus fruits ... brought by traders from warmer regions of the Mediterranean. A conservatory by definition must have more than 50% of its wall surfaces glazed.” Our south facing wall will be mainly glass and there will be three windows on the north wall and two sun tunnels in the ceiling but there won't be any glass on the other two walls. Therefore, technically, our greenhouse does not meet the 50% rule and does not qualify as a conservatory. We are calling our greenhouse the Garden Room. It's not a big room; however, we are certainly looking forward to trying our hand at indoor gardening even if it's not technically a conservatory.



No, this is NOT an indoor pool!

URBAN FRONTIER HOUSE

06/22/15

Where Is “Away?”

It's big! It's blue! It's a??? What is it??? So, that's what a composter looks like! So, that's what is going to reside in my basement. When I was growing up, my grandma had a compost pile in her backyard. She also had beautiful flower gardens. I didn't make the connection between the two. When Gran would save her fruit and vegetable scraps for her compost pile, I would often wonder why she didn't just throw them “away” like other people did. Perhaps it was because she knew that “away” was actually a huge landfill pile of discarded stuff that accumulated more and more stuff and just kept getting bigger and bigger. Perhaps it was because she knew that composting biodegradable food scraps, grass clippings, and dry leaves actually produced something beneficial for her gardens. Perhaps I should have paid more attention at the time. If I would have, perhaps composting wouldn't seem so foreign and mysterious to me now. Nevertheless, I am learning - better late than never. So, Gran, here's to you!



Meeting the composter for the first time

URBAN FRONTIER HOUSE

07/22/15

Skylights and Roofing

I had no idea that I would be sooooooooooooooooooooo excited to see skylights and roofing installed at the new house. For the last few months, every time it rained outside, it also rained in the house. Around the end of June, the skylights were installed. Our skylights are from Velux and they are solar powered. That means there is no wiring to each skylight but they can still be programmed to open and close and the blinds in the skylights can be opened and closed. The skylights on the south side are larger than the ones on the north side but all six provide light and will provide ventilation. I really like these skylights! Also around the end of June, the metal arrived from Bridger Steel and the soffit and fascia installation began. There are quite a few eaves so the soffit and fascia installation took awhile. The eaves around the crow's nest very particularly challenging since it is three stories up and the roof pitch is substantial. However, the contractors did an excellent job and were extremely fastidious about matching seams and lining up the fasteners. We were very impressed and pleased! And now the corrugated metal roofing is being installed. (Bridger Steel, which is located right here in Billings, actually makes corrugated metal roofs so I'm guessing that Randy is not the only one who wants a corrugated metal roof.) It is structurally strong and impact resistance. It's perhaps not your typical roofing material but this is not your typical house which makes it perfect for Randy.



Solar powered skylights in a 45° pitch roof

URBAN FRONTIER HOUSE

08/09/15

Windows and Doors

These are **NOT** your typical windows and doors. These windows and doors are from Alpen High Performance Products and are made in Niwot, Colorado. The windows on the south are triple paned and the windows on the north are quadruple paned. They arrived around the end of July but were stored in the garage until it was time for installation. We made our annual trek to Swan Lake in northeastern Montana around the beginning of August, and had a wonderful time I might add. When we returned, the windows were all in!!! What a nice surprise!!!



Triple-pane windows on the south face

URBAN FRONTIER HOUSE

08/31/15

Time

Time! Where does it go??? Two days after we returned from our vacation came the time for my step-dad, Papa Harry, to leave this world. His health had been declining for some time so it was not a complete surprise. Nevertheless, it was a time of sadness. Yet, it was also a time for the family to gather together and celebrate the life of this man. He was a great guy!!! Needless to say, our house construction did not get a lot of our time for awhile. But, time waits for no one. Time goes on. It's probably time to regroup, reconvene, re-mobilize. It's time!



Time

URBAN FRONTIER HOUSE

10/01/15

Tilting at Windmills – Part 2

Wow! Our contractor and his crew have really made substantial progress in the past week. The siding is going up; the front sidewalk was poured; and our windmill was installed on October 1. A large entourage was present for the installation of the windmill – engineers, contractors, consultants, and owners (that’s us!). In addition, the process was mustering significant interest by passers-by. Vertical axis windmills aren’t installed in residential front yards every day. The pole is brown in hopes of replicating a tree trunk. The blades were going to be green so they might blend in with the trees; however, the decision was made by the engineers that adding paint to the blades might alter the energy efficiency calculations. As a result, the blades remain silver, are quite sleek, and actually blend in with the house roof. The windmill is connected to four batteries in the basement of the house. After the batteries arrived, Randy asked me if I wanted to go downstairs and check out the batteries. I said, “Sure!” For the record, they look a lot like car batteries. I have to admit that I probably didn’t convey as much enthusiasm as Randy upon seeing the batteries for the first time. But then, matching Randy’s enthusiasm would be a difficult task. He has spent considerable time vetting the appropriate batteries for the project and having them finally on site was HUGE! Now, the windmill can start generating electricity which will be stored in the batteries. In the past, I have not been particularly fond of blustery days but I might be changing my tune as the wind is generating electricity for our new house.



I don't even want to know how they got this photo!

URBAN FRONTIER HOUSE

10/02/15

Sustainability Revolution Tour

The house isn't complete yet but we hosted our first event on Friday night, October 2. Months ago, we were approached by Ed Gulick, an architect in our office and a member of Northern Plains Resource Council, who asked if we might be willing to allow a group of interested individuals to tour our new house and learn about some of the not-so-usual features of the home. Of course, last spring, we were fairly confident that the house would be nearing completion, if not already done by the beginning of October. Unfortunately, that is not the case. Undeterred, the party went on as planned. Northern Plains handled the refreshments and advertising:

Get a sneak-preview of the almost-complete Urban Frontier House. This residence is currently pursuing Living Building Challenge certification, the most rigorous green building certification IN THE WORLD! Tour all aspects of the home and enjoy locally-sourced hors d'oeuvres, beer, and wine.

Built in a historic downtown Billings neighborhood by Randy and Janna Hafer of High Plains Architects, the house will be completely off-grid with its own self-sustaining systems for energy, water, and wastewater. Heated only by the sun and its occupants, all energy captured through a vertical wind turbine and photovoltaic panels will be distributed throughout the house via a DC Microgrid. There's even a greenhouse, which will enrich the indoor air quality!

The Sustainability Revolution Tour is a fundraiser for the clean energy work of Northern Plains. This is our 6th annual Billings event celebrating Montanans at the forefront of clean energy, energy efficient design, and local food!

Approximately 60 inquiring souls showed up and were treated to food, drink, and five learning stations. I think a good time was had by all! I know I had a good time and am looking forward to hosting more events in the future.



Ed from our office standing tall

URBAN FRONTIER HOUSE

10/12/15

Clash in the Kitchen

As the architect, Randy had a kitchen design for the new house. As the main cook, I had a few ideas for the kitchen design as well. First of all, in the beginning, there was no pantry. I **REALLY** wanted a pantry; in fact, I was convinced I **NEEDED** a pantry for adequate storage in the kitchen. Randy bumped out the north wall to accommodate my wishes. Yeah!!! Second, kitchens tend to be **VERY** high energy consumers because of all the major appliances, particularly the refrigerator, so major considerations needed to be made. From many sources, the consensus is that the most energy efficient refrigerator on the market is the Sunfrost; however, there is no water dispenser in the door and no automatic icemaker in the freezer. I rather like those features but Randy is convinced these are conveniences which are too energy demanding and which we can live without! Bummer!!! Then, there was the disagreement about the corner in the kitchen. I wanted a diagonal upper corner cabinet for storing dishes and for transition. Randy wanted a straight upper wall cabinet because it is less bulky and would allow more light from the living room. I wanted direct access to the lower cabinet from the living room side. Randy wanted a longer bar top on the living room side. We were at an impasse on this issue for months! The cabinetmaker needed an answer. The contractor needed an answer. We couldn't order the countertop until we had an answer. What do you do when two people don't agree? I am a firm believer that one person should not prevail all the time and the other person should not acquiesce all the time. In the end, Randy got the straight upper wall cabinet and I got direct access to the lower cabinet. Whew! Thankfully that is decided and we can move on so this house can get finished one of these days.



Not seeing eye to eye on kitchen cabinets

URBAN FRONTIER HOUSE

11/15/15

Barnwood and Beadboard

Randy's vision for the front porch was to create a gathering space reminiscent of an old front porch on our new house. Therefore, we contacted our friend Gary when we were searching for old barnwood for the front porch walls and reclaimed beadboard for the porch ceiling. Our friend Gary has a business repurposing wood and hardware from old homesteads and frequently travels to the Scobey area in northeastern Montana for just such a purpose. The Homestead Act of 1862 was enacted to accelerate the settlement of the western territory by granting adult heads of families 160 acres of surveyed public land for a minimal filing fee and five years of continuous residence on that land. In 1909, Congress passed the Enlarged Homestead Act. As a result, more than 80,000 homesteaders moved into Montana between 1909 and the early 1920's. Montana's weather tends to come in cycles with some years of continuous wetter weather followed by some years of dryer weather. As it turns out, many of those homesteaders were not cut out to be "dryland farmers" in Montana. By the late 1920's, 60,000 of them had packed up and left. However, two families that must have stuck it out near Scobey, Montana were the Rowe family and the Bummer family. As a result, the barnwood on our porch came from the Rowe family barn and the beadboard on our porch ceiling came from the Bummer Place. According to the Living Building Challenge, "...the use of salvaged materials is encouraged to acknowledge the considerable value of a material's embodied energy..." The wood on our front porch had a previous life and, oh, the stories it could probably tell!!!!



My architect also does manual labor

URBAN FRONTIER HOUSE

11/28/15

BioPCM

What is BioPCM and is this something I really need in the house??? BioPCM stands for Bio Phase Change Material and the purpose, according to the marketing brochure, is to “help maintain constant, comfortable building temperatures.” That sounds like a good thing but I have never heard of such a product. I am, however, familiar with the scientific principle since I spent many an hour learning Chemistry in Room 101 Gaines Hall at Montana State University. The basic concept is that materials have a natural tendency to absorb heat when they melt and to release heat when they solidify. The classic example is water giving off heat when it changes to ice or water absorbing heat when it changes to steam. This mystery stuff is a “bio-based material ... encapsulated in flame retardant, super-engineered polyfilm.” We decided that if this stuff works like they claim, it could be the difference between comfort and discomfort on either a very hot day or a very cold night. We opted to give it a try. Randy easily installed the sheets of BioPCM by stapling them to the wall studs before the walls were enclosed. I hope this isn't one of those “too good to be true” examples. Time will tell!



Randy (with my excellent assistance) installing BioPCM

URBAN FRONTIER HOUSE

12/03/15

Gingerbread House

This year the Downtown Billings Alliance sponsored a 'Home for the Holidays' gingerbread house competition among teams of architects and chefs to kick off the holiday season. Our office mulled it over and four willing individuals volunteered to take on the challenge. They decided that our Urban Frontier House was going to be the inspiration for their creation. And, what a creation it is!!! Our High Plains Architects team joined with the Lilac (restaurant specializing in local foods) team to build a smaller (to scale) version of our new house out of gingerbread and frosting complete with fruit leather solar panels, stacked peppermint candy rain barrels, and cinnamon bear miniatures on the front porch of Randy and me. (Of course, Randy's bear has a moustache!) Randy and I were overwhelmed when we saw the finished product. And, the winner of the 2015 Gingerbread House Competition is (drumroll, please) the High Plains Architects/Lilac team. The gingerbread house is on display in a downtown storefront on Broadway; our team was interviewed on the local news; and a photo of their winning entry was on the front page of the Local and State section of the Billings Gazette. For their efforts, the Downtown Billings Alliance will make a \$500 donation to the charity of their choice. What better way to kick off the holiday season!



It's beginning to look a lot like Christmas!

URBAN FRONTIER HOUSE

12/15/15

Sheetrock

We don't have much sheetrock in the Urban Frontier House but we do have some. Mainly, it is in the bathrooms, laundry room, high walls, and the ceilings of the hip ends. In this case "hip" is actually an architectural term rather than a slang adjective; however, I do think the hip ends are pretty hip! The sheetrock couldn't go up until the mineral wool insulation (instead of fiberglass insulation) was tucked into all the remaining nooks and crannies and wall cavities. Our sheetrock came from Cody, Wyoming which is only 106 miles from Billings and the "rockers" had it up the week before Christmas. (This is where I could say something about "rocking around the Christmas tree" but I will spare you that "hip end" to this blog. 😊)



Gypsum board aka sheetrock aka drywall

URBAN FRONTIER HOUSE

12/27/15

Scavenger

Scavenger, *n.* a person who collects abandoned things. Randy and I can certainly identify with this definition. We are always on the lookout for anything that someone else has deemed “unnecessary.” For example, when the old Cobb Field ballpark was being demolished, we purchased some green outfield fence posts. We frequently check out the Habitat for Humanity Restore where we have found tile and glass blocks. We purchased a significant amount of wood shelving out of an old building that was of no use to the owner. That shelving now clads one of our interior walls (as of the day after Christmas) and made excellent vertical railings for our stairs. Our stair treads are from old corral boards off the Brenden farm near Scobey, Montana. The advantages of scavenged building materials are numerous. One, the price is often reasonable. Two, the items have been diverted from the landfill. Three, the items tend to have inherent “character” and an associated story that can’t be found in newly manufactured products. And, four, the manufacturing source of scavenged items do not need to be tracked for the Living Building Challenge! This last one is huge because, as we have discovered, tracking the ingredients and manufacturing source of every item in the house is extremely taxing and time consuming. Wouldn’t it be nice if all building materials contained nothing on the Red List? Hopefully, being a scavenger will pay off in the end.



Repurposed materials

URBAN FRONTIER HOUSE

01/16/16

Brotherly Love

My brother Scott owns his own business, “Rent-a-Hubby,” and is a very capable handyman. He is the one people can call upon to assist with them with those “honey do” projects that never seem to get done. He seems like he is busy all the time but being the wonderful brother that he is, he made himself available to tackle a few projects for us on our new house. One of those jobs was to strip layers of paint off a few old doors we had salvaged. It was fairly tedious but he did such a nice job. Another project he undertook was to sand the OSB walls in the living room. He created mountains of sawdust and was covered from head to foot but the walls look great! Typically, OSB is not left as a finished wall but we are planning on leaving them exposed and just putting a clear sealer on them. They sort of look like a wall of marble made out of wood. I’m not sure what other tasks we might find for him to do but I’m sure they will be equally exciting. I just wanted to take this opportunity to give him a Shout Out and wish him a Happy Birthday!!!



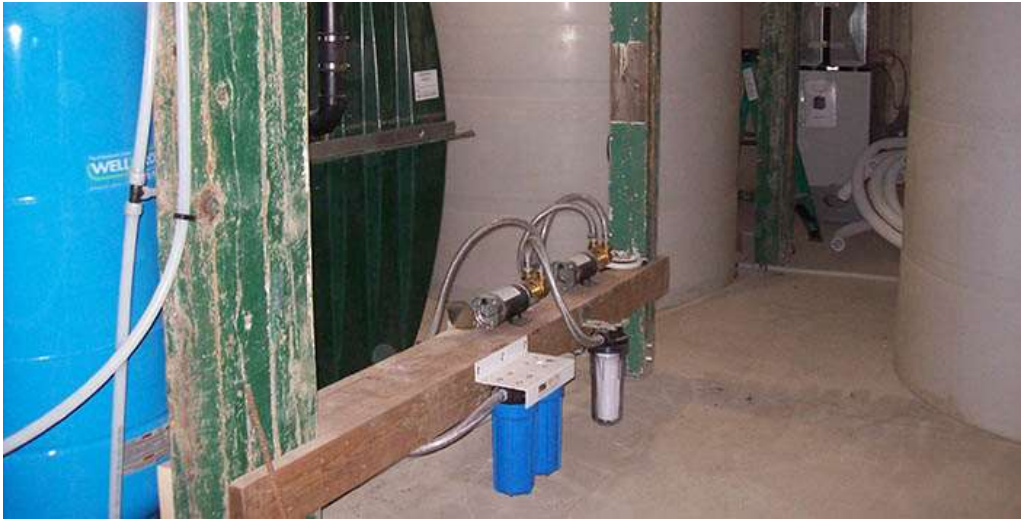
My baby brother

URBAN FRONTIER HOUSE

02/01/16

Operations Control Central

While construction and painting is continuing upstairs, mechanical, electrical, and plumbing is happening downstairs. That is where the seven rainwater tanks, the composter, and the batteries ended up but it is also where the hot water heaters, the electrical panels, the gray water tank, the filtration cylinders with the UV light, and the heat recovery ventilator are located. (The purpose of the heat recovery ventilator is to introduce fresh air into the house while also saving energy by reducing heating and cooling requirements. Since the house is so well insulated there is a need for fresh air. Of course, we could open the operable windows but that is not such a good idea when it is in the middle of the winter or summer.) There is **A LOT** going on in the basement!!!! That is why I refer to the lower level as Operations Control Central.



O.C.C.

URBAN FRONTIER HOUSE

02/14/16

The Wall of Many Colors

The Urban Frontier House has a lot of exposed wood on the interior of the house and while I really like the look of natural wood with its different shades and variations, I also want some color in the house. But what color??? The window and door frames are deep red; the columns by the stairwell are former Cobb Field fence posts and are, therefore, green; the high wall in the living room is dark blue to absorb heat; the tile that we found at the Restore is gray. So, after much discussion Randy and I finally agreed to incorporate all the colors into one wall that extends across one end of the living room and down one side of the hall. Call us crazy but we really like it!



Who says you have to paint a wall all one color?

URBAN FRONTIER HOUSE

02/15/16

Rain Gutters and Rain Barrels

The metal for the rain gutters finally arrived last week and were installed in one day. The downspouts are in place and are connected to the six rain barrels. The rain barrels are crafted from pre-used food grade barrels that were originally used to ship pickled food overseas. (The barrels don't smell like pickles so, hopefully, our water won't taste like pickles!) The company making the rain barrels minimizes their carbon footprint through effective use of water by collecting rainwater off their roof to use for washing the barrels. They advertise on the website that they "haven't used a drop of city water in over eight years." That is exactly what we are hoping to do also. So, now we just need it to rain and on Monday, February 15, 2016 it rained in Billings, Montana. Rain fell on our roof, was captured in the rain gutters, traveled into the rain barrels, and collected in the rainwater tanks in our basement. We could see the level in the bottom of the rainwater tanks at about two inches. Of course, we can't really move in until we have quite a bit more water than that but at least it's a start. This rain was a very welcome event. Oh, happy, oh, happy days!!!



Two of six rain barrels

URBAN FRONTIER HOUSE

02/21/16

Weekend Warriors

Since last November, Randy and I have spent a good portion of almost every weekend working at the new house. Our tasks have included such things as general carpentry, sanding, painting, and hauling all sorts of building materials, floor preparation, sweeping, shop vacuuming, and all around cleaning. Our contractor handles the “big” stuff and we tackle the “do-it-yourself” stuff. Anything we do is something we don’t have to pay someone else to do. I can’t tell you how many recycled boards Randy has cut and installed for walls, ceilings, and floors. Speaking of recycling, one of our tasks is to separate the leftover “trash.” We don’t have a construction dumpster on our building site but we do have recycling containers for paper, plastic, metal, and cardboard. The cardboard, in particular, adds up quickly! Fortunately, during the trash separation, the watch I lost last fall resurfaced and it still had the correct time! There are still work weekends ahead of us, but every little bit brings us closer to being able to move in and we all know how much fun moving is ☺



Hi ho, hi ho – it's off to work we go!

URBAN FRONTIER HOUSE

03/10/16

Gravelpave

We have an over-sized two car garage attached on the west end of the garden room. It is over-sized to accommodate some storage and a shop area for Randy. The driveway to our garage is composed of a Gravelpave permeable grid of raised rings made of “solid plastic resin, primarily from post-consumer and post industrial recycled sources, with a polyester fabric backing from recycled sources.” Yes, this stuff is made to drive on and it’s 100% made in the USA. We filled the rings with red scoria course gravel approximately $\frac{3}{4}$ ” in size. It allows for moisture to pass through in order to replenish the groundwater as opposed to a solid surface such as concrete which is basically impermeable. We lined the north and south edges of the Gravelpave with a line of stone pavers made at the local Pottery Shop which is located about eight blocks from our house. We can’t pull into the garage yet because it is still set up as a workshop but now, when we come over to the house, we can pull into the driveway. That’s pretty fun!



Our gravelpave driveway

URBAN FRONTIER HOUSE

03/28/16

Wood Flooring

Randy has started installing the wood flooring in the main areas on the first floor but this is not your typical wood flooring. We investigated all types of wood flooring materials but ran into numerous roadblocks with ingredients on the Red List. We discovered that manufactured wood flooring is not just wood! Enter Nick from Mystic Reclaimed Lumber located just outside of Billings. Nick gives three reasons for using reclaimed lumber:

1. Environmental Impact. Using reclaimed lumber saves new trees from being harvested as well as greatly reducing fuels used in the production and shipping of milled lumber.
2. Stability & Strength. Aged lumber has been through plenty of winter/summer cycles and everything in between, so the wood is generally more stable and less likely to shrink, twist, and cup like fresh cut lumber. Aged lumber is also generally tighter grained than today's lumber. Much of the reclaimed wood originally came from old growth forests which results in the natural, dense, tight grain patterns from trees grown naturally in the wild.
3. Character. With a vast array of patinas, textures, and grain patterns that only father time can create, nothing is comparable to the beauty and character reclaimed lumber presents.

The lumber for our wood flooring was all rafter stock from a few different buildings – a barn in Columbus, Montana; a calving shed in Molt, Montana; and a two story barn that had collapsed north of Acton, Montana. All of our floor boards are fir 2x6s reclaimed by Mystic Reclaimed Lumber and re-sawn by Country Pine. In fact, because of our project, these two entities are going to be collaborating on other projects. It's a win-win-win!!!



The pine flooring in the home office

URBAN FRONTIER HOUSE

04/19/16

Insect and Fungus

You might recall that all the wood in our house needs to either come from FSC (Forest Stewardship Council) forests or be reclaimed. For cabinets, we chose to have them built by Country Pine out of beetle-killed wood.

And now here is a little biology lesson: The mountain pine beetle is native to the forests of western North America; however, it appears that the current warmer temperatures have allowed the mountain pine beetle to survive longer and thrive. The beetle bores through the bark into the phloem layer on which it feeds and lays its eggs. Along with the mountain pine beetle is the blue-stain fungus which serves as food for the beetle and its larvae and travels from tree to tree via the mouth of the beetle. In addition, the fungus improves the environment for the beetle eggs and larvae by stopping the tree from producing its natural defense resin. Within two weeks of a beetle attack, the tree starves to death. This double whammy is devastating to the forests!

The dead trees are selectively harvested in hopes of promoting the reforestation of the affected areas. The commercial integrity of the beetle-killed trees is compromised since the moisture in the trees seeks to escape thus causing cracking. In addition, the beetle-killed wood has blue/gray streaks that give it a distinctive coloring. Nevertheless, the wood's strength appears to remain intact. Our logs were delivered to Country Pine where they were cut and dried. Randy came up with a design for all the kitchen cabinets, the dining room buffet cabinet, the master bathroom cabinet, and the upstairs guest bathroom cabinet. On April 19, the final two cabinets were delivered and Randy (with a little help from me) installed the cabinets. As sad and unfortunate as the mountainsides of red-needled dead pine trees are, at least the trees can be put to use and we are **VERY** pleased with our unique cabinets!



The buffet cabinet made out of beetle-killed pine

URBAN FRONTIER HOUSE

04/24/16

Alkylphenols

Paint comes in soooooooooooooo many colors that it is not always easy to pick one or two or even several colors to paint the interior walls in a new house. But let me tell you what is even **HARDER** to do: find a paint that does not contain alkylphenols. Alkylphenol is one of the ingredients included on the **Red List**. So, what the heck are alkylphenols???

Here is a little chemistry lesson from the APE (Alkylphenol Ethoxylates) Research Council: "Alkylphenols (APs) are chemical intermediates that are reacted with other compounds to create derivative products, which are then used to make high-value, high-performance compounds that are used in a variety of applications. The two most commercially relevant alkylphenols are nonylphenol (NP), which has a 9-carbon alkyl group, and para-tert-octylphenol (ptOP), which has an 8-carbon alkyl group."

So, what the heck does that mean???

Alkylphenols are used in a wide variety of products including detergents, cleaning products, pesticides, lubricants, hair products and as wetting agents, emulsifiers, and dispersants in paint.

So, is that necessarily a bad thing???

There appears to be a controversy as to whether alkylphenols pose a health risk or not. According to Wikipedia, "The European Union has implemented sales and use restrictions on certain applications in which nonylphenols are used because of their alleged "toxicity, persistence, and the liability to bioaccumulate" but the United States EPA has taken a slower approach to make sure that action is based on "sound science"." Toxic means harmful to living organisms; persistent in this case means they do not readily biodegrade into simpler, less harmful compounds; and bioaccumulate means that once they enter a living organism they tend to accumulate in its tissues. None of those sound like a good thing so perhaps it

makes sense to avoid exposure to alkylphenols just in case. Fortunately, there is a paint company in South Carolina, Ecos Paints, that ships any paint order of any color or size for \$9.95 and it doesn't contain any alkylphenols. The paint is not necessarily inexpensive but it is **very good** paint and has no odor (at all!); in fact, our painter commented how nice it was. My job description also includes painting. I have spent many a weekend sponging and rubbing paint on our walls to create a "faux" painted look. I am quite impressed with the result if I do say so myself!



I call this "French Chateau"

05/11/16

It Looks Like A Toilet

There are various models of composting toilets on the market, none of which I wanted in my new house. I did not want a self-contained model that had a drawer. (Our son in particular asked the question right up front, “Dad, is this thing going to have a ‘poop’ drawer?”) I did not want one with a giant hole where small items or children could disappear into the abyss. I did not want plastic. I did not want a foot flush. I wanted something that looks like a toilet, that is porcelain, and that visitors would not need a 30 minute lecture on how to use it. Fortunately, there is such a thing! It is made by SeaLand and it looks a lot like a “regular” toilet. It probably could be found on some big fancy yacht because it is a little on the pricey side as far as toilets are concerned but I was not backing down on this one. I might sound like a spoiled brat but I was trying to look at it through the eyes of future guests. Hopefully, this won’t be too scary for the less daring (me included☺)!



One of our three Sealand toilets

URBAN FRONTIER HOUSE

06/08/16

Being First Is Not Easy

Our banker wants to know when the house is going to be done. That is a fair question. I have asked the same thing myself! We have already been under construction for 22 months. The sinks, faucets, and showers have been installed; our seven rainwater tanks are full; the pumps are in place. It must be time to turn on the water. On May 18, 2016, Tristan Bounds with Orenco came to town to assist us in starting up the water system. The plumber was there; the low voltage electrician was there; Randy was there. They flipped the switch. The water started to move from the tanks to the point of filtration. Then, it stopped. Why did it stop? Well, we forgot to un-wrap the filter. (time out to unwrap the filter) Ok, try again. This time the pump in the gray water tank doesn't kick on. Bummer!!! The electrician verifies that power is flowing to the pumps. A day later and after a call to the pump manufacturer, we learned that the water has a minimum level requirement before the sensor will activate the pump and the water level in our gray water tank was not to capacity yet. Wow, the things we have learned during the building of our self-sustaining house! Other lessons we have learned are:

- Purchase enough tile at the Restore to cover the entire wall because you will probably never find the same tile at a later date.
- Speaking of tile, it's okay to be a little creative when you discover that you did not purchase enough tile at the Restore to cover the entire wall.
- AC LED lightbulbs are not the same as DC LED lightbulbs. Who knew???
- Be sure and add the peat moss in the bottom of the composter **BEFORE** adding 60 cubic feet of wood shavings.
- Don't assume that those really cool recycled barn floor boards won't smell like a barn and require **A LOT** of scrubbing – pee-eewwwwww!!!
- Maintain patience. Trying to change the world while building a house can be extremely challenging; so, scream in your pillow if you need to and then put on your game face and carry on.

Things don't always run smoothly and often take a little longer when attempting something for the first time; however, we are very excited about what this house has to offer (and the many additional lessons we are sure to learn☺) and are looking forward to moving in!



Randy and the DC electrical consultant contemplating options

URBAN FRONTIER HOUSE

06/17/16

The Fridge Fiasco

Randy and I were planning on purchasing a DC refrigerator for the new house; however, when it came time to place the order we found out that the Sunfrost company no longer made DC refrigerators. Now what were we going to do? We were counting on using a DC refrigerator since it uses soooooo much less energy than a conventional refrigerator. If left up to Randy, he would have settled for a cooler in the corner because it doesn't use any electricity; however, that wasn't going to fly with me. Randy's only criterion was: no refrigerator that uses more than 400 kWh hours/year. That was *almost* impossible unless I went with some scaled down model. Not to be deterred, I was on the hunt for a refrigerator that would meet both of our expectations. I found one!!! It was a stainless steel, French door, with an ice maker and the website advertised the electrical usage on the U. S. Government ENERGYGUIDE label at 400 kWh estimated yearly electricity use. Wahoo!!! We waited for seven weeks and four different delivery dates before my new refrigerator was finally delivered. It was a happy day until I opened the door and read 573 kWh estimated yearly electricity use on the U. S. Government ENERGYGUIDE label. Randy was not going to be happy with 573 kWh! I went back to the store and the salesperson was apologetic and offered to exchange it for a different model. I explained to him that I only purchased that refrigerator because of the 400 kWh estimated yearly electricity use and no other refrigerator met that standard. He looked at me with a perplexed look and stated, "I don't think I have ever had a customer shop for a refrigerator by the number of kWh used in a year!" Randy wanted it gone. I knew there wasn't anything else out there. We were at an impasse. So, I purchased a kWh usage meter that plugs into the outlet and then the refrigerator plugs into the meter just to see how bad it really was. We waited for four days before reading the results. According to the meter, the refrigerator used less than 1kWh per day. We waited four more days and read the results. Again, the meter read less than 1kWh used per day. Yeah!!! Not sure what happened but the refrigerator gets to stay!

U.S. Govt. Agency Federal law prohibits removal of this label before consumer purchase.

ENERGYGUIDE

Refrigerator-Freezer
 • With Automatic Defrost
 • Bottom-Mounted Freezer
 • Without Through-the-Door Ice Service

Model LFC21776**
 Capacity: 21 Cubic Feet

Estimated Yearly Operating Cost

\$43

Cost Range of Similar Models

400 kWh
 Estimated Yearly Electricity Use

Your cost will depend on your utility rates and use.

- Cost range based only on models of similar capacity with automatic defrost, bottom-mounted freezer, and without through-the-door ice.
- Estimated operating cost based on a 2007 national average electricity cost of 10.65 cents per kWh.
- For more information, visit www.ftc.gov/appliances.

ENERGY STAR

PAWG_MF200910006

U.S. Government Federal law prohibits removal of this label before consumer purchase.

ENERGYGUIDE

Refrigerator-Freezer
 • Automatic Defrost
 • Bottom-Mounted Freezer with an automatic ice maker
 • Without Through-the-Door Ice Service

Model(s) LFC21776**
 Capacity: 20.8 Cubic Feet

Compare ONLY to other labels with yellow numbers. Labels with yellow numbers are based on the same test procedures.

Estimated Yearly Energy Cost

\$69

Cost range not available

573 kWh
 Estimated Yearly Electricity Use

- Your cost will depend on your utility rates and use.
- Cost range based only on models of similar capacity with automatic defrost, bottom-mounted freezer with an automatic ice maker, and without through-the-door ice service.
- Estimated energy cost based on a national average electricity cost of 12 cents per kWh.

ftc.gov/energy

ENERGY STAR

PAWG_MF200910006

Energy Star labels for the same model refrigerator – very confusing!!!

URBAN FRONTIER HOUSE

06/25/16

Reinforcements

Randy and I were again working at the house on Friday night after work. (Boy, do we know how to have fun or what???) Our good friends, Dennis and Rody, stopped by on their way home from doing something more fun on a Friday night. They took one look at us and decided we could use some assistance. So, on Saturday morning, they showed up with cleaning supplies and washed all the windows (that they could reach) inside and out. Wow!!! What a difference that made! Oh, and then they just happened to mention that they had left a lasagna, salad, and bread in our new refrigerator. We ate really well for about three nights! What can I say about friends like that? Priceless!!!



Our good friends washing our windows

URBAN FRONTIER HOUSE

07/13/16

The Governor's Innovate Montana Symposium

The Governor of Montana, Steve Bullock, hosted the Innovate Montana Symposium in Billings in mid-July 2016 and his staff had asked us months ago if our house could be open for tours during the symposium. Months ago it did not seem like tours in July would be a problem. We had our work schedule lined out and were making significant progress; however, as the date for the symposium approached, the “sweat equity” hours increased. We were working at the house every weekend and almost every night after work. I was still painting trim. (I had a rude awakening just how much trim is in a house when I found myself on trim painting detail!!!) Randy was installing the trim and the railing on the front porch. The furniture movers were scheduled for July 7. My mom came over to dust furniture and help make beds. Randy and I were up very late the night before the tours. The house wasn't completely finished and the landscaping wasn't done but we were as ready as we were going to be. The morning of July 13th dawned into a beautiful Montana day. I greeted the tours at the front door. Randy, three of our architectural staff, and the wind power supplier hosted five educational stations at the house for the approximately 80 tour attendees. One of the local TV stations showed up and we were on the evening news. All in all, it was a really good day!



Welcome to the front porch

URBAN FRONTIER HOUSE

08/28/16

What's That Smell???

Shortly after the Governor's Innovate Montana Symposium, I noticed a distinct odor coming from all the drains. At that time, we had moved most of our furniture into the new house and were sleeping there but we were still cooking meals at our previous residence since we wanted to have the water at the new house tested first. For the most part, there wasn't anything going down the drains except water and a little soap. The smell was so noticeable at times that I put tape over all the shower drains and stopped up all the sink drains. Randy checked the rainwater tanks, the graywater tank, the pumps, and the filters but there was no obvious odor. Where could it be coming from??? Nothing seemed amiss so we ran water down every drain in hopes of flushing the lines and went on our (much needed) annual vaca to Swan Lake in northwestern Montana (which was wonderful, BTW!) Unfortunately, upon our return the smell was still there. Randy contacted our MEP engineer who agreed to meet him at the house. Between the two of them, they discovered that the plumber had vented the drainline to the trap. This is typically done; however, this house is not typical. The back draft from the composter vent was occasionally sucked into the drainline. The good news is that it was an easy fix and the smell is now gone. I cannot properly convey my obvious relief. Not to sound like I'm up on my soapbox, but non-smelly air is NOT something to be taken for granted!!!



Not happy about that smell

URBAN FRONTIER HOUSE

9/15/16

The Water Test Results Are In!

In the past, clean drinking water was something that I assumed would be available every time I turned on the faucet. All of the water provided by the Water Production Division of the City of Billings comes from the Yellowstone River and I always felt confident that the water provided was of the highest quality. My 10 year old daughter didn't necessarily agree. She only wanted the cold water that was available out of the refrigerator door and not the **tap water** out of the bathroom sink or the **city water** out of the kitchen faucet. When I tried to explain to her that all the water in the house was the same water, she was **NOT** convinced. Sometimes it doesn't pay to argue with a 10 year old. The rainwater tanks in the basement of our new house are full and the filtration system is in place but is the water **really** ok to drink??? On August 29 I took two water samples – one from the kitchen sink and one from the graywater tank spigot - to Energy Labs here in Billings for complete analysis. I was told it would take approximately 10 days. Two weeks later, we received the results. The Microbiological Analytical Report indicated there is no E. coli bacteria present in either sample! That was really good news! The Physical Properties Analytical Report was within acceptable limits for all categories except for one result from each sample slightly out of range; however, neither of those characteristics has any direct health effects. Not sure if the water will pass the criteria of my daughter but for me, I am good to go!



Drinking water

URBAN FRONTIER HOUSE

10/02/16

My Moving Day

I never imagined that it would be two years and two months from when construction began to when I finally made the move to our new house. Oh, we had moved lots of things into the house over the last several months but I had not moved my personal items that indicated that I actually lived there. We had been sleeping in the new house since July and Randy moved his clothes in late July. Moving involved more than just moving items in; we also needed to learn how to live in this type of house, testing the systems, and working out any “bugs.” There are many down sides to moving but one up side is that everything in the current house had to be picked up and moved which provided the opportunity to have a heart-to-heart with myself and to weed out some non-essential stuff. We got rid of a lot of stuff seven years ago so where did we get all this new stuff??? It must be Randy’s stuff! Well, Randy has his fair share – things like his tools, camping gear, and his golf clubs but some of it is left behind stuff from when the kids lived at home. Things like a few old prom dresses that were really special, a pink fishing pole with a reel that lights up, the green blow-up thing in the garage that looks like a floating device with cup holders, and an oboe that never seems to fit in the suitcase when the kid leaves again after the most recent visit. The instructions are always the same, “Mom, please don’t get rid of my stuff!!!” But then there is my stuff – my sewing machine and all the paraphernalia that goes with it, the boxes of photos from when the kids were little, and all the Christmas decorations. I am really trying to get serious about which stuff makes the move and which stuff doesn’t make the cut which has been quite time consuming. However, October 2, 2016 was when I officially moved into the new house with my essential stuff – things like my toothbrush, my curling iron, and all my shoes.



My shoes in their new home

We would first like to thank our colleagues at High Plains Architects, both past and present, who have inspired, encouraged, endured, and assisted with the building of the Urban Frontier House. You are greatly appreciated!

We would also like to thank our Partners, Contractors, Suppliers, Distributors, Consultants, and other Contributors without whose ideas, support, and unflagging good humor, this project would not have been possible!

Our Partners/Suppliers/Distributors:

Stockman Bank – Billings, MT (*FINANCING*)

MT Dept. of Enviro. Quality – Helena, MT (*RENEWABLE ENERGY FINANCING*)

Newell Construction – Columbus, MT (*GENERAL CONTRACTOR*)

Structural Engineering Design – Billings, MT (*STRUCTURAL ENGINEER*)

Sanderson Stewart – Billings, MT (*CIVIL ENGINEER*)

Rimrock Engineering – Billings, MT (*GEOTECH REPORT*)

Acuity Power Group – Wellesley, MA (*DC POWER DESIGN*)

Energetechs – Missoula, MT (*PASSIVE HOUSE ENERGY MODELING*)

Orenco Systems, Inc. – Sutherlin, OR (*GRAYWATER SYSTEM DESIGN*)

MKK Consulting Engineers – Billings, MT (*MECH, ELEC, PLUMBING ENGINEER*)

Sundance Solar – Red Lodge, MT (*PHOTOVOLTAIC PANEL DESIGN/INSTALLATION*)

Taisei Techno – Tokyo, Japan/Billings, MT (*WIND POWER DESIGN/INSTALLATION*)

Smart Home Systems – Laurel, MT (*DC/LOW VOLTAGE LIGHTING CONSULTANT*)

Bear Plumbing – Acton, MT (*PLUMBING CONTRACTOR*)

Gnerer Electric – Billings, MT (*ELECTRICAL CONTRACTOR*)

Country Pine – Billings, MT (*INTERIOR DOORS & CABINETS*)

One Source Lighting – Billings, MT (*LIGHTING & FIXTURES*)

Ridgeline Restoration – Laurel, MT (*PAINTING CONTRACTOR*)

Soft Touch Designs – Billings, MT (*WOOD FLOOR PREPARATION*)

American Appliance – Billings, MT (*GE APPLIANCES*)

Rent-A-Hubby – Billings, MT (*HANDYMAN SERVICES*)

Peaks To Plains – Billings, MT (*LANDSCAPE ARCHITECT*)

Big Ass Fans – Lexington, KY (*HAIKU CEILING FANS*)

Our Partners/Suppliers/Distributors:

Sears – Billings, MT (*LG REFRIGERATOR*)

Renewable Energy Partners – Billings, MT (*WIND ENERGY CONSULTANT*)

Kiedrowski Tile – Billings, MT (*TILE INSTALLATION*)

Cory Page – Billings, MT (*HRV INSTALLATION*)

Daltile – Spokane, WA (*SHOWER TILE*)

Keller Supply – Billings, MT (*KITCHEN & BATH PLUMBING FIXTURES*)

Oasis Montana – Stevensville, MT (*DANKOFF BOOSTER PUMP*)

Aqua Systems – Laurel, MT (*UV WATER STERILIZER*)

Ferguson Enterprises – Billings, MT (*PRESSURE TANKS*)

Grease Trap Sales – Williston, OH (*GREASE TRAP*)

Mystic Lumber – Billings, MT (*RECLAIMED WOOD*)

Advanced Counter Technology – Billings, MT (*COUNTERTOPS, SINKS, SILLS*)

Trenay Hart – Billings, MT (*RECYCLED BATHTUB*)

Lowe's – Billings, MT (*GEOSPRING WATER HEATER*)

Home Depot – Billings, MT (*TOWEL BARS, HARDWARE, PAINT STRIPPER*)

Albertsons – Billings, MT (*BORAX*)

Montana Window & Doors – Billings, MT (*EXTERIOR GARAGE DOORS*)

Custom Roto-Molding – Caldwell, ID (*WATER TANKS*)

Timberweld – Billings, MT (*GLULAM BEAMS*)

Pacific Architectural Products – Clackamas, OR (*PHASE CHANGE MATERIAL*)

Ace Hardware – Billings, MT (*MISCELLANEOUS HARDWARE*)

Ambient Weather – Chandler, AZ (*WEATHER STATION*)

Fasteners – Billings, MT (*DRYWALL SCREWS*)

Our Partners/Suppliers/Distributors:

Gary Tomljenovich – Laurel, MT (*RECLAIMED WOOD*)

Pottery Shop – Billings, MT (*CONCRETE PAVERS*)

Upcycle Products – Morris, IL (*RECYCLED RAINBARRELS*)

Stevens Corporation – Lakewood, CO (*GRAVEL PAVE*)

Montana Masonry Supply – Billings, MT (*LANDSCAPE BLOCKS*)

Ecos Paints – Fairforest, SC (*PAINT & VARNISH*)

Bricor – Loveland, CO (*LOW FLOW SHOWERHEADS*)

Vemco – Billings, MT (*POINT OF USE MINI TANK WATER HEATER*)

CO2 Meter Co. – Ormond Beach, FL (*CO₂ SENSOR*)

Rocky Mountain College – Billings, MT (*SENSORS DESIGN*)

Scrap – Billings, MT (*CANNING JARS FOR LIGHT FIXTURE*)

Becker's Glass – Billings, MT (*DOOR GLASS, GLASS SHELVING, & MIRRORS*)

National Waterproofing Supply – Denver, CO (*PROSOCO SEALANT*)

Bridger Steel – Billings, MT (*ROOFING & SIDING MATERIAL*)

NorthWestern Energy – Billings, MT (*NET METER*)

Fischer Commercial Flooring – Billings, MT (*SHOWER TILE, MORTAR, GROUT*)

The Blind Guy – Billings, MT (*WINDOW BLINDS*)

Advanced Pump & Equip. – Bozeman, MT (*ORENCO PANEL, GRAYWATER TANK*)

Pierce Flooring – Billings, MT (*BACKERBOARD, MEMBRANE, RECYCLED MAT, FORBO*)

EZ Shelf – Delray Beach, FL (*CLOSET SYSTEM*)

Hiromi Paper, Inc. – Santa Monica, CA (*RICE PAPER*)

Shipton's Big R – Billings, MT (*WOOD SHAVINGS*)

A&H Turf – Billings, MT (*CABINET PULLS*)

Our Partners/Suppliers/Distributors:

Battery Systems – Garden Grove, CA (4 BATTERIES)

BMC West Corp. – Missoula, MT (DOOR HARDWARE)

Western Ranch Supply – Billings, MT (WATER COLLECTION PLUMBING PARTS)

D's Insulation – Billings, MT (MINERAL WOOL INSULATION)

Cutler Drywall – Billings, MT (DRYWALL INSTALLATION)

Image Drywall – Billings, MT (DRYWALL TAPING)

Red Lodge Overhead Door – Red Lodge, MT (OVERHEAD GARAGE DOORS)

Big Sky Gutterworks – Shepherd, MT (GUTTERS INSTALLATION)

Frontier Fence – Billings, MT (FENCING)

MJR Industries – Billings, MT (METAL LIGHT FIXTURE BRACKETS)

Schlessler Ready Mix – Laurel, MT (CONCRETE MIX)

Fisher Sand & Gravel – Billings, MT (SAND & GRAVEL)

Lonesome Dove – Belgrade, MT (CONCRETE PUMPING)

Rock Creek Lumber – Billings, MT (MISCELLANEOUS CONSTRUCTION MATERIALS)

Pacific Steel – Billings, MT (STEEL BEAMS & HANGERS)

Concrete Formfitters – Red Lodge, MT (CONCRETE BASEMENT WALLS LABOR)

True North Steel – Billings, MT (STRAW WATTLES)

Macon Supply – Billings, MT (WATERSTOP ROLL & GEOGRID)

Blythe Construction – Billings, MT (CONCRETE FOOTINGS, BASEMENT & MAIN FLOOR)

Western Tool – Billings, MT (MISCELLANEOUS HARDWARE)

Cayton Excavation – Billings, MT (ASPHALT REMOVAL, EXCAVATION)

Parker Construction – Absarokee, MT (GARAGE FOUNDATION & FLOOR)

Donahue GSR – Billings, MT (TPO ROOFING)

Komposition – Billings, MT (PHOTOGRAPHY)

Our Partners/Suppliers/Distributors:

RamBoard – Burbank, CA (*TEMPORARY FLOOR PROTECTION*)

Knife River Corp. – Billings, MT (*FLYASH CONCRETE/CONCRETE*)

Boise Cascade – White City, OR/Homedale, ID (*FSC WOOD PRODUCTS*)

ProBuild – Butte, MT (*FSC WOOD PRODUCTS*)

Idaho Forest Group – Lewiston, ID (*FSC WOOD PRODUCTS*)

Potlach – St. Maries, ID (*FSC WOOD PRODUCTS*)

Norbord – Bemidji, MN (*FSC WOOD PRODUCTS*)

Certified Wood Products – Maple Lake, MN (*FSC WOOD PRODUCTS*)

Lame Deer Elementary School – Lame Deer, MT (*SALVAGED WOOD PRODUCTS*)

Big Sky Insulations Inc. – Belgrade, MT (*STRUCTURAL INSULATED PANELS*)

Big Sky Insulations Inc. – Belgrade, MT (*RIGID FOAM INSULATION*)

Alpen Windows – Niwot, CO (*WINDOWS*)

Velux Skylights – Fort Mill, SC (*WINDOWS*)

Therma-Tru – Maumee, OH (*EXTERIOR DOORS*)

Allegion Door Hardware – Indianapolis, IN (*EXTERIOR DOORS*)

Advanced Composting Systems – Whitefish, MT (*PHOENIX COMPOSTING TOILET*)

Phasechange Energy Solutions – Asheboro, NC (*PHASE CHANGE MATERIAL*)

Norwesco, Inc. – St. Bonifacius, MN (*WATER TANKS*)

Zehnder America, Inc. – Greenland, NH (*HEAT RECOVERY VENTILATOR*)

LumenCache – Billings, MT (*DC LIGHTING CONTROL SYSTEMS*)

Small Planet Workshop – Tumwater, WA (*HVAC SYSTEM*)

Ken & Sandra Kunkel – Billings, MT (*RECLAIMED WOOD*)

Bud Mitzman – Billings, MT (*RECLAIMED WOOD*)

Habitat ReStore – Billings, MT (*RECLAIMED TILE, GLASS BLOCK, & SINK*)

**BUILDING THE
URBAN FRONTIER HOUSE**

(From the Wife's Perspective)

Janna Hafer

Cover Photo: John Warner

Architect: Randy Hafer, FAIA

Text: © 2016 Janna Hafer

Photos: © by High Plains Architects, P.C.

Printed in the United States of America

Distributed by High Plains Architects, P.C.



COMING SOON!!!

**LIVING IN THE
URBAN FRONTIER HOUSE**



Janna Hafer and her husband Randy live in Billings, Montana. She holds a Bachelor of Arts degree in Microbiology - Environmental Health from Montana State University in Bozeman. They started High Plains Architects in 1999 and she is the CFO of the firm. Janna currently serves as one of nine trustees on the Billings Public School Board. Together, they have seven children.

“When we build, let us think that we build forever.
Let it not be for present delight, nor for present use
alone; let it be such work as our descendants will
thank us for. . .”

JOHN RUSKIN



HIGH PLAINS

ARCHITECTS

PHONE (406) 896-0250 | FAX (406) 896-0255
2720 MINNESOTA AVE | BILLINGS, MT 59101
P.O. BOX 2203 | BILLINGS, MT 59103
WWW.HIGHPLAINSARCHITECTS.COM