



Improving Operations and Maintenance

Effective operations and maintenance (O&M) practices are among the most impactful tools for improving building performance; reducing operating risks, costs and disruptions; and preserving long-term value. These practices and improvements can deliver meaningful savings without major equipment replacements.

This guide focuses on steps that building owners and managers can take to improve O&M in ways that are achievable, affordable, and aligned with requirements that can assist with Energize Denver compliance.

THINGS TO KEEP IN MIND

This guide is designed to help building owners and operators take a structured, manageable approach to improving operations.

- Not every action applies to every building.
- You do not need to take every one of these steps at once.
- Many improvements are low-cost or no-cost.

Start with the sections most relevant to your building and focus on steady progress over time. Improving operations early can help reduce the scale and cost of future upgrades while putting compliance within reach.

Building a Culture of Efficient Operations

Technology and software are important, but long-term success depends on people and processes. Buildings that consistently reduce energy use tend to share a common trait: a culture that prioritizes efficient operations.



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An effective operations culture includes:

- Clear responsibility for building performance
- Routine monitoring of systems
- Consistent maintenance practices
- Communication between owners, operators, and service providers

When efficiency is built into everyday decision-making, buildings are more resilient, experience fewer emergencies, and face fewer compliance challenges over time.

Operations and Maintenance Platforms

Many buildings use computerized maintenance management systems (CMMS) to support operations. These platforms help track equipment, schedule maintenance, and identify issues before they become costly problems.

Modern CMMS tools can:

- Track maintenance history and schedules
- Identify recurring issues
- Flag equipment operating outside expected ranges
- Support data-driven maintenance decisions

Some buildings also receive structured equipment data through construction handoff processes, such as Construction-Operations Building Information Exchange (“COBie”) -formatted information. While these tools can be helpful, they are most effective when paired with clear O&M priorities and consistent follow-through.

Choosing the Right Maintenance Approach

Most buildings use a mix of maintenance strategies. Understanding the differences can help owners and operators choose the right balance.

- **Predictive maintenance** uses data and condition monitoring to identify early signs of deterioration. This approach can reduce unexpected failures and extend equipment life, particularly for large or critical systems.
- **Preventive maintenance** follows scheduled inspections and servicing. It is often the most cost-effective strategy for energy-intensive systems such as heating and cooling equipment, air handling and ventilation systems, pumps and distribution systems, and domestic hot water equipment.
- **Reactive maintenance** addresses issues after equipment fails. While it may reduce short-term labor costs, it often leads to higher repair expenses, unexpected downtime, and shorter equipment life.

For most buildings, a combination of preventive and predictive maintenance offers the best balance between cost, reliability, and performance.



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Looking at the Whole Building

Improving operations is most effective when the building is viewed as an integrated system. Key areas to consider include:

- Structure
- Envelope
- Mechanical systems
- Interior systems and controls

Addressing operational issues in one area often improves performance across others.

The Role of the Building Envelope

The building envelope — including walls, windows, roofs, and foundations — plays a major role in energy performance. Air leaks, poor insulation, or deteriorating seals can undermine even the most efficient mechanical systems.

Operational considerations for the envelope include:

- Monitoring for air leakage
- Maintaining window and door seals
- Addressing moisture and insulation issues early

Improving envelope performance first can reduce the size and cost of future mechanical upgrades and protect existing equipment investments.

IMPROVING PERFORMANCE OF MAJOR BUILDING SYSTEMS

Boilers

Boilers are central to many heating systems and benefit significantly from consistent operations and maintenance.

Operational best practices include:

- Keeping boiler rooms clean and unobstructed
- Ensuring operators are properly trained
- Maintaining clear startup and shutdown procedures
- Using maintenance logs to track performance and issues
- Conducting regular inspections after repairs or modifications

Routine fireside and waterside maintenance are one of the lowest-cost ways to improve boiler efficiency and reliability.



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Steam Traps

Poorly functioning steam traps can lead to significant energy losses.

Effective steam trap management includes:

- Annual testing at a minimum
- Mapping and labeling trap locations
- Prioritizing timely repair of failed traps
- Training staff on proper testing methods
- Ensuring traps are properly sized and vented

Regular inspection programs can significantly reduce steam losses and maintenance costs.

Chillers

Chillers are among the most energy-intensive systems in large buildings.

Operational strategies that improve efficiency include:

- Raising chilled water temperatures where feasible
- Reducing condenser water temperatures
- Maintaining clean heat transfer surfaces
- Ensuring proper water flow
- Minimizing auxiliary equipment energy use

Operating chillers near their optimal efficiency range and managing loads across multiple units can deliver substantial savings.

Cooling Towers

Cooling towers present both energy and water efficiency opportunities.

Operational priorities include:

- Maintaining safe access and worker protections
- Ensuring even water distribution
- Monitoring cycles of concentration
- Using conductivity controls for blowdown
- Tracking makeup and blowdown water usage

Increasing cycles of concentration can significantly reduce water use and operating costs when managed correctly.

Air Handling Systems

Air handling systems move and condition air throughout a building. Small operational issues can have large energy impacts.



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Key practices include:

- Changing filters based on pressure drop or condition
- Cleaning heating and cooling coils regularly
- Ensuring dampers operate correctly and seal properly
- Avoiding manual overrides that defeat control strategies

Regular inspection helps maintain comfort while avoiding wasted energy.

Fans

Fans often operate continuously and can quietly drive energy use.

Efficiency-focused practices include:

- Maintaining clean blades and inlets
- Reducing unnecessary fan speed
- Using variable speed drives where appropriate
- Eliminating duct leaks
- Turning fans off when not needed

Even small adjustments can lead to meaningful savings over time.

Pumps

Pumps support many building systems and directly affect overall efficiency.

Common efficiency issues include:

- Oversized or throttled pumps
- Cavitation or excessive noise
- Bypassed flow
- Mismatched operating conditions

Regular assessment of pump sizing, control strategies, and operating conditions can improve performance and extend equipment life.

Lighting Systems

Lighting upgrades are often among the most cost-effective improvements available.

Operational best practices include:

- Routine cleaning and inspection
- Group re-lamping strategies



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- Regular calibration of lighting controls
- Periodic evaluation of new lighting technologies

Well-maintained lighting systems reduce energy use while maintaining occupant satisfaction.

Controls and Sensors

Controls play a central role in how efficiently systems operate, and are most effective when they are actively managed rather than set and forgotten.

Effective control strategies include:

- Ensuring sensors are calibrated and functioning
- Reviewing control sequences periodically
- Avoiding unnecessary overrides
- Using trend data to identify inefficiencies

PRACTICAL OPERATIONS & MAINTENANCE CHECKLIST

This checklist is designed to help building owners and managers take steps towards reducing energy use through operations and maintenance. You do not need to complete every item at once. Focus on steady progress and prioritize actions that make sense for your building.

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GETTING STARTED: PLANNING & BASELINE

That shows how the building will reduce energy use in common areas over time. The plan should include:

- Confirm annual benchmarking is complete and accurate
- Review recent energy use trends for unexpected increases
- Identify major energy-using systems in the building
- Assign clear responsibility for monitoring building performance
- Establish or update an operations and maintenance schedule

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BUILDING A CULTURE OF EFFICIENT OPERATIONS

- Ensure operations staff understand energy efficiency goals
- Document standard operating procedures for major systems
 - Maintain clear communication between owners, operators, and contractors
 - Track recurring maintenance issues and system inefficiencies
 - o Review operational practices annually and adjust as needed



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MAINTENANCE STRATEGY

- Identify which systems are maintained reactively, preventively, or predictively
 - Shift high-energy systems toward preventive maintenance where feasible
 - o Use condition-based or predictive monitoring for critical equipment
- Maintain up-to-date maintenance logs and records

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OPERATIONS & MAINTENANCE SYSTEMS (CMMS)

- Use a CMMS or maintenance tracking system
- Ensure all major equipment is logged and documented
 - Track maintenance schedules and completed work
- Review system alerts or trends regularly
- Use maintenance data to inform operational decisions

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WHOLE-BUILDING REVIEW

- Evaluate how building systems interact with one another
 - Identify operational issues affecting multiple systems
 - Prioritize improvements with the greatest impact on energy use
 - Address envelope issues before major mechanical upgrades

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BUILDING ENVELOPE

- Inspect windows, doors, and seals for air leakage
 - Address visible insulation gaps or deterioration
 - o Monitor moisture or condensation issues
 - o Coordinate envelope maintenance with HVAC operations



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HEATING SYSTEMS

- Keep boiler and mechanical rooms clean and unobstructed
- Confirm operators are trained on startup and shutdown procedures
- Maintain clear operating and maintenance logs
 - Schedule routine inspections and tune-ups
 - Address fireside and waterside maintenance needs

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STEAM SYSTEMS

- Maintain an inventory and map of steam traps
 - Test steam traps at least annually
 - Prioritize repair of failed traps
 - o Ensure staff are trained on proper testing methods
 - o Verify proper venting and trap sizing

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COOLING SYSTEMS

- Ensure adequate water flow through the system
 - Review chilled water temperature setpoints
 - Review condenser water temperature controls
 - Inspect and clean heat exchange surfaces
 - o Review load management across multiple chillers

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COOLING TOWERS

- Maintain safe access and fall protection
- Remove debris and inspect components during startup
 - Monitor cycles of concentration
 - Track makeup and blowdown water usage
 - Review conductivity controls and setpoints
 - o Coordinate with water treatment providers



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AIR HANDLING SYSTEMS

- Replace filters based on condition or pressure drop
 - Clean heating and cooling coils regularly
 - Inspect dampers for proper operation and sealing
 - Eliminate unnecessary manual overrides
- Confirm sensors are functioning correctly

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FANS

- Clean fan blades, inlets, and screens
- Inspect belts and alignments
 - Reduce fan speed where possible
 - o Use variable speed drives for variable loads
- Turn off fans when not needed
 - Inspect ductwork for leaks or obstructions

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PUMPS

- Listen for noise or vibration issues
 - Identify oversized or throttled pumps
 - Check for bypassed flow
 - o Review pump sizing and control strategies
- Schedule maintenance based on operating conditions

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LIGHTING SYSTEMS

- Replace outdated lamps with high-efficiency options
- Clean fixtures and luminaires regularly to maintain light output
- Inspect and recalibrate lighting controls
- Implement group re-lamping where appropriate to maintain consistent performance
- Review broader lighting upgrade opportunities, including fixture replacement or advanced controls



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CONTROLS & SENSORS

- Confirm sensors are calibrated and fully operational
- Minimize unnecessary overrides that increase energy use
 - Review control sequences periodically to ensure systems are operating as intended
 - Use trend data to identify inefficiencies and operational drift
 - o Coordinate control strategies across systems to improve whole-building performance

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ONGOING REVIEW & CONTINUOUS IMPROVEMENT

- Review energy performance annually using benchmarking results
- Adjust day-to-day operations based on performance data
 - Update maintenance priorities as systems age or building uses change
 - Plan improvements early to avoid last-minute compliance challenges
 - o Reach out for technical assistance or explore additional support programs when needed

ENERGIZE DENVER HELP DESK

Need more information on energy audits or additional guidance from our team?
Reach out to our help desk:



Hours

8 AM-5 PM, M-F



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