Pest Prevention By Design:
Another Dimension of Green Building Best Practices

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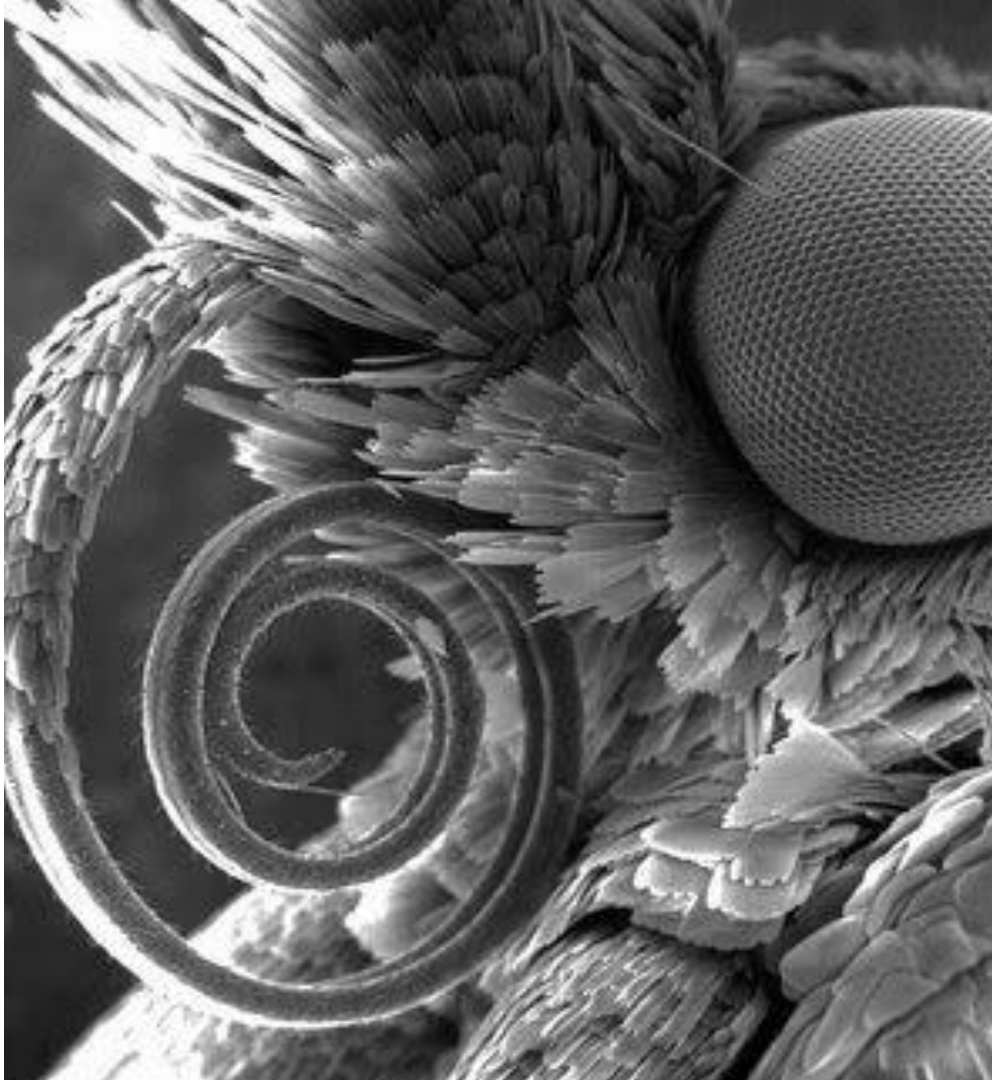
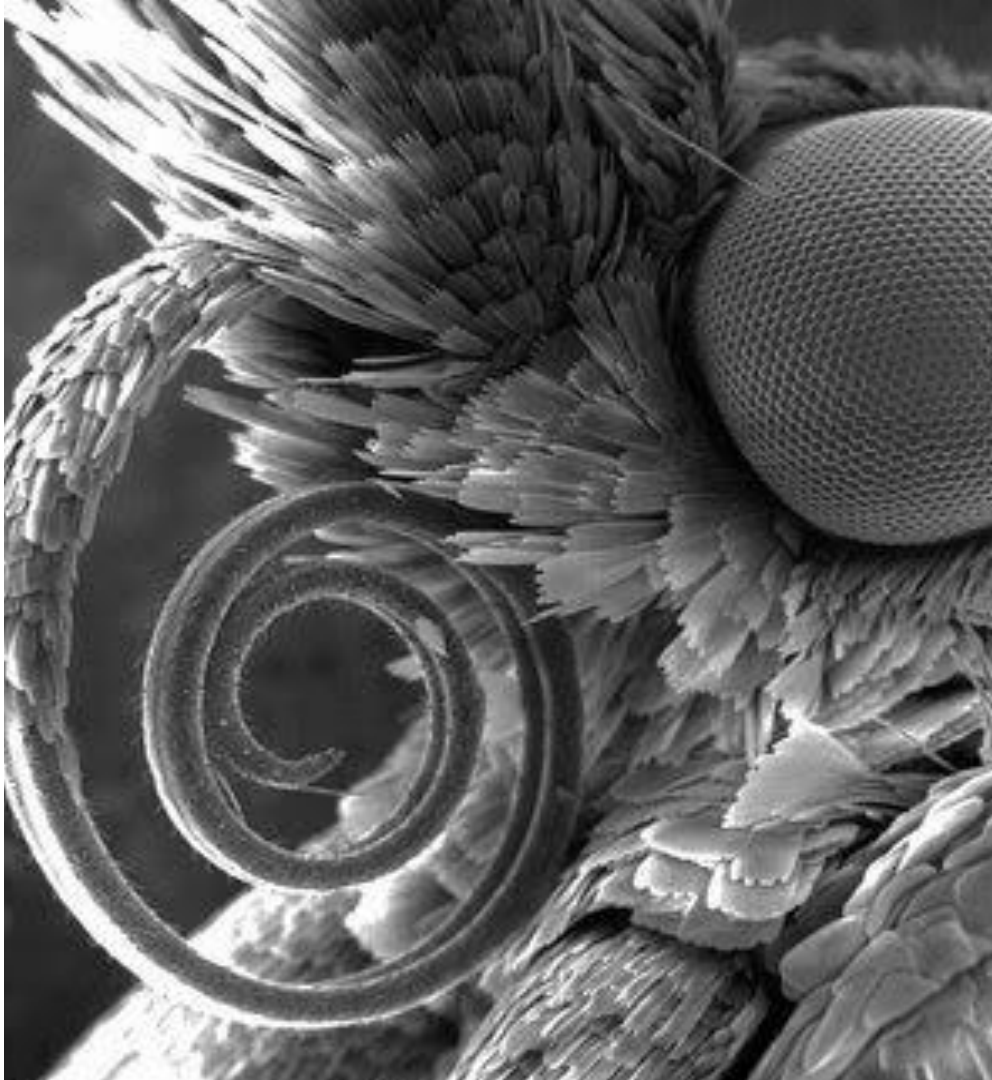
pestec

The world is blessed with many charming, pleasurable, glamorous and enticing subjects on which to ponder.



The world is blessed with many charming, pleasurable, glamorous and enticing subjects on which to ponder.

Pest management is not one of these.



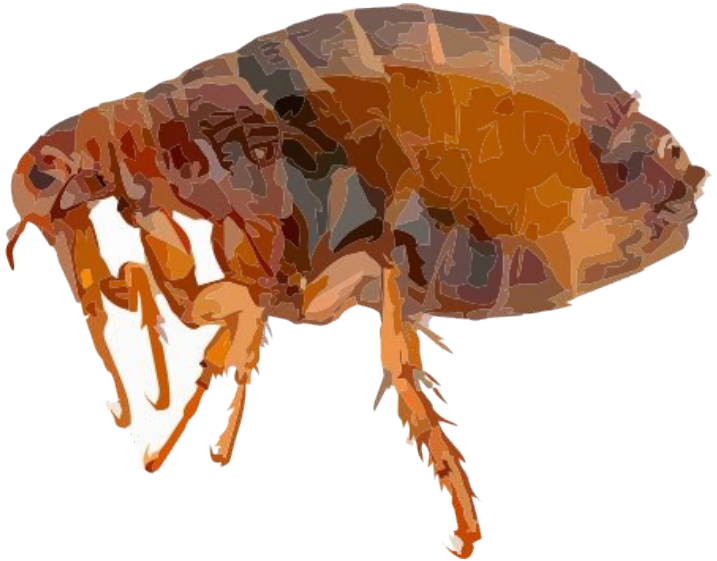
Why pest management? Asthma

Most inner-city children with moderate to severe asthma are sensitized to multiple indoor allergens and that environmental factors known to be associated with asthma severity are commonly present in their homes.

Allergen skin tested	% positive
Dust mites (2 species)	62
Cockroaches (2 species)	69
Rat	19
Mouse	28
Either rodent	33
Mold (4 species)	50

Why pest management? Diseases spread by pests

- Worldwide, rodents can transmit over 35 different disease-causing organisms.
- In NYC, the flea that transmits bubonic plague has been found on Norway rats in parks.*
- Rodents and cockroaches transmit food-borne illness: Salmonella, E. coli, etc.
- Mosquitoes carry many diseases.



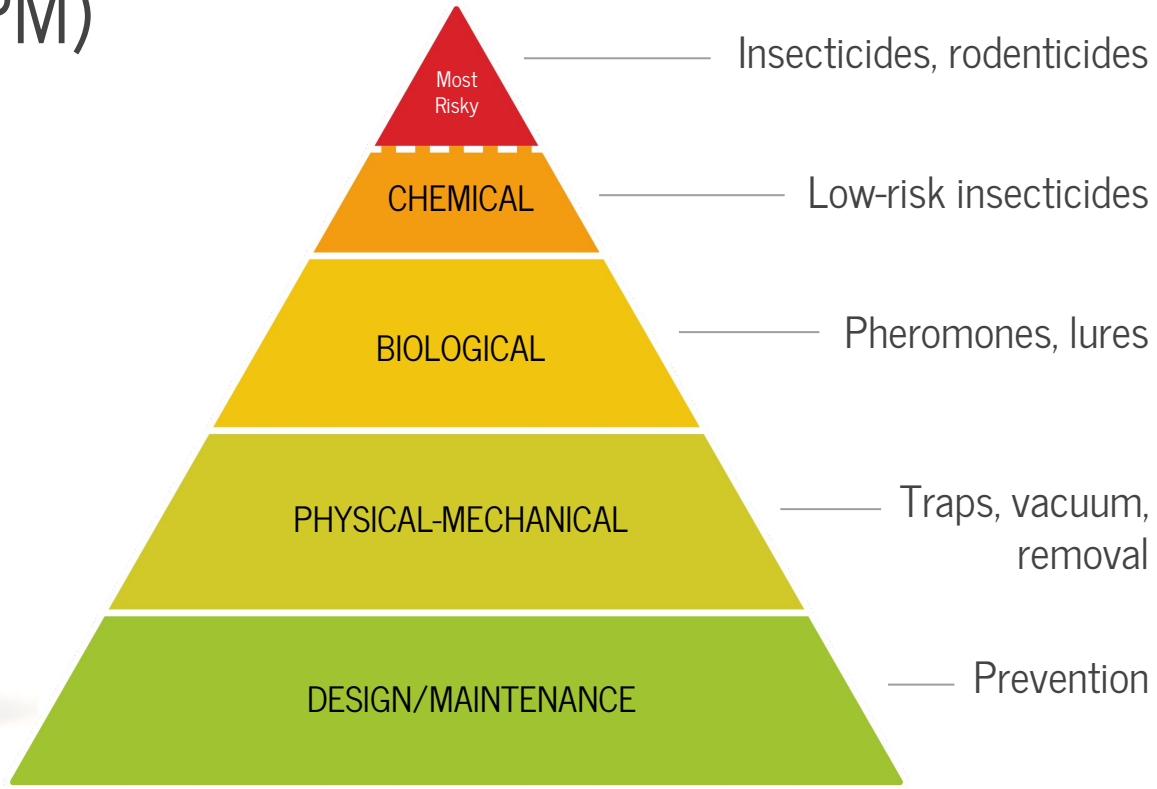
*Frye, et al. J. Med. Ent. 52(2),2014

Why pest management? Damage to buildings

An estimated 20% of undetermined fires are caused by rodent damage

Integrated Pest Management (IPM)

Common sense pest prevention and management



IPM in Existing LEED Systems (1)

- LEED EB-OM 2009, Credit EQ 3.9 (Green Cleaning: Indoor Integrated Pest Management) – 1 point
  - Notification of sprays, IPM plan, reporting of pesticides used, general language on sanitation and sealing entryways

- LEED O+M v.4 (Integrated Pest Management) – 2 points
  - Incorporated outdoor IPM, much improved language, communications plan, general reference to pest prevention, included incentive for certified pest management providers

IPM: What's missing from LEED?

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"D"= "DESIGN"

IPM: What's missing from LEED?

Current credits address practices, but not **design** to avoid pests in the first place

Pest Prevention by Design

Authoritative guidelines for designing pests out of structures

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ICC
INTERNATIONAL CODE COUNCIL

PPBD Technical Advisory Committee

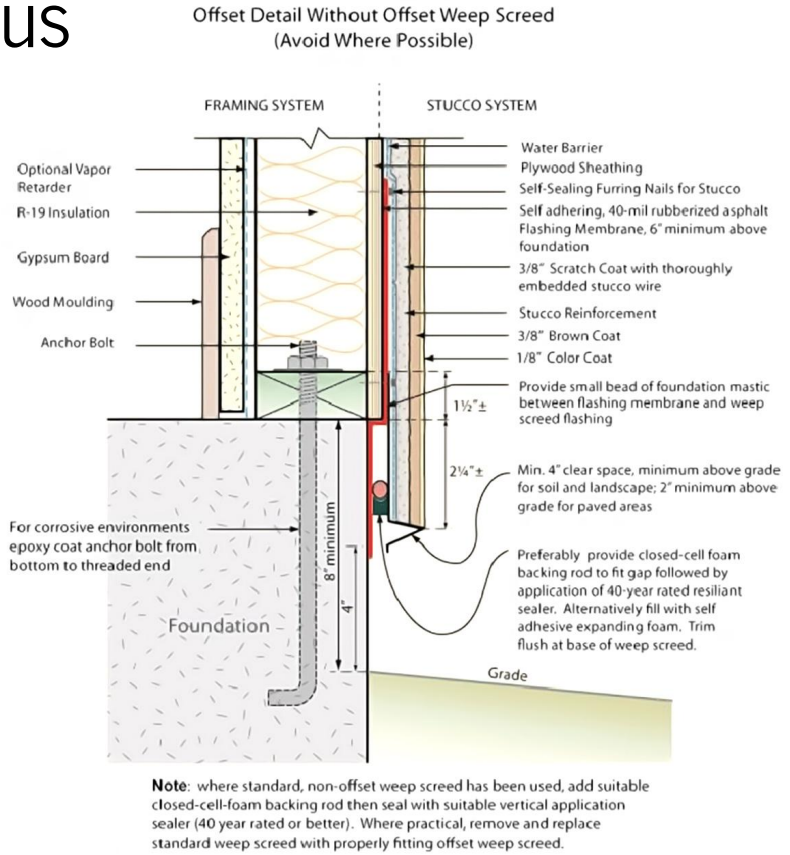
Name	Organization	Sector	Name	Organization	Sector
Allison Taisey, Ph.D	Cornell Univ. Extension	Academic/ Extension	Luis Agurto, Jr.	Pestec	Pest Control Industry
Arthur Slater	Slater Pest Control	Pest Control Industry	Lyn Garling	PA IPM Program, Penn State University	Academic/ Extension
Bobby Corrigan, Ph.D	Corrigan Consulting	Consultant	Margaret Hurlbert	Univ. of Calif., Berkeley	Facility manager
Brad Guy	Material Reuse	Architect	Mark Palmer	SFE – Green Building Program	Government
Darren Van Steenwyk	Clark Pest Control	Pest Control Industry	Mary Louise Flint, Ph.D	Univ. of Calif. Statewide IPM Program	Academic/ Extension
Dion Lerman	PA IPM Program, Penn State University	Academic/ Extension	Megan White	WebCor Builders	Construction
Doug Henderson	Alameda Co. Lead Prevention Program	Government	Michael Merchant, Ph.D	Texas A&M AgriLife Extension	Academic/ Extension
Greg Axten	American Geotechnical Inc.	Engineer	Nita Davidson, Ph.D	California Dept. of Pesticide Regulation	Government
Jim Fredericks, Ph.D	National Pest Management Association	Pest Control Industry	Paul Romano	New Jersey Institute of Technology	Architect
Jody Gangloff-Kaufmann, Ph.D	New York State IPM Program	Academic/ Extension	Richard Estrada	ATCO Pest Control	Pest Control Industry
John Cahill	Cahill Inspection Services	Inspector	Sraddha Mehta	SFE - Environmental Justice Program	Government
Kathy Seikel	US EPA - Childrens Health	Government	Tara M. Cahn	Tara Cahn Architecture	Architect
Lee Tanner	US EPA – Office of Pesticide Programs	Government	Thomas Green, Ph.D	IPM Institute of North America	Consultant
		Public Housing			

Building Exterior: Miscellaneous

4.6.5 Sealing for stucco walls with offset framing and standard weep screed.

For offset framing where standard weep screed was used, install closed-cell-foam backing rod between foundation and flashing. Apply suitable, vertical application and resilient caulking between foundation and flashing. Alternatively fill gap between foundation and flashing with self-adhering, expanding foam. Upon cure, trim flush
with base of flashing.

Effective on:	Ants, Spiders, Subterranean Termites, Dampwood Termites, Misc. Wood Destroying, and Misc. Insects
Compatibility Issues with Other Design Goals:	None identified
References:	Technical Advisory Committee



Source: Greg Axten

Five Design Principles for Pest Prevention

Entry

Entry

Food

Entry

Food

Water

Entry

Food

Water

Harborage

Entry

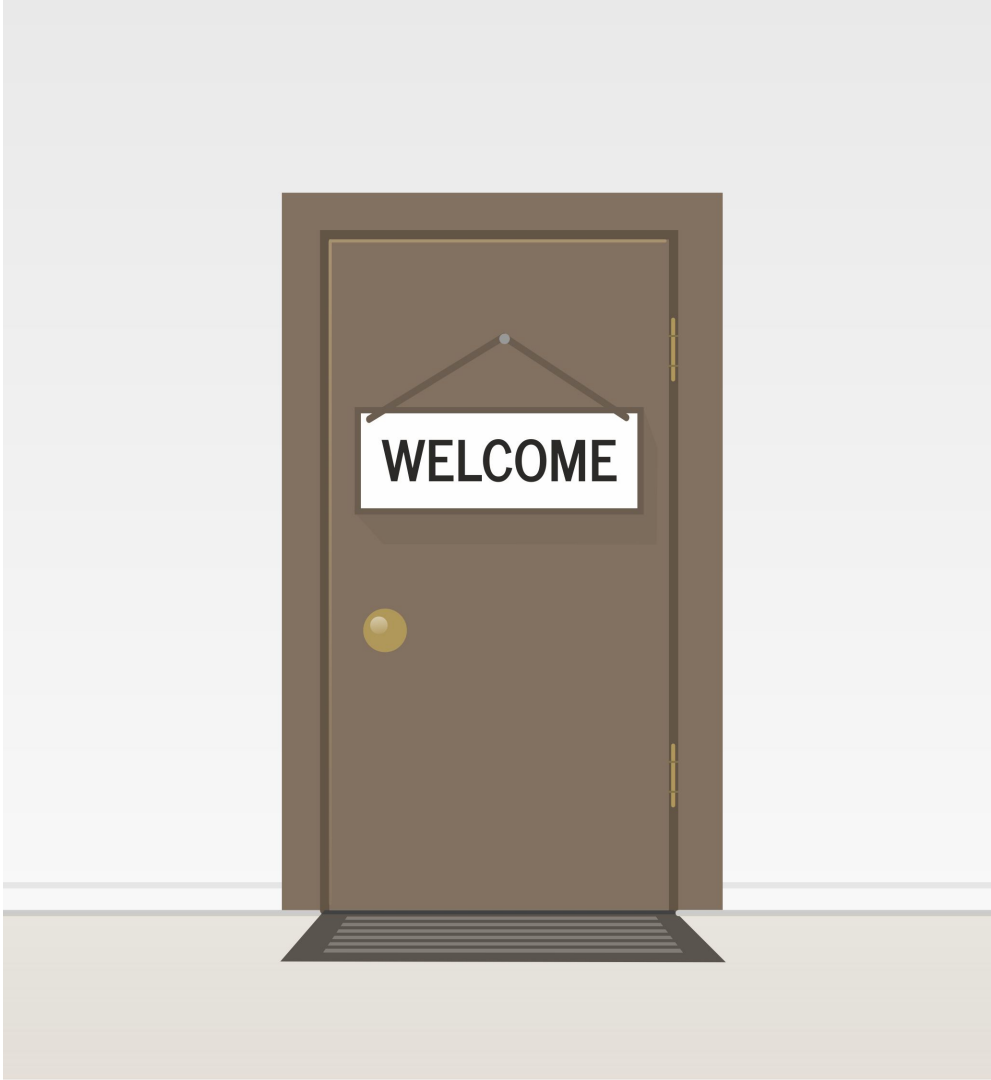
Food

Water

Harborage

Inspectability

Entry



Entry

	Common Name	Scientific name	Maximum opening size/mesh size	Reference
Insects/arthropods	**Biting midges**	Ceratopogonidae	0.605 mm ~30 mesh	AFPMB, 2009
	Cockroaches	*Blatella germanica*	1.66 mm ~12 mesh	Koehler, 1994**
	Fruit flies	*Drosophilida* spp.	2.12 mm ~10 mesh	NPS, 2006
	Honeybees	*Apis* spp.	3.00 mm ~7 mesh	NPS, 2006
	House flies	*Musca domestica*	2.03 mm ~10 mesh	Block, 1946
	Mosquito	*Anopheles quadrimaculatus*, *Culex quinquefasciatus*	1.38 mm ~14 mesh	Block, 1946
	Termites (Eastern subterranean)	*Reticulitermes flavipes*	0.610 mm ~30 mesh	Tucker, 2008*
	Thrips	*Frankiniella occidentalis*	0.192 mm ~80 mesh	Bethke & Paine, 1991*
	Yellowjackets	*Vespidae* spp.	3.00 mm ~7 mesh	NPS, 2006
Birds	**Pigeons**	*Columba livia*	50.8 mm (2 in)	Timm & Marsh, 1997
	Sparrows, Starlings	*Passer* spp., Sturnus vulgaris	19.1 mm (0.75 in)	Timm & Marsh, 1997
Mammals	**Bats**	*Chiroptera spp*	6 mm/0.25 in	Greenhall & Frantz, 1994
	Mice	*Mus musculus*	6 mm/0.25 in	Greenhall & Frantz, 1994
	Rats	*Rattus norvegicus*, *R. rattus*	9.5mm/3/8 in gaps under doors; 18 gauge 13 mm/0.5 in mesh	Corrigan, 1997
	**Studies marked with an asterisk identified nominal gap sizes; these were matched with the closest Tyler mesh size. All other studies referred specifically to minimum mesh sizes; these were matched with approximate gaps sizes. Mesh opening sizes are nominal, i.e., not diagonal*			
	***Study pertained to preferred harborage for nymphs, not minimum opening for access, which is likely smaller*			

Entry

(½ inch)

Entry

(¼ inch)

Entry: Door sweeps

WRONG

RIGHT


pestel

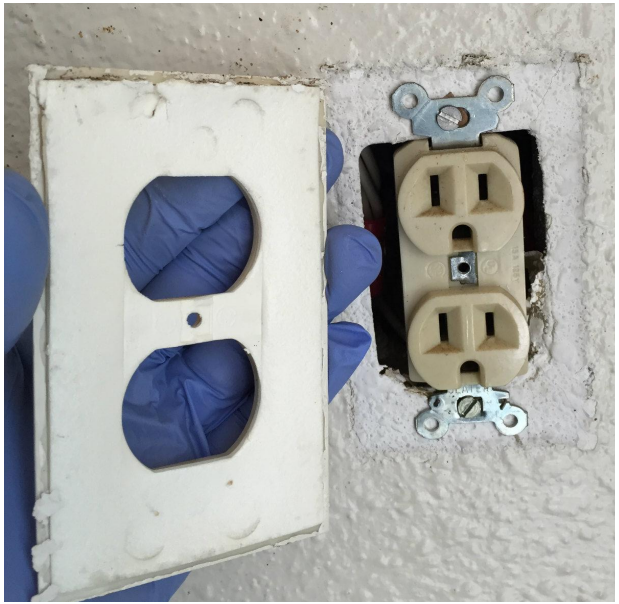
Entry: Knockouts

Entry: Electrical Outlets

Electrical outlets provide pests entry into voids and other locations.

Entry: Electrical Outlets

WRONG



RIGHT

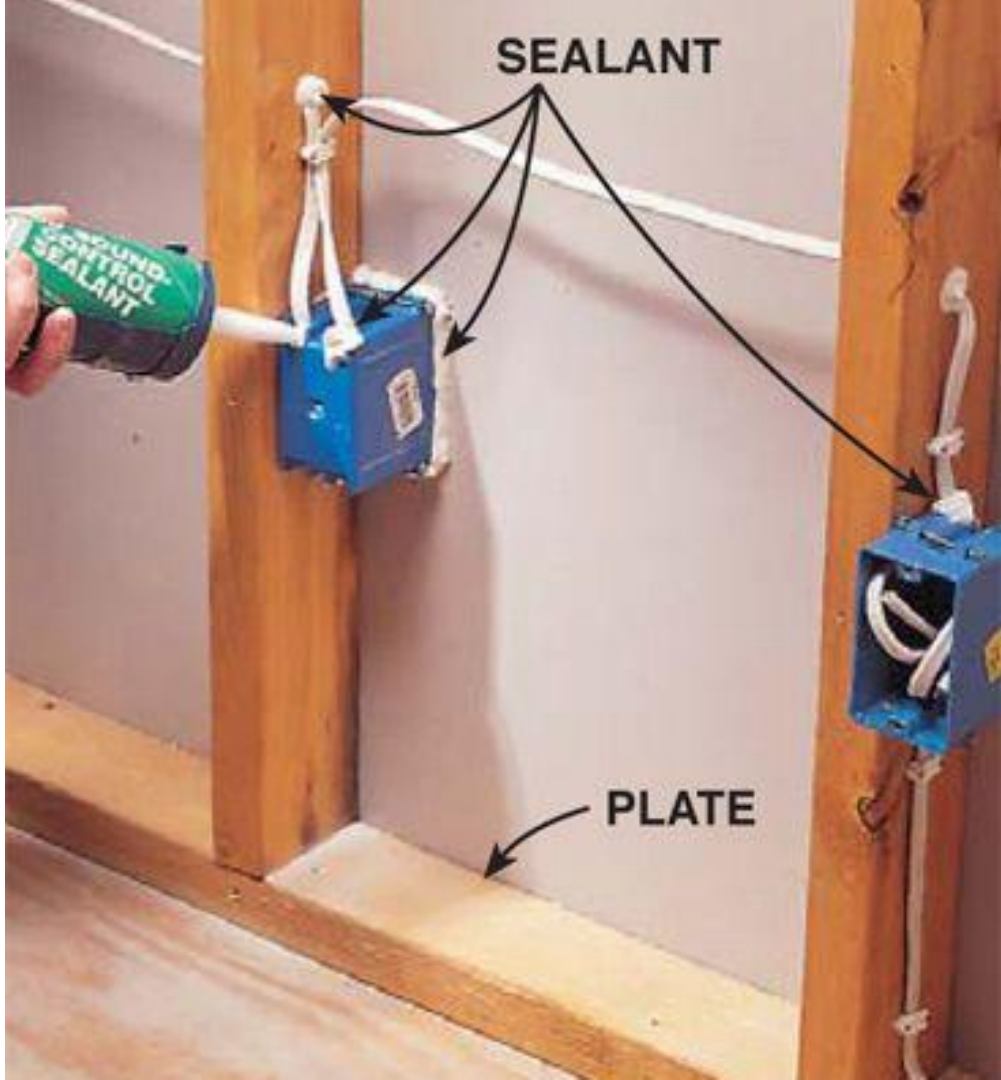
Gaps around electrical receptacles create drafts and pest entry.

Entry: Electrical Outlets

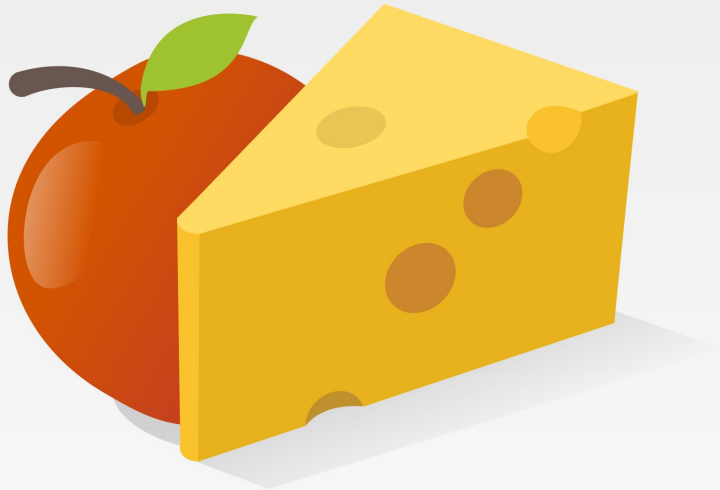
Gaps around electrical receptacles create drafts and pest entry.

Entry: Electrical Outlets

- Draft and acoustical sealant reduces drafts, sounds and pest entry
- Fire barrier putty pads help control the spread of fire, smoke, noxious gases, and blocks pests



Food



Food:
Refuse Areas

Food:
Refuse Areas

Waste diversion requires space for holding and sorting.

Food:
Refuse Areas

Self closing doors, secure door, no holes within ¼” will reduce pest access to food.

Food:
Refuse Areas

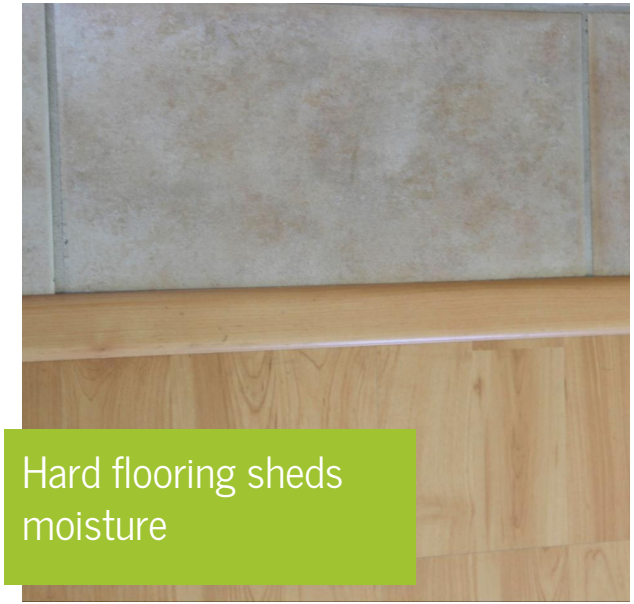
Enclose roof, add doors, seal around edges.

Water

Water:
Good drainage

Water: Carpeting near moist areas

WRONG



RIGHT

Water:
Sealing around coolers

Harborage

Harborage:
Cabinet voids

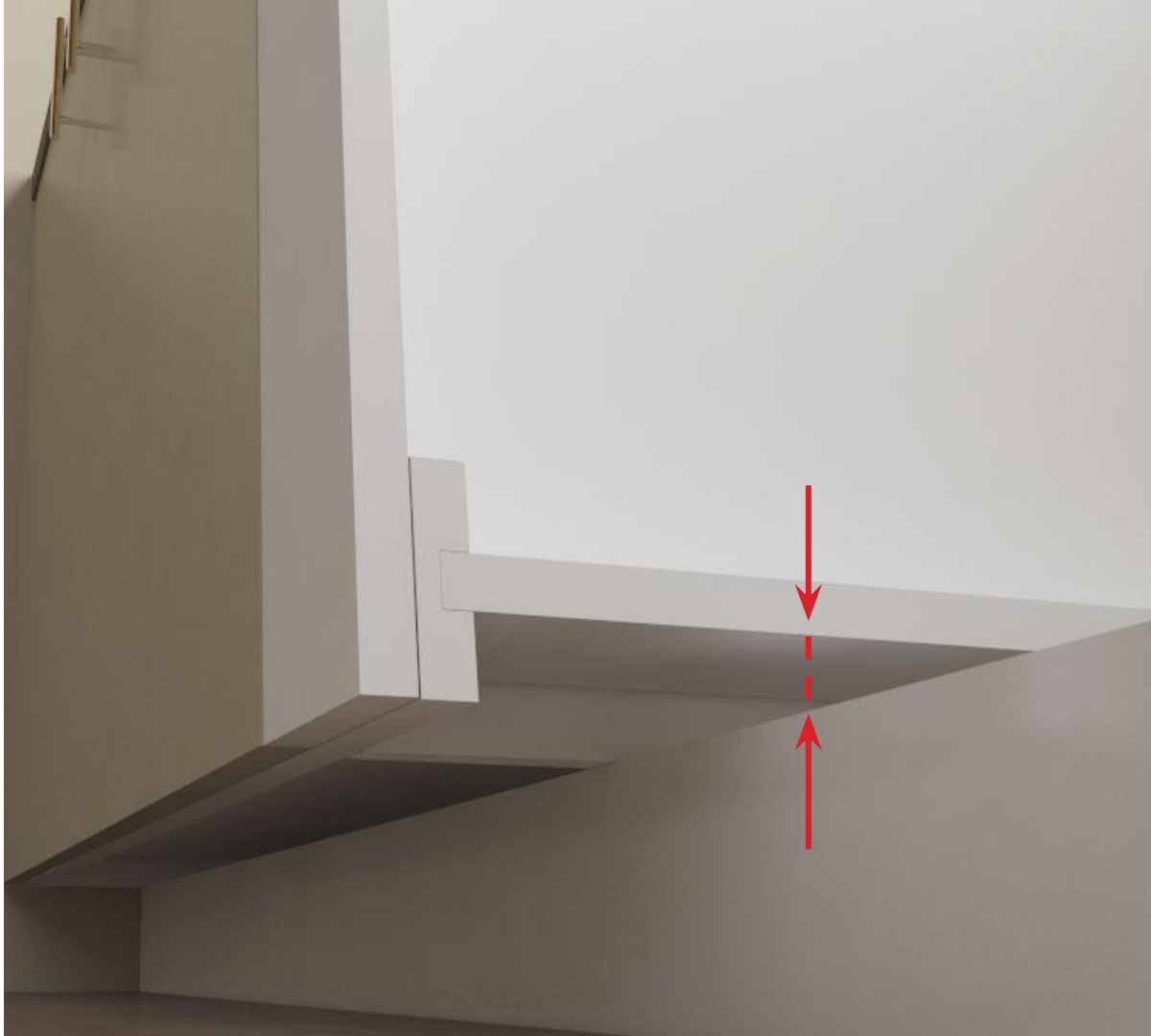

Gaps behind
cabinet boxes
Gaps between boxes
& between box & base

Gaps = homes
Seal around cabinet kick/base

Seal around cabinet perimeter

Seal between cabinet boxes

Gap between bottom of box & kick



Provide filler strip at gap

Upper cabinets

Seal cabinets to wall to reduce cockroach harborage in kitchens.

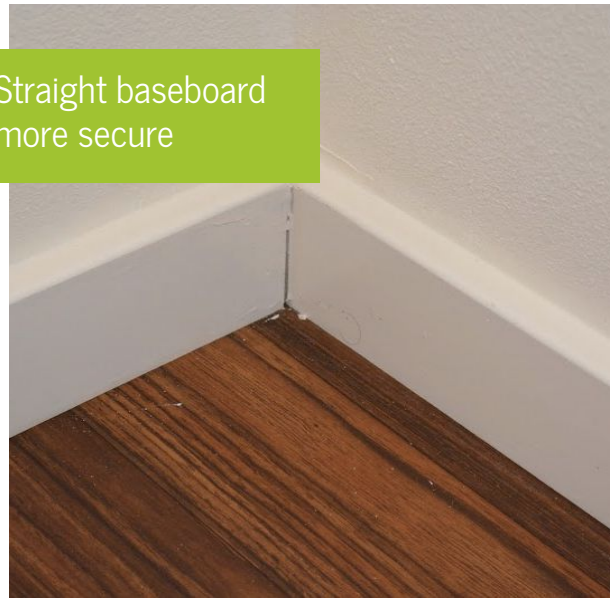
Upper Cabinets

WRONG

RIGHT

Harborage: Vinyl baseboards

WRONG



RIGHT

Harborage:
Vinyl baseboards

Harborage: Cinderblock construction

Once they can get in, mice will have an unlimited amount of protected nesting space.

Harborage:
Cold joints

Harborage:
Pigeon heaven

Harborage:
Semi-enclosed alcoves

Harborage:
Tile roofs

Harborage: Install bird stops on tile roofs

WRONG

RIGHT

Harborage:
Shade Screens

Inspectability

Inspectability:
Drop ceiling in LEED-certified building

Inspectability:
Refuse chutes

Inspectability
Foundations

Worst case

What about landscapes?

Mowing strips, edging... and more

Common Design Flaws

1. Unsecured or poorly located refuse areas
2. Inadequate exclusion in the building envelope
3. Hidden voids

   Ex.) cabinetry
4. Lack of bird prevention

   Ex.) semi-enclosed alcoves, perches over doors
5. Poor choice of doors seals
6. Poor choice of baseboards

Thank You!

This presentation can be found at:
https://www.pestec.org/pest-prevention-by-design

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