

Cleveland-Cuyahoga
Healthy House Project Training

Weatherization + Health
Building Interventions

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Weatherization + Health

-  Primary Goal: to combine/integrate weatherization, healthy house and lead hazard control interventions
-  Secondary Goal: where feasible and funded, add safety, water conservation and electric energy use reduction

Intervention funding

- 🏠 Weatherization
- 🏠 Healthy House - average \$2500
- 🏠 Lead
- 🏠 Water conservation
- 🏠 Electrical use reduction

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Combined interventions

Core interventions:

- 🏠 Weatherization is the base
- 🏠 Moisture & mold is key
- 🏠 Dust & dust sink removal
- 🏠 Pest control as needed
- 🏠 Spec low-emission materials

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Combined interventions

-  Lead hazard control - specs written separately; work may be done later

As funding allows:

-  Safety/injury prevention (HH)
-  Water conservation
-  Electricity use reduction

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Weatherization +Health considerations

-  Should reduce moisture, not make worse (e.g., insulation, bath fan)
-  Can reduce contaminant distribution (e.g., Cleve drop)
-  Health considerations may tip some optional specs (e.g., crawlspace ducts)

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Review interventions

Building Interventions - DRAFT
3/29/04

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WEATHERIZATION		
	usual scope-of-work and specs	W
	some weatherization that might not be selected on weatherization criteria alone might be included because of additional health benefit (see below)	W

HEALTHY HOUSE			
Moisture & Mold Control			
bath fan vented directly to exterior	W	moisture	don't vent to attic
range hood vented directly to exterior	HH	moisture, combustion by-products	
dryer vented directly to exterior	HH	moisture, combustion by-products	don't use corrugated tubing - fire hazard
crawl space - remove debris, cover soil with poly, insulate, seal ducts	W	moisture	energy loss
repair floor drains - snake, install screens	HH	moisture	flooding
if drain tile not functioning, disconnect downspout from storm drain	HH	rainwater intrusion	reduces storm water load
gutters - redirect flow to streetside downspout	HH	rainwater intrusion	
install gutters and downspouts	HH	rainwater intrusion	

HEALTHY HOUSE Mold & Moisture Control			
regrade soil at foundation	HH	rainwater intrusion	integrate with soil lead control
create flash joint between foundation and soil	HH	rainwater intrusion	integrate with soil lead control
caulk windows	W	rainwater intrusion	heat loss
caulk wood siding vertical seams	HH	rainwater intrusion	protects wood
caulk entry doors	HH	rainwater intrusion	
seal roof and chimney flashing	HH	rainwater intrusion	
repair roof leaks	HH	rainwater intrusion	
seal tub/wall surround joint and floor seam	HH	moisture	
eliminate sub-slab ducts	W	moisture	
replace down-draft furnace with up-draft	W	moisture	
create closed cold air return system for furnace	W	IAQ	heating efficiency

	Dust Decontamination and Dust Sink Removal			
	remove bath, kitchen and basement carpeting	HH	lead, allergens, particulates	mold and moisture
	remove contaminated, uncleanable carpet	HH	lead, allergens, particulates	mold and moisture
	HEPA vac/intensive clean all interior surfaces	HH	lead, allergens, particulates	
	remove moldy or water-damaged material	HH	mold	
	cleanup mold contamination on hard surfaces	HH	mold	
	cleanup roach contamination on hard surfaces	HH	allergen	
	remove potential mold host material from basement and other areas	HH	mold	

	Integrated Pest Management (roaches and rodents):			
	flush (hot air) and HEPA vac roaches	HH	allergens	
	seal entry points and harborages	HH	allergens	integrate with other repairs
	apply boric acid powder behind cabinet, in wall voids, in cracks and crevices	HH	allergens	integrate with other repairs
	apply gel baits (out of the reach of children)	HH	allergens	
	monitor with sticky traps	HH	allergens	

Injury Prevention (as HH funds or other funding permits):			
ground-fault interrupters (kitchen, bath, laundry)	HH/ Other	electric shock	integrate with other repairs
safety glazing - shower, other large glass	HH/ Other	broken glass injury	integrate with other repairs
handrails on stairs	HH/ Other	fall hazard	integrate with other repairs
others better???			

Low-Emission Materials:			
spec low VOC coatings, sealers, adhesives	HH	IAQ	environmental impact
spec no CCA wood; spec ACQ or plastic/fiber wood	HH	IAQ	environmental impact
no VOC counter top, back splash, cabinets; spec wheat straw	HH	IAQ	

	LEAD HAZARD CONTROL			
	paint stabilization	L	lead hazards	low VOC coatings
	window repair/replace	L	lead hazards	heat loss,
	soil lead remediation	L	lead hazards	rain intrusion at foundation
	make surfaces smooth/cleanable	L	lead hazards	decon of other contaminates
	dust reservoir removal	L	lead hazards	decon of other contaminates
	specialized cleaning	L	lead hazards	decon of other contaminates

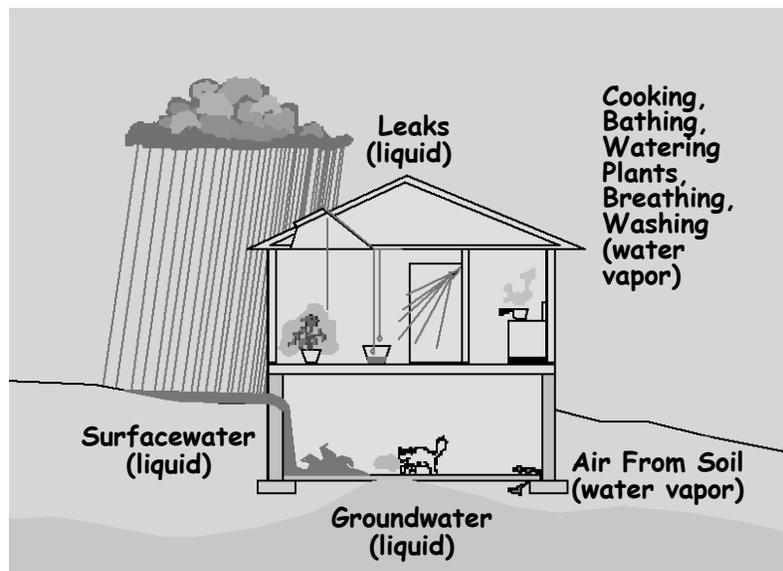
	WATER CONSERVATION & ELECTRICITY USE REDUCTION			
	plumbing leak repairs	WC	water loss	mold, pests, paint failure
	low flow faucets, shower heads; 1.6 gal toilets	WC	water loss	
	compact fluorescent light bulbs	E	electric energy waste	air pollution
	refrigerator replacement; remove extra refrigerators	E	electric energy waste	air pollution
	load balancing at service panel (if electrician is there for something else)	E	electric energy waste	air pollution

Moisture interventions

1. Remove/repair moisture source
2. Divert moisture source
3. Block moisture source
4. Block moisture paths
5. Ventilate the moisture source
6. Control surface temperature/room temperature

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How Water Enters a Building



Mold interventions

1. Remove water damaged material
2. Clean mold from hard surfaces
3. Block mold pathways

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Spec experience from Mold & Moisture Project

-  Eliminate sub-slab duct and heating systems
-  Disconnect and redirect downspouts
-  Reduce moisture in crawlspaces
-  Flash the soil to the house
-  Treat the porch like a roof
-  Repair the "Cleveland drop"

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Eliminate sub-slab duct and heating systems

- 🏠 Post WWII bungalows with slab-on-grade foundations, downdraft forced air furnace with ducts in slab
- 🏠 Water leaking into ducts creates whole-house humidification resulting in mold on walls and ceilings
- 🏠 Spec: Install updraft furnace with new duct system and fill old ducts with cement

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Mold generated by moisture from sub-slab heating ducts



Eliminate sub-slab duct and heating systems

Spec execution:

- New furnace and ductwork avg. cost = \$2,971
- Some sub-slab ducts were not sealed, allowing musty odor in living space

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Disconnect and redirect downspouts

-  Downspouts, by code, enter sub-grade storm drain system
-  With deterioration, water leaks and spills at foundation walls
-  Spec: Downspouts disconnected and 5' elbows installed
-  Spec: Gutters resloped toward downspout closest to street

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Disconnect and redirect downspouts

Spec execution:

- Downspout disconnect avg. cost = \$114
- Gutters repitched avg. cost = \$145
- Sometimes water flow not adequately diverted from foundation

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Downspout disconnect



Reduce moisture in crawlspaces

-  **Moisture from dirt floors enters living space**
-  **Spec: Remove debris**
-  **Spec: Cover floor with 6 mil plastic carried along walls to grade level**

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Reduce moisture in crawlspaces

-  **Spec execution:**
 - Plastic sheeting avg. cost = \$270
 - Debris removal avg. cost = \$305
 - Would have been good to spec "rat slab" at the same time
 - Some crawl spaces missed

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Flash the soil to the house

-  To reduce surface water entering at house foundation
-  Spec: Trench 12-16" deep, 2-3' wide, sloped away from foundation
-  Spec: EDPM, rubber roofing material placed against wall and along trench

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Flash the soil to the house

-  Spec execution:
 - Avg. cost = \$860
 - Some soils settled too much, leaving a depression
 - Spec should have called for overfilling

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Treat the porch like a roof

- 🏠 Foundations extend under porch, allowing water to enter basement when porch flooring deteriorates
- 🏠 Spec: Two layers of 6 mil plastic on old deck, sealed at perimeter. Indoor/outdoor carpet installed

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Treat the porch like a roof

- 🏠 Spec execution:
 - Avg. cost = \$312
 - Covers the lead paint on deck
 - Does the lead dust in the carpet get tracked into the house or is it trapped?

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Repair the "Cleveland drop"

- 🏠 Cold air return not connected to forced air furnace
- 🏠 Furnace pulls air from across basement floor
- 🏠 Spec: Duct cold air return directly to furnace

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Repair the "Cleveland drop"

- 🏠 Spec execution:
 - Done on a third of the houses; avg. cost = \$553; max \$1600
 - Some contractors "panned" the floor joists with sheet metal instead of installing full duct

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Repair of "Cleveland drop" by ducting cold air return directly to furnace



One-year follow-up observations of Mold & Moisture Project work

-  43 houses visited at least one-year post-remediation:
- 347 mold & moisture spec executions assessed
 - 285 (82%) - "OK"
 - 28 (7%) - "poor work," "not done," or "did not follow spec"

One-year follow-up observations of Mold & Moisture Project work

Specification Rating	Number of specs	Percent of specs
Ok	285	82%
Poor work	12	3%
Not done	8	2%
Did not follow spec	8	2%
Material failure	7	2%
Wrong treatment	4	1%
Defeated by occupant behavior	4	1%
Extreme event	0	0%
Other	19	5%