

Bonus Room Floor Temp Evaluation

RE: Bleeder Ducts



12/11/02

Three houses were reviewed for temperatures of the floor over the garage and/or over outside air. All are in Columbus suburbs. The question is floor temperature stability with different insulation approaches. All temperature references are in Fahrenheit degrees. Outside temperature was near 30*.

House #1

Cellulose insulation is in the walls, cantilevers, and bonus room floor over garage. There are no bleeder ducts in any otherwise unconditioned cavities.

Temperatures:

			Bed Room	
2 nd Floor Living Room			Floor / open garage	76*
Floor / conditioned	76*		Walls / Inside	77*
Floor / outside	75*		Outside	73*
Bath			Kneewall	76*
Floor / open garage	74*		Garage	
Toilet Drain (2' in)	61*		Slab floor	19*
			Outside walls	23*
			Ceiling below k-Wall attic	23*
			Ceiling below heated space	28*

Conclusion:

The consistent floor and wall temperatures indicate an effective thermal boundary has been established. The record of note is the toilet drain temperature of 61*. This indicates the drain in the floor cavity is within the thermal envelope; protected from freezing without the added bleeder duct.

House #2

Fiberglass insulation is in the walls, cantilevers, and bonus room floor over garage. The use of the open floor truss system allows any outside air leaks and any supplied bleeder duct heat to move throughout the floor system. Floor truss systems need more careful attention to perimeter air sealing details because of this feature. The floor joist cavity was blocked just outboard of the kneewall; however not foamed in place. The blocks stop some but not all of the k-Wall attic airflow into the floor joist cavities. The bonus room and bath have two bleeder ducts in the floor cavity.

Temperatures:

Bed Room		Bath	
Floor / garage	75*	Outside wall	75*
k-wall (w/osb)	78*	Floor / garage	76*
		Ceiling	78*
		Tub drain	74*
		Shower drain	71*

Conclusion:

The bleeder duct supplied heat keeps floor temperatures comfortable and should prevent plumbing freeze. This is a questionable band-aid approach, not unlike leaving a bathroom window partially open to exhaust objectionable odors. Both work but with some significant energy loss. Further, given enough cold, wind driven airflow, this floor cavity could drop significantly below the comfort level indicated here.

House #3

Same as House #1, cellulose insulation is in the walls, cantilevers, and bonus room floor over garage. There are no bleeder ducts in any otherwise unconditioned cavities. This house had no bath over the garage, was at drywall stage and only had construction heat.

Temperatures.

Bonus Room		Walls		Floor	
Ceiling	55*	Inside	55*	/ garage	53*
		Outside	53*	/ house	54
		k-Wall	53*		

Conclusion:

As with House #1, the consistent floor and wall temperatures indicate an effective thermal boundary has been established. The bonus room floor surface is essentially the same temperature over the buffered cold garage or the heated living space below.

Summary Conclusion:

Insulation works best when held against the warm surface (proximity), when protected from air wash (enclosed), and when the air barrier and thermal boundary are aligned. Typical bonus room floors have insulation placed away from and have cold attic or soffit air coming in contact with the warm surfaces. Drop or boxed down floor cavities allow for plumbing and added insulation depth, but typically still fail to correct the air barrier / thermal failure that causes pipe freezing. Bleeder ducts can maintain a greater floor cavity temperature, but are inefficient and wasteful ... similar to opening a bathroom window an inch, 24/7 for ventilation. Blocking or dense pack insulating the floor joist cavities to disconnect them from unconditioned air and placing the insulation up against the warm surface, not down against the ceiling below, will assure stable floor cavity temperatures.

House #1



House still under construction with garage open to weather.



Exterior of large 2nd floor living room cantilever is open to ambient temperatures.



Dense floor insulation maintains even floor temperature. Cellulose insulation has filled the cavity and is against the floor.



This is a thermal image of a near perfect insulation - thermal barrier. Cellulose wall cavities are uniformly white (warm) with studs showing consistent lower R-value than cavity. Edge leaks are an imperfectly sealed sill plate and corner and are comparatively minor. Floor is a consistent warm with the white indicating a heat run to a room register.



Garage ceiling is finished and was open to ambient temperature the day of the test. Box down included beam and bonus room duct runs, but no bleeder ducts.

Pictures: Don Michael Jones, Columbus OH