DIY Walk-In-Cooler

So I've started my latest project - a walk-in cooler. It will be roughly 5' X 5' X 7' and will be located in our utility closet / laundry room in the garage and take up slightly more than half of the room. I am going to insulate the walls with R30 insulation (the heaviest I can find) and then 2 layers of this insulated foam board I found at Lowes which is 2" thick and listed as R15. I've picked out a frigidare 12k BTU window AC combined with a Ranco controller to cool it. My goal is to keep the entire cooler between 35 and 37 degrees year round.

I am also considering creating a fermentation cooler that is external to the cooler but is fed cold air on demand from a hole in the side of the cooler. It will have its own temperature controller which will power two fans (one push, one pull) and baffles to exchange cold air as necessary to maintain whatever my target fermentation temperature is.

I will update this post as I make progress but it will be a little slow going as I am pretty busy with work right now. I also plan on detailing the entire process on my website www.johnbeere.com when I get it setup as there is very limited information on this type project on the net - but from the info I've found (mainly on this forum), I am confident in the results.

Here are three photos of the room as it stands today:

I made some progress today... bought 5 rolls of Reflectix 24" wide foil insulation at Lowes and got it installed on the two brick walls. I was able to put it between the brick and the joists due the to way the room was originally constructed. They recommend airspace of at least 1/2"... I don't think I ended up with that much overall but there is some airspace due to the crap mortaring on the inside of the wall. I'm going to end up pushing it closer to the wall when I lay the insulation as that R30 stuff is thick stuff... still better than nothing right? I also used expanding foam and duct tape to begin closing all the gaps... gotta go get more

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tape tomorrow. Here are two photos:

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I ended up getting a good deal on a 10k BTU Frigidaire AC unit today at Lowes... one of the last they had in stock other than some tiny 6K units and some huge 18k units. Just took it apart and began experimentation on "hotwiring" it. This is the one area of the project that has me the most concerned as I have found very little information on how to accomplish it.

The goal is to completely control the unit from my Ranco controller. When it powers up the unit, I want the compressor to kick in and the fan on full blast until it cuts the power.

I began installing the R30 insulation this evening... that stuff is rediculously thick. Due to the fact the idiots who built my house decided to space the studs at random intervals, I ended up strapping the insulation down with duct tape to better hold it in place until I can put the foam board over it.

I guess I haven't mentioned that the room is roughly 10' tall which makes it look smaller than it is in the photos. I'm only building the cooler 8' tall but am going ahead and insulating up to the top of the joists.

Here is a shot of the wall after plugging all the holes with Great Stuff, Duct Tape, and Reflectix before insulation.

And after insulation. Not that pretty but should be functional (and hidden in the end).

Look how thick this stuff is... nuts.

Slight update - as suggested, I extended the thickness of the walls two inches by adding a 2"x2"x8' to each joist. I also got some proper strapping which made the job go a lot quicker. I didn't take the insulation all the way out but I did re-fluff it as much as possible. There are still some small spots I need to fill, but overall - the walls are done. Here are two photos:

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Edit: - I forgot to mention I left the bottom across the back un-insulated for now as I have to run some wiring through the wall first.

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Update on the AC: I test wired a new Ranco controller into the AC this evening. This was the step I was most worried about and, now that its done, I can't believe how easy it was... I was able to completely bypass the built-in controls on the first try. I will officially re-wire it tomorrow. The diagram at http://franklinbrew.org/members/sj/walkin.html is correct, even for my brand new AC.

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Lowes didn't have but about 10 sheets of that Dow board so I bought a pallet of another called R-Max. Its 3/4" thick with an R value of R5. I plan on lining the walls 3 sheets thick.
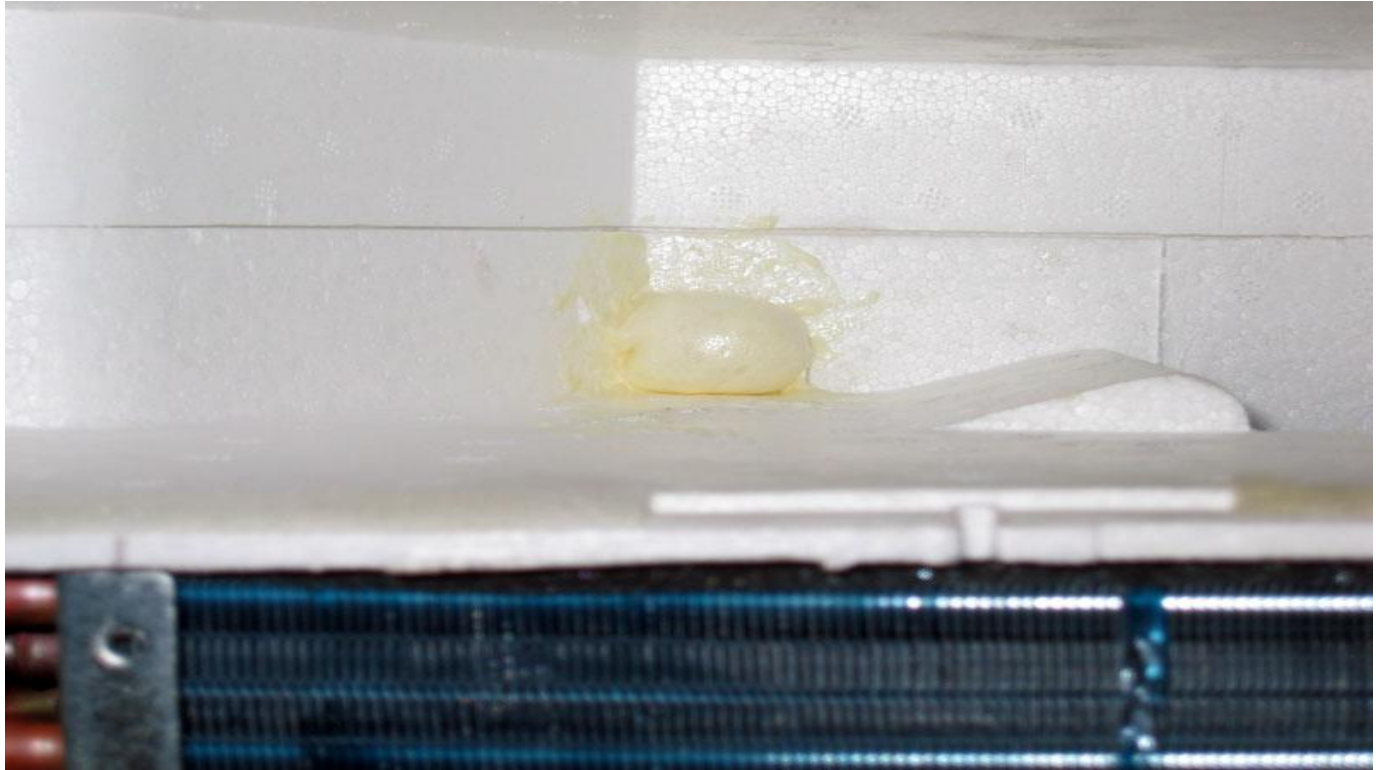
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Made some progress today... I totally re-wired the AC to completely remove the built-in controls as well as got it working off of only one plug. The diagram I linked to last night shows the need for a second plug and is what I tried last night. The only reason the ground is clipped is I cut it last night during my test.
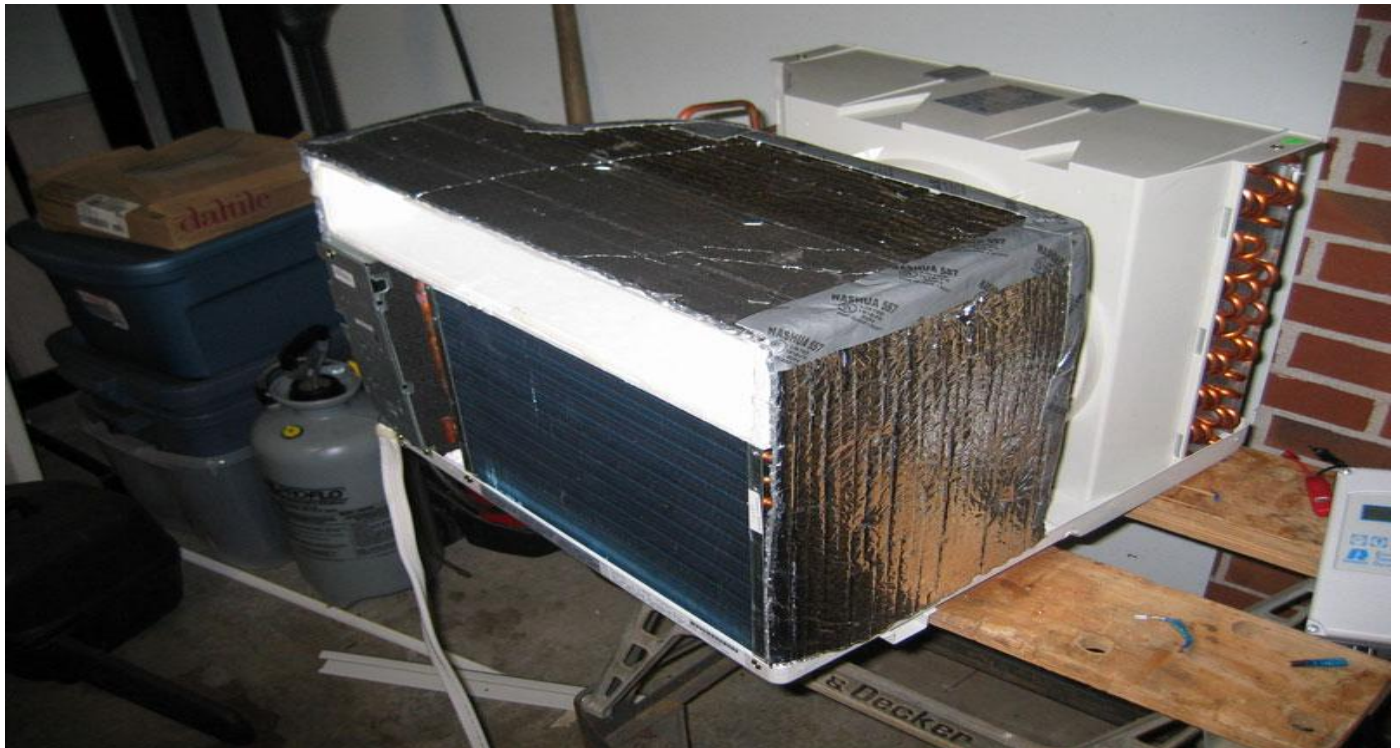
I filled the vent in the AC with great stuff as shown here:

And I then covered the outside of the styrofoam with some extra Reflectix. It probably won't help anything but it gave me the warm-fuzzys.

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After that, I framed out and installed the AC in the window, plugged up all the holes with great stuff, and lined it with Reflectix like the rest of the walls. I then wired up a new breaker in my breaker box, ran it under the house (absolutely horrible place), out the back of the house through 1" conduit, into the garage, and wired up four new plugs in the garage (only one in the cooler itself - been needing better power out there for some time). And finally, I put a couple of pieces of the foam board on the walls just to see how it was going to work. Turns out there is just no way I can compress the insulation behind the foam board all the way down to the 2x2 etensions I added. So I pushed the board as square as I could and nailed into place leaving about another 1.5" gap. The insulation is pretty much taking up all that room but the back of the foam board is lined in foil and it says dead spaces is OK.

Made some progress today but also took a step back. I hadn't put the front of the AC back on and something fell into the fan while testing - shattering it into a million pieces. Damnit. I have no idea what it was as there is no way I was putting stuff in there. I'll find out when I take it all back apart...

Does anyone know where I can get a replacement blower fan for ACs?

OK, back to the build. I framed out the final wall and installed the door. The perspective in this first photo is a little hard to follow. It was taken from outside the utility room looking

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through the door. The wall for the cooler is on about a 30 degree angle.

Picture of the door frame:

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Door frame from inside. Notice I've built out the scructure to better seal the door.

And finally, the ceiling after insulation. Once the walls are fully lined with foam board, I will line the ceiling from the inside with it as well.

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I haven't had much time to work on the cooler this week but have made some progress. I was hoping by this point to be able to cool the area while I worked but no such luck since I shattered the AC's fan blade. Hopefully the replacement will be here this weekend. Anywho, I have all the framing done as well as the wall insulation wrapped up. Now its down to installing all the foam board.

Here is a photo of the cooler looking into the utility room. We'll put some trim around it to finish it off once everything else is complete. I'm hoping to make serious progress by this weekend and be ready to finish it up as soon as the replacement fan arrives.

Got all the walls finished today. Now it is down to the ceiling, floor, and the door... should go pretty quick over the next few evenings. Still debating what wallboard to use to finish off the inside but will have that settled in the next few days. What I really want is $30 a sheet... and I need eight sheets - whew. Regardless of the wallboard, I am in hopes to start testing later this week.

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Here are two photos from this evening. First is just the AC all put back together and working. Second is a shot of the door jam to show wall thickness (6").

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Got the ceiling finished. Its lined with three layers of foam insulation. On top of the ceiling was exactly enough room to pack the R30 insulation on its side - six pieces across. No photos as its really more the same at this point. Plan on doing the floor tomorrow night...

I tested it down to 60 degrees for about 30 minutes. I didn't pay that close of attention but the temperature dropped from 84 to 60 within 10~15 minutes and the AC never came back on until after I opened the door. Can't wait to test it once the floor and door are fully insulated.

Got the floor finished up tonight... ended up laying six layers of the foam insulation. Pretty much came out flush with the bottom of the doorway. Scroll back to post #75 for the before shot of the floor and doorjam to get a feel for how thick it turned out to be. Here is a photo of the floor now:

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Now all thats left is:

1) Insulate the door
2) Lay plywood on the floor
3) Line the inside walls with wallboard or something similar
4) Wire up a light in the ceiling
5) Mount the Ranco controller and shorten the cord
6) And finish the exterior wall

After a few days away from the project, I'm back on it. I put 1/2" MDF on the floor and started placing the wall board. The plastic wall board I chose is EXPENSIVE at $30 a sheet (I needed 7 sheets) but it is going to look really good once finished.

Here is a photo of the floor. A layer of the plastic wall board will go on top of this to finish it off.

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Here is a photo of the wall board after installing it on three of the walls and the ceiling. Notice that the room isn't exactly square. I'm looking for some "L" shaped rubber molding that covers at least 1"... haven't been able to find anything yet. Anyone have any ideas?
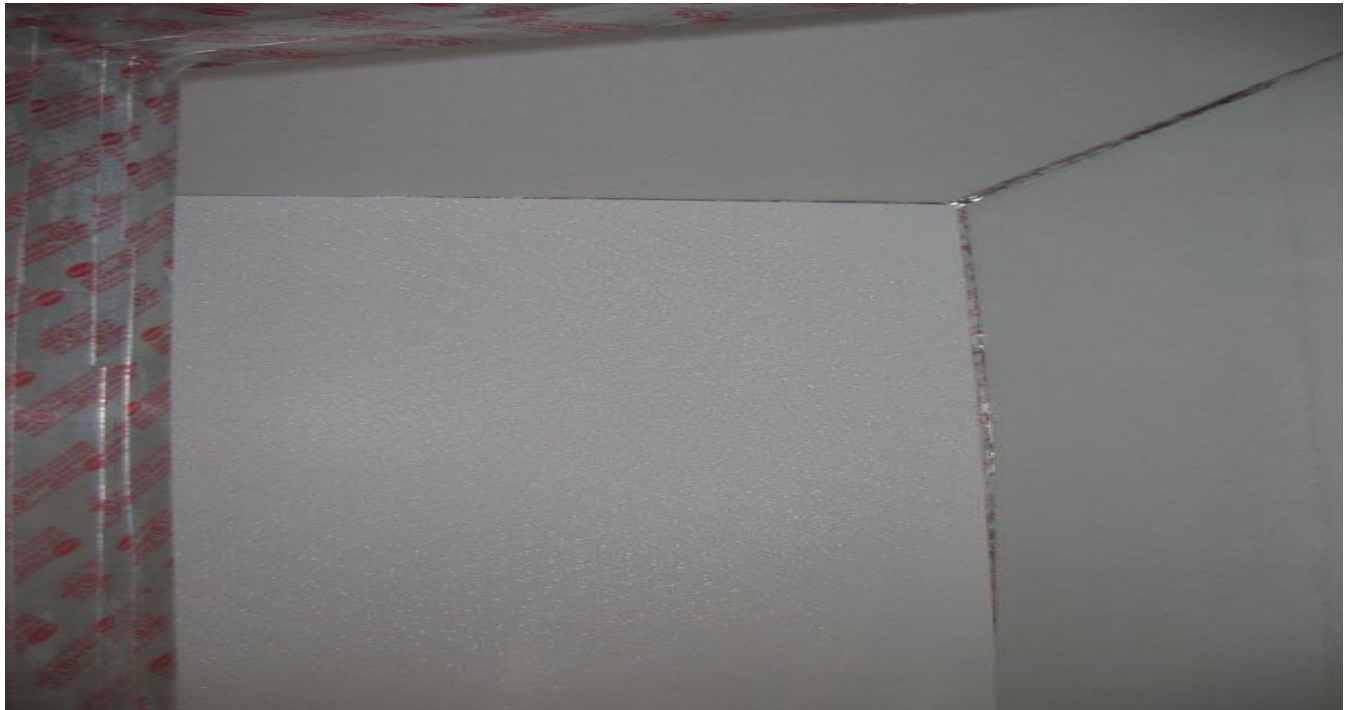
And finally, for tonight, a photo of the simple light fixture on the ceiling near the entrance.

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For the corners I went with the only thing I could find wide enough to cover the gaps. It is really made for outside corners but worked pretty well on inside corners. I haven't caulked around it yet so I am holding final judgement until I get that done. Either way, it is what it is...

Here is a picture of the back corner as it stand now. Should get a chance to caulk it all in the next few days. Notice the one piece is discolored... didn't notice that until it was glued on tight. O well...

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And a photo of the doorway. Still haven't insulated the door. PT Ray, yeah, I considered an exterior door, but this was the only 24" door I could find (that was the widest door I could install)... I think it will work out fine.

BTW, I've been running at test all afternoon - even without the door insulated I've been able to sustain 35 degrees with no problem. Not really testing efficiency - more testing the AC's ability to run under these conditions and not freeze up. Seems to be working with no problem. Won't be able to run efficiency testing until I get the door properly insulated.

A few more photos from this evening. All that is left is to insulate the door - which would have been well underway but the weather didn't cooperate. Hopefully will get that finished tomorrow. Then it will be down to cleaning everything one last time and installing all the shelving. Oh, the cord is just draped over the door to get it out of my way...

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Looking up through the doorway:

Looking straight in through the doorway:

Looking towards the door from the back of the cooler:

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Got the door insulated today... still needs to be sanded a bit and then caulked. Its six layers of 3/4" foam board thick. The side of the door away from the hinges is on a 15 degree angle for clearance. I tried several different angles just to make sure it couldn't be less - 15 degrees is the answer.

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Installed the racks tonight... was able to fit a 48"x18"x72" rack and a 36"x18"x72" rack together into an "L" shape in the back corner. I put a much smaller rack directly under the AC unit just for a little more shelving. There is a lot of deadspace in there but there is also a WHOLE lot of shelf room too.

Couple of photos of the shelving:

And one of the little shelf:

Did some more testing today... slowly dropped the temperature down to 35 degrees and held it with no problems. I had a thermometer in the AC's vent to measure air temperature - it was holding steady at 19 degrees but rose to 21 degrees before I could take a photo.

The other thing I did that is still experimental is I took a white labs yeast jar, filled it with the goop from an ice pack, drilled a hole in the top, placed the temperature controller's probe through the hole and into the goop. I then placed the container in the very top of the back of the cooler. I know I don't want to measure the air temperature, so I'm thinking this will work well. Time will tell...

Dismiss the 106 on the LCD... that was some alarm setting.

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The unit has now been running for 24 hours at 33 degrees while plugged into the "Kill A Watt". It averaged .2 KWPH or 4.8 KW during the entire 24 hour period. I'm going to estimate $.10 per KW - meaning it cost $.48 to run. Remember it is the dead of August and is probably hardest at work this time of year. Tickle me pleased...

I felt the exhaust coming off the rear of a window AC at a friends house and it was blowing fairly hot air. In contrast, the exhaust from my unit - blowing 19 degree air - is barely warm!

Couple more photos from tonight. FYI, the cooler is rocking along at 33 degrees without any problems so far.

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The cooler is holding steady at 36 degrees at an average .14 KWPH (roughly $.014 an hour based on a cost of $.10 KWPH).

I noticed the first real problem about two weeks ago. The weatherstripping around the door had several small gaps where the 2x4s weren't exactly straight and the seal wasn't air tight. I knew the door was leaking as there was condensation build-up all around it as well as considerable ice buildup on the AC coils - although it technically wasn't "froze up" and was still running just fine. I decided to remove all the existing weatherstripping and start over with a 2" wide insulated foam tape. Its 1/8" thick and needed two layers installed where the weatherstripping originally was. I then ran a ring of duct tape (looks better than it sounds) on the inside of the door in the exact pattern of the insulated tape. Had to experiment some

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with this as there were places that needed several layers of duct tape to properly seal the imperfections of the 2x4s. It only took about an hour to get it as air tight as I could make it and still close and lock the door. After doing this, there have been no signs of condesation build up around the door but there was still ice buildup on the AC.

The ice build up is somewhat coming from moisture in the cooler (cardboard, condensation, etc) but mainly is coming in through the AC itself and there isn't much that can be done about it at this point as that is the nature of a window AC. I modified the AC to include seven small (40mm) 12v fans in the front grill which constantly draw "warmer than freezing" air over the AC coils. Right now I have the fans running 24x7 but will probably start experimenting with different cycles soon.

The fans have completely solved all moisture problems by keeping ice from building up on the coils. Notice in the second picture the ice buildup on the AC coils. This ice is now completely gone.

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Here is my best guess at the materials used. Remember that I built it with quaility in mind rather than a fixed budget... although I had guessed it would cost around $1,000 total.

$250.00 (1) 12k BTU AC
$50.00 (1) Ranco Controller
$300.00 (30) R5 insulated board
$160.00 (4) R30 Insulation
$70.00 (14) 2x4x10
$20.00 (1) 5/8" MDF
$30.00 (1) 24" Door
$240.00 (8) 4'x8' wall board
$180.00 (60) Tube adhesive
=========
$1,300.00

FYI, I put the "Kill A Watt" on my little dorm fridge for a few days just to see how much power it eats. I'm very pleased to report that the walkin cooler uses almost exactly the same amount of power (just a touch more) as the dorm fridge! Nuts...

Overall, good and bad, I really couldn't be happier with how it turned out...