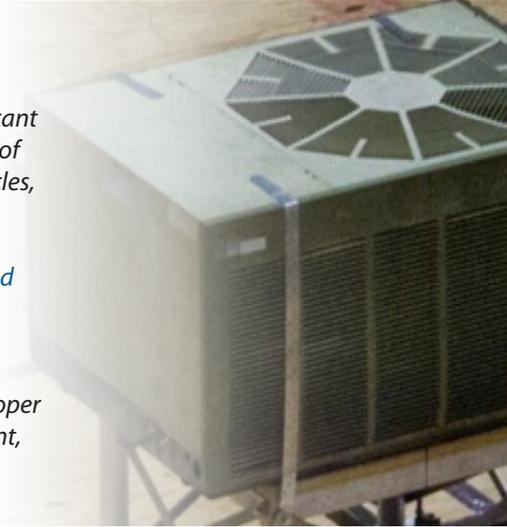




Benefits of Properly Maintaining Roof-Mounted Equipment

Roof damage is a major source of property loss each year when buildings are subjected to high winds, wind-driven rain, hail, ice and snow, and wildfires. A compromised roof can lead to significant damage to internal fixtures, furniture and equipment. What's more, rooftop equipment or pieces of the roof itself can take flight during a windstorm and cause damage to the building, nearby vehicles, or even neighboring property. Proper attention to all aspects of a roof can make the difference between minimal damage and catastrophic failure during high winds. To help business owners tackle roof issues, IBHS has produced a [series of short papers on the installation, maintenance and repair of commercial roofs](#).

The focus here is on roof-mounted equipment, such as HVAC, photovoltaic systems, exhaust fans, and other mechanical units, all of which are common features on many commercial rooftops. Proper maintenance of this equipment leads to long-term savings by prolonging the life of the equipment, lowering utility bills and affording greater protection in a storm.



ENERGY EFFICIENCY

Proper ventilation of roof-mounted air conditioners and air makeup units means greater energy efficiency, which leads to lower electric bills, a smaller carbon footprint and a more comfortable indoor climate for the building's occupants. Clogged and soiled air filters can reduce air flow and affect the unit's heating and cooling abilities. Poor ventilation also requires the unit to run for longer intervals, causing greater wear and tear on the motors and leading to a shorter operating lifetime.

STEPS BUSINESS OWNERS CAN TAKE:

- ✓ Replace the air filter in accordance with the manufacturer's guidelines. This is an easy and cost-effective way to help maintain a ventilation system's efficiency.

KEEPING PARTS IN GOOD WORKING ORDER

Motors, bearings and belts should be well maintained in accordance with the manufacturer's maintenance guidelines to ensure proper operation of rooftop units. This will help prolong the life of the unit and prevent breakdowns, which can have cascading effects on many aspects of business operations.

STEPS BUSINESS OWNERS CAN TAKE:

- ✓ Keep motor and fan bearings well lubricated.
- ✓ Ensure that rubber belts have the proper tension. Belts that slip will emit a high pitched whining sound similar to an automobile's belt slipping.
- ✓ Watch for signs that rubber belts have become brittle and cracked. Remember, belts have a limited lifespan and should be inspected and replaced when directed by the manufacturer or upon signs of deterioration.

THE IMPORTANCE OF BALANCE

Fans, as shown in the split-system AC units pictured here, are an integral part of all air conditioning systems. Fan blades operate most effectively when they are well balanced. When the blades are unbalanced, the unit will vibrate and this may cause screws and other parts to loosen. An unbalanced fan reduces efficiency and compromises the unit's secure attachment.



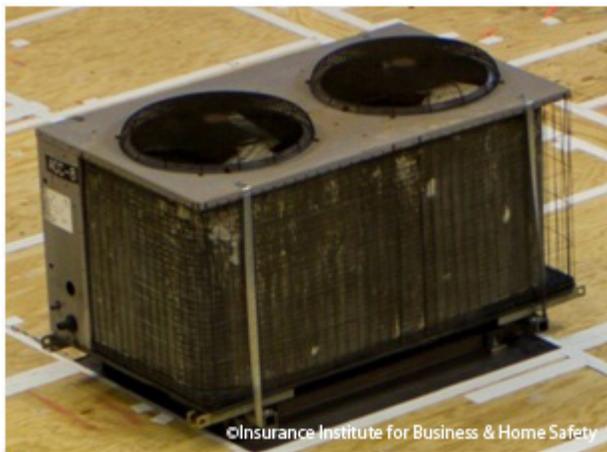
Secure AC units like those shown above in order to reduce the risk of damage to the equipment during high winds.

STEPS BUSINESS OWNERS CAN TAKE:

- ✓ The greater the imbalance, the greater the vibration. This vibration may become obvious on smaller sized units but should be part of regular inspections.
- ✓ When a roof top unit begins to vibrate and shake, contact a reliable contractor to correct problems that may cause the fans to be unbalanced.

EXTERIOR MAINTENANCE AND SECURE ATTACHMENT

Because rooftop equipment is exposed to all weather elements, it is vital to maintain the unit's exterior and make sure it is securely attached. Corrosion and deterioration, as shown below, are the most common problems and can allow panels or other parts to become airborne in the event of high winds.



The AC unit above shows wear from corrosion and deterioration, which can cause parts of the unit to become airborne during high winds.

STEPS BUSINESS OWNERS CAN TAKE:

- ✓ Inspect for rusted metal panels, screws and metal flashing on curbs, and replace as soon as possible.
- ✓ Inspect around the unit's connection to the curb it sits on. Check for any visible signs of potential leaks; these can be repaired using various roof sealants and caulks that are readily available.
- ✓ If it is suspected that a water leak has occurred, the curbing itself should be inspected for rotting and replaced if needed.

CHECK AND RECHECK

While a local contractor or maintenance worker can perform most of the inspections and repairs that are necessary to keep rooftop equipment in good working order, it is important to inspect the equipment after the work is done to make sure all screws, cables, and cable straps are tightened and back in place. Failure to correctly reinstall screws and cables can compromise the unit's overall structural integrity and leave it vulnerable to potential damage during a windstorm. For example, the panels can tear away and skip across the roof cover. This creates water leaks and, in some cases, causes the roof cover to fail.



Regular inspection of commercial rooftop equipment, as shown above, is critical in preventing significant damage during severe weather.

STEPS BUSINESS OWNERS CAN TAKE:

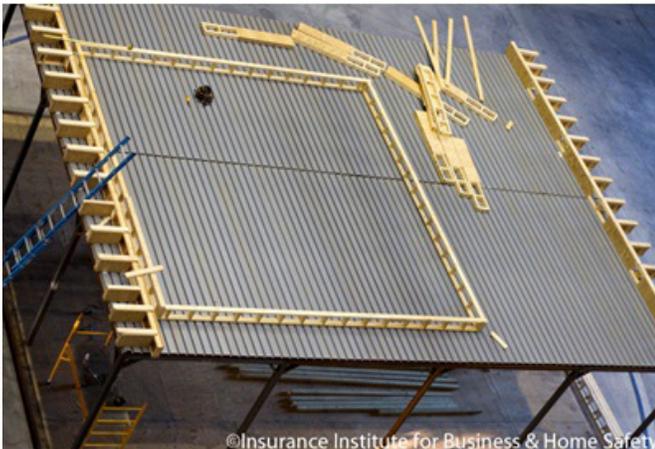
- ✓ Remind the contractor that you will not consider the job done until all parts of the unit are back in place and properly secured and all debris is removed.
- ✓ At the conclusion of rooftop equipment repair, have maintenance staff inspect the unit to make sure that screws, cables and cable straps are tightened and reconnected.
- ✓ Check the roof for miscellaneous debris, as well as tools that may have been left behind. Anything that is not firmly attached to the roof can become windborne debris in the event of a storm.

IBHS RESEARCH

Commercial roofs and rooftop equipment are a top priority for the research agenda at the IBHS Research Center in Chester County, South Carolina. Testing at the lab has included rooftop equipment, with a specific focus on wind load specifications and future prescriptive guidelines for anchorage. Additionally, IBHS plans to test photovoltaic equipment on both commercial and residential roofs to make sure that the goal of “going green” is consistent with “staying strong.”



The picture above shows some of the tools that allow IBHS to measure various loads on AC units during tests.



Construction of the commercial building used during tests on rooftop equipment at the IBHS Research Center.



AC units in the above picture were used during recent tests, which included a specific focus on wind load specifications and future prescriptive guidelines for anchorage.

The overall approach of the research continues to be the use of actual rooftop equipment and objects that represent typical shapes of rooftop equipment. This includes mounting the equipment on force balances that allow IBHS to measure various loads on the units. The results of these tests will be used to:

- Compare current results to those from model scale wind tunnel tests
- Compare the results to current code provisions
- Evaluate anchorage requirements, based on results
- Make recommendations for future codification, as appropriate

While this research holds promise for improving future designs and installation techniques, there still is no substitute for the preventive maintenance and proper care of roof-mounted equipment. Following the essential steps outlined above can reduce utility costs, enhance longevity, help reduce expensive repairs, and prevent serious damage to your business and your bottom line.

For additional information about maintaining commercial properties, visit disastersafety.org/commercial_maintenance.

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IBHS is a non-profit applied research and communications organization dedicated to reducing property losses due to natural and man-made disasters by building stronger, more resilient communities.

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