APPENDIX 14
INTEGRATED PEST MANAGEMENT

TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>SECTION</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>OVERVIEW</td>
<td>1</td>
</tr>
<tr>
<td>CU IPM OPERATIONS</td>
<td>1</td>
</tr>
<tr>
<td>BUILDING ENVELOPE – Standards for exterior surfaces and features</td>
<td>3</td>
</tr>
<tr>
<td>Caulking &amp; Sealing</td>
<td></td>
</tr>
<tr>
<td>Cooling Towers</td>
<td></td>
</tr>
<tr>
<td>Cupolas</td>
<td></td>
</tr>
<tr>
<td>Exterior Doors</td>
<td></td>
</tr>
<tr>
<td>Exterior Walls</td>
<td></td>
</tr>
<tr>
<td>Ledges, Overhangs &amp; Sills</td>
<td></td>
</tr>
<tr>
<td>Louvers</td>
<td></td>
</tr>
<tr>
<td>Open-Air Balconies</td>
<td></td>
</tr>
<tr>
<td>Rain Gutters</td>
<td></td>
</tr>
<tr>
<td>Stone &amp; Brick Work</td>
<td></td>
</tr>
<tr>
<td>Window and Exterior Screens</td>
<td></td>
</tr>
<tr>
<td>STRUCTURAL – Considerations for exposed structural components</td>
<td>8</td>
</tr>
<tr>
<td>Structural I-beams</td>
<td></td>
</tr>
<tr>
<td>Exposed / Exterior Metalwork</td>
<td></td>
</tr>
<tr>
<td>FOOD SERVICE – Standards for commercial kitchen facilities</td>
<td>9</td>
</tr>
<tr>
<td>Loading Dock &amp; Waste Collection</td>
<td></td>
</tr>
<tr>
<td>Receiving Entrance</td>
<td></td>
</tr>
<tr>
<td>Dock Lighting</td>
<td></td>
</tr>
<tr>
<td>Ceiling Tiles</td>
<td></td>
</tr>
<tr>
<td>Wall Coverings</td>
<td></td>
</tr>
<tr>
<td>Food Storage Areas</td>
<td></td>
</tr>
<tr>
<td>MECHANICAL – Suggestions for specific mechanical and utility systems</td>
<td>11</td>
</tr>
<tr>
<td>Plumbing &amp; Radiant Heating</td>
<td></td>
</tr>
<tr>
<td>Electrical &amp; Wiring</td>
<td></td>
</tr>
<tr>
<td>HVAC Systems</td>
<td></td>
</tr>
<tr>
<td>Floor Drains</td>
<td></td>
</tr>
<tr>
<td>Exposed Mechanical Systems</td>
<td></td>
</tr>
<tr>
<td>Mechanical Rooms</td>
<td></td>
</tr>
<tr>
<td>Humidity Control</td>
<td></td>
</tr>
<tr>
<td>LANDSCAPES – Considerations for landscapes connected with new buildings</td>
<td>13</td>
</tr>
<tr>
<td>Building Perimeter</td>
<td></td>
</tr>
</tbody>
</table>
OVERVIEW
The University of Colorado at Boulder has an in-house Integrated Pest Management (IPM) service that is responsible for the majority of pest control on campus. Their goal is to provide timely, quality service that minimizes health and environmental risks while protecting the University’s investment in its facilities. IPM takes a proactive approach to pest control where early involvement produces the greatest results.

IPM enacted these standards in order to preempt common situations that lead to pest infestations. These preventative measures will reduce overall incidents of pest infestations and the associated costs of control over the life of the facility.

All standards are mandatory; advisory recommendations are denoted by an asterisk (*).

Standards address the following issues:
- Pests enter buildings through unintentional openings.
- Birds roost on building exteriors.
- Structural members provide inlets and harborage to pests if improperly enclosed.
- Exposed metalwork provides harborage for pests if not completely sealed.
- Kitchen waste attracts pests if improperly disposed.
- Food storage areas attract pests if improperly constructed.
- Improper water drainage produces pest habitats.
- Lighting attracts flying insects.
- Mechanical chases allow pests to migrate through buildings if improperly sealed.
- Improperly designed/installed mechanical systems gather debris and harbor pests and create sanitation difficulties.
- Exposed mechanical systems provide harborage for pests.
- Humidity attracts pests if improperly controlled.
- Drainage systems may provide indoor access and harborage for pests.
- Landscapes around buildings may attract pests and lead to infestation.
- Landscapes without access for future maintenance serve as pest habitats.
- Building materials can create pest habitats if improperly stored and disposed.

CU IPM OPERATIONS
The CU IPM office is located at 2290 Stadium Drive, in the Grounds Building. Technicians are scheduled from 7:00 a.m. – 5:00 p.m. Sunday – Friday and are on call at all other times. They serve all university facilities and properties. IPM staff can be reached through the Facilities Management Service Desk at (303) 492-5522.

IPM offers job-site services including pest baiting, trapping, monitoring, and removal. These services are intended to control or reduce pest populations during construction and are not a substitute for following IPM standards. Please call the Facilities Management Service Desk at (303) 492-5522 to schedule an on-site visit and/or routine service.
**Issue:** Pests enter buildings through unintentional openings.

Birds roost on building exteriors.

**RELATED SECTIONS**

- 08100 - Metal Doors and Frames
- 08210 - Wood Doors
- 08305 - Access Doors
- 08520 - Aluminum Windows
- 08100 - Metal Doors and Frames
- 08305 - Access Doors
- 08520 - Aluminum Windows
- 05500 - Metal Fabrications
- 15936 – Air Inlets and Outlets
- 07900 - Joint Sealers

**Caulking & Sealing**

The terms ‘caulking’ and ‘sealing’ will be used interchangeably throughout this document. There are too many types of caulk and sealers as well as too many applications for them to be described here. Other standards and codes adequately address the best type and use of each product.

The concern of the IPM team is simply that all cracks and crevices should be caulked/sealed to prevent pest entry. All pipe and mechanical penetrations should be caulked and sealed, which may require fire-rated sealants. Bathrooms should have all utilities sealed at the base and sides as well as sealed pipe entries. Doors and windows should be caulked from the outside and inside to prevent pests. All cracks and crevices on the exterior should also be sealed to prevent pests like ants and ground insects. This includes but is not limited to floors, walls, interior ceilings, roofs, soffits, and any other sites that could lead to pest entry.

**Cooling Towers**

All towers on the rooftop should include bird exclusions to prevent the nesting and roosting of birds. Includes but not limited to affixing the top edge with electric deterrent bird wire and exclusion of any other potential bird nesting sites within the structure. Screen off access openings to voids or equipment that birds would use for nesting. The screen should be a hardware cloth or other material that birds cannot pull off or work out to gain entry. Depending on exposure/visibility, architect will need to be consulted. On all units the objective is to repel the birds and prevent nesting or roosting. **Materials will carry a 2-year warranty. Work will carry a 2-year warranty.**

**Cupolas**

Cupolas may be functional (exhaust, building ventilation) or purely aesthetic; the resulting voids or openings provide pest harborage unless screened. Any structures and openings that resemble cupolas should be screened off to prevent raccoons, birds, and other animals from using them for nesting or entry. The screens should meet with building standards set by the campus. Screens will be constructed of perforated expanded metal that allows air to pass through them. Screen mesh should be
small enough to prevent bird and mammal entry (no greater than 1/2” mesh) and strong enough to withstand gnawing, pulling, or pest impact.

Screens and necessary hardware will be powder coated in a black finish, or painted black according to metal fabrication standards. Screens must be removable for maintenance and cleaning yet secure enough to withstand sustained winds as well as gusts in excess of 70 MPH. Screens should be framed and removable for future service access.

Screens should be installed flush to the structure on all sides when possible so as not to create a shelf, ledge, recess, or void. Recesses, voids, and ledges created by the installed screen will be corrected using approved methods. Fastening hardware shall be hidden, recessed, or countersunk to minimize aesthetic impact. Screens and exclusions will match existing structure to minimize aesthetic impact. The campus architect will approve these before placement is granted. Materials will carry a 5-year warranty. Work will carry a 5-year warranty.

Example: Plan for previously completed cupola screens. Note concealed hardware, powder coating, and custom-size fabrication.
Exterior Doors

All exterior doors should be fitted with door sweeps on the bottom edge. IPM makes material recommendations on the basis of initial cost, maintenance cost, light and weather resistance, and pest resistance. IPM recommends the Sealeze® High-Density Pest Control Brush door sweep or comparable product. This product includes a brass or aluminum flange and nylon brush insert. The brush insert is tall and bendable, allowing for proper installation on various door gap heights. Solid rubber or nylon inserts degrade in the cold and require excessive upkeep. Additionally, to get a good seal at the door threshold, solid inserts often need to be lowered such that they create excessive drag or resistance when opening the door. Exterior doors with uninterrupted access to the interior (i.e. no partitioned entryway or hallway) should be fitted with door sweeps on both sides of the door. Door sweeps will be properly installed so as to tightly seal the bottom edge of the door when closed. This also requires that doorway thresholds be of a design to withstand the type and amount of traffic expected.

* IPM acknowledges the possible need for and applicability of automatic door sweeps, solid insert door sweeps, and other alternative products. Traffic type and volume, as well as specific location, may influence product selection. For instances where the door requires an alternative product, contractors are asked to consult with the campus IPM Coordinator.

Exterior Walls

Exterior walls must be seamlessly constructed and free of voids, cracks, or entry points. All joints and transitions should be properly constructed and sealed according to existing building standards.

Ledges, Overhangs & Sills

All ledges that extend outside or around the buildings will attract birds. If the building has an overhang or any type of ledge, including light fixtures, birds may roost or nest there. Bird prevention employs many products including electric deterrent bird wire, bird exclusion nets, deterrent screens, “No-land” bird slide, and other mechanical exclusion. All means of bird control will have the IPM Coordinator’s approval before installation. Materials will carry a 2-year warranty. Work will carry a 2-year warranty.

* Bird exclusion methods affect aesthetics differently; contractors should consult with the Architect when evaluating approved options. The ideal solution will effectively repel birds with minimal aesthetic impact.
Example: Bird Slide™ installed to eliminate shelf created by light fixture.

Example: One of several electric bird shock systems.

Louvers

Exterior louvers used for ventilation and exhaust provide interior access for pests. These include framed louver panels, mechanical sheds, and penthouses. These louvers should have screens pre-fitted or later installed behind them to exclude pests. Screen mesh should be no greater than $\frac{1}{2}$". Screens should be framed and removable to allow future service access.
Open-air Balconies

Covered/sheltered (open) balconies will attract nesting birds and should be fitted with bird exclusion nets, deterrent screens, or other exclusion method. The goal is to exclude the entire open area in order to prevent bird nesting and roosting. Careful design of the space that does not create ledges, sheltered corners, windbreaks, etc., may eliminate the need to net/exclude the entire space. The campus architect and IPM staff will approve exclusion methods before placement is granted. Materials will carry a 2-year warranty. Work will carry a 2-year warranty.

* Bird exclusion methods affect aesthetics differently; contractors should consult with the Campus Architect when evaluating approved options. The ideal solution will effectively repel birds with minimal aesthetic impact.

Rain Gutters

Cracks, voids, and ledges created by the installed gutter system will be corrected using approved methods. Gutter systems will divert water away from the building and toward an appropriate drainage point (storm drain or absorbent landscape).

Stone & Brick Work

Weep holes left in mortar should be filled with a plastic or aluminum weep hole screen to prevent pest entry.

Window and Exterior Screens

All operable windows (crank, slider, flap) must be fitted with screens to prevent pest entry. Any openings that could lead to interior infestations will be screened. Screens will be taught and sealed tightly around the frame with a gasket so as to be strong enough to withstand gnawing, pulling, or pest impact. Screens may be removable for cleaning and repairs.
STRUCTURAL – Considerations for exposed structural components

Issue: Structural members provide inlets and harborage to pests if improperly enclosed. Exposed metalwork provides harborage for pests if not completely sealed.

RELATED SECTIONS
05120 - Structural Steel
05400 - Cold Formed Metal Framing
05500 - Metal Fabrications

Structural I-beams

Structural I-beams provide roosting areas for birds and interior access for other pests if improperly enclosed. I-beams should be blocked or filled with rigid construction foam on exposed lengths to eliminate the shelf. Exposed ends also must be filled to eliminate the void, shelf, or ledge created from installation. Bird Slide™ may also be installed to eliminate resulting shelves or ledges. Bird slide must be installed seamlessly and painted to match the exterior. **Materials will carry a 2-year warranty. Work will carry a 2-year warranty.**

* Use Bird Slide™ or rigid construction foam to fill in the shelf and exclude any voids.

* IPM prefers that I-beam ends and sides are never exposed. IPM recommends using alternative materials to I-beams when structural members must be exposed.

Example: Exposed I-beams with Bird Slide™ installed at ATLAS dock. Note all shelves and ends are fully excluded. Bird Slide™ will be painted to match exterior.

Exterior Metalwork

Exterior metal structures must be seamlessly fabricated and welded without holes, gaps, or accessible voids. This includes hand rails, fences, and all metal structures. Fence posts must be capped if hollow. Wasps and yellow jackets seek out these holes in order to nest. Necessary weep-holes must be no greater than ¼” to prevent such nests.
FOOD SERVICE FACILITIES – Standards for commercial kitchen facilities

**Issue:** Commercial kitchens have an increased incidence of pest infestations above other facilities.
- Kitchen waste attracts pests if improperly disposed.
- Food storage areas attract pests if improperly designed.
- Improper water drainage may attract pests.
- Lighting attracts flying insects.

**RELATED SECTIONS**
- 09950 - Wall Coverings
- 16110 – Raceways
- 02730 - Sanitary Sewer Systems
- 16530 – Site Lighting
- 09510 – Acoustical Ceilings

**Kitchen Loading Dock & Waste Area**

Loading docks are the common entry point to food service facilities for invading pests; food waste containers located here attract foraging pests and improper water drainage may lead to infestation. Trash and food waste receptacles should have a designated area at least fifty (50) feet from the dock entrance. The dock and disposal areas should be designed and graded so that it is possible to spray them with water to clean. Waste water should be diverted into a sewer drain rather than a storm drain, and it may be necessary to install a drain conversion system. There should not be any recesses or ruts to retain water.

**Receiving Entrance**

Dock entrances are often propped open all day to receive deliveries, and this is when many pests migrate indoors. At minimum, the dock or receiving entrance door should have a door sweep and self-closing mechanism installed.

* “Air doors” are a welcome addition and will deter pests and insects while doors are propped open. Also, a second set of doors (creating an entry way or airlock) with door sweeps and self-closing mechanisms installed can reduce infestation.

**Dock Lighting**

Lights at dock entrances attract many flying insects depending on the color and wattage of the bulb. Fixtures will be sealed to prevent infestation. Certain lights create (heated) ledges and therefore require bird deterrents as well.

* IPM suggests fixtures located directly adjacent to doors should have CFL light fixtures with yellow CFL bulbs in order to attract fewer flying insects.
Ceiling Tiles

The void created by drop ceilings can provide harborage for pests. Ceiling tiles should be properly installed so that they can be easily removed for future service access. Ceiling tiles should be of a lightweight material for easy removal; metal or stainless steel tiles are too heavy and cumbersome for regular maintenance and are at times fitted too tightly for easy removal.

Wall Coverings

Damaged walls can expose structural voids for pests to infest. Kitchen wall coverings should be installed in all kitchen areas to prevent damage. These coverings should be properly installed and free of swells or bulges. Coverings should be seamless when installed with no gaps at the edges, either by overlapping all seams.

IPM recommends a durable shatterproof material, either metal or synthetic, such as FRP (Fire Resistant Panel) or stainless steel. Surfaces can be cleaned by scrubbing and rinsing with water. It may be necessary to use a waterproof caulk or sealant at all seams and edges to assure that water does not accumulate between the covering and the wall.

A textured floor epoxy (or similar product) may be applied from the floor to six (6) to twelve (12) inches up the wall to completely waterproof the joint between wall and floor.

Food Storage Areas

Food storage areas should be properly sealed to prevent pest infestations. Doors should include door sweeps at minimum and should seal completely when closed. Ideally, the space should be designed to accommodate an eighteen (18) inch clearance between the walls and shelves.
**MECHANICAL** – Suggestions for specific mechanical and utility systems

**Issue:** Mechanical chases allow pests to migrate through buildings if improperly sealed. Improperly installed mechanical systems gather debris and house pests. Drainage systems may provide indoor access and harborage for pests. Exposed mechanical systems provide harborage for pests. Humidity attracts pests if improperly controlled.

**RELATED SECTIONS**
- 07285 – Electric Power Transmissions
- 15575 - Breechings, Chimneys, Stacks & Flues
- 15850 - Air Handling
- 02695 - Steam Distribution Systems
- 15521 - Steam & Condensate Piping Specialties
- 15430 - Plumbing Specialties
- 15440 - Plumbing Fixtures
- 15450 - Plumbing Equipment
- 15410 - Plumbing Piping
- 15555 - Boilers
- 02665 - Water Systems
- 02722 - Drainage Structures & Piping
- 02667 - Chilled Water Systems
- 15300 - Fire Protection
- 02685 - Gas Distribution Systems
- 02300 - Utility Tunnels
- 07900 - Joint Sealers

**Electrical & Wiring**

All conduit pipes must be properly sealed where they penetrate walls, floors, ceilings, or chases. Pipes should be suspended overhead or run through mechanical chases.

* IPM prefers electrical lines and wiring do not lie along floors. Ideally, lines/conduit run to stationary equipment should protrude from walls and ceilings and never out of the floor. This is particularly important in food service areas.

**Plumbing & Radiant Heating**

All pipes should be sealed (pipe collars, escutcheon, sealant, etc.) where they penetrate walls, floors, ceilings, or chases. Pipes should be suspended overhead or run through mechanical chases. Heated (steam or otherwise) or sweating pipes should be insulated on all exposed sections because humidity draws pests and hot pipes create a safety risk for service technicians. Pipes and drains will be properly sealed and without leaks. Radiators are properly sealed and installed with reasonable clearance from the wall and floor.

* IPM prefers pipes do not lie along floors. Ideally, lines should protrude from walls and ceilings and not out of the floor.
HVAC Systems

All air ducts must be properly sealed where they penetrate walls, floors, ceilings, or chases. Ideally, lines to equipment should protrude from walls and ceilings and not out of the floor. All ducts in the system should be properly sealed and all registers and vents properly installed.

Floor Drain Covers

To prevent pests from entering through the drain system a crosshatch rather than slotted design cover will be used over drain openings. The maximum size of the openings on the cover should not exceed one quarter (¼) inch; openings may be round or square. If the design or operation requires a larger opening, the cover will have to be approved by the campus IPM Coordinator prior to installation.

Exposed Mechanical Systems

Exposed mechanical systems include equipment and fixtures on the outside of buildings, and those on the inside of the building with immediate access to the exterior. This includes air handlers, ducts, pipes, vents, and other mechanical materials. Exposed mechanical systems must be modified to prevent pest infestations. Screening over vents and pipes can prevent many infestations. Rooftop equipment should be sealed completely where it meets the structure, and may have bird net installed above it to exclude the entire area.

Mechanical Rooms

Mechanical rooms often connect directly to the exterior via exhaust or ventilation, and to the rest of the building via mechanical lines and chases. These rooms must be properly sealed around every mechanical line that penetrates the wall, ceiling, or floor. Exhaust and ventilation outlets must be installed with screened caps and roof jacks. Steam tunnel access doors or hatches should be well sealed using appropriate methods.

Humidity Control

Humidity sources will attract conventional pests (roaches, silverfish, rodents) and unconventional pests (mildew, mold, bacteria) if left uncontrolled. Specifically, steam tunnels adjacent to buildings attract pests that may find their way into the building. Contractors should install dehumidifiers in tunnel sections adjacent to buildings. Also, cracks and voids in tunnels should be sealed to reduce humidity and pests.
**LANDSCAPE** – Considerations for landscape projects connected with new buildings

**Issue:** Landscapes around buildings may attract pests and lead to indoor infestation. Landscapes without access for future maintenance serve as pest habitats.

**RELATED SECTIONS**
02810 - Irrigation Systems
02900 – Landscaping, General
02711 - Foundation Drainage

**Building Perimeter**

Landscape next to buildings should have a barrier to prevent pests. This can be rock or a true hardscape like concrete or pavement. Mulch is not an acceptable material for this application. Crusher fins also tend to wash out and are not preferred. Barriers should extend three (3) feet away from buildings in order to prevent rodents from digging burrows next to buildings. For rock barriers the diameter of rock is one (1) inch or larger and at least a two (2) inch depth all around. Contractors will consult the campus landscape architect for approval of barrier material.

Trees and shrubs should planted beyond the stone barrier or a minimum of six (6) feet away from the foundation (depending on species and mature size). The landscape must move water away from the building. High-water flora should not be placed near building perimeters.

* Low water landscapes may attract fewer pests due to lower residual moisture. Contractors are encouraged to consider low water landscapes for building perimeters.

Please reference the related sections noted above for additional landscape pest control considerations.

###