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DEPARTMENT OF ADMINISTRATION AND FINANCIAL SERVICES
BUREAU OF GENERAL SERVICES

ENERGY EFFICIENCY REPORT

JANUARY 31, 2003

OVERVIEW

The department's overall approach to energy efficiency is as follows:

- Sell or demolish old, inefficient buildings that have no value.
- Renovate those buildings that have value and construct new buildings where necessary, all using energy efficient materials and systems.
- Improve the efficiency of leased space.
- Fix the State's steam pipes and water lines.
- Recycle.
- Purchase energy efficient equipment and vehicles.
- Make maximum use of the State's teleconferencing capacity.
- Burn cleaner, more efficient fuels to heat our buildings.

RENOVATION AND NEW CONSTRUCTION 1999-Present Completed/In Progress

Renovation	12 Buildings	525,000 Square Feet	$59 Million
New Construction	9 Buildings	819,000 Square Feet	$181 Million

During the design process, architects and engineers are required to submit ranges of energy efficiency measures to BGS, with associated cost estimates, to allow the Bureau to assess the measures that each project can afford. Building envelopes are designed to maximize insulation and energy saving windows and doors. Mechanical systems are automatically controlled to regulate heating and cooling on the basis of demand. High efficiency boilers and motors are installed. Lighting fixtures have high efficiency ballasts and lamps and are regulated by motion sensors.

SCHOOLS 1999 - Present

24 Projects	1,539,000 Square Feet	$225,450,000

Schools are designed in compliance with ASHRAE 90.1 standards. BGS is working with the Department of Education, the PUC and the Maine School Management Association to determine the areas where these minimum design standards may be raised.

GEOTHERMAL PILOT

The geothermal system at the new Gorham Middle School is comprised of 112 wells, each 356 feet deep. The system will heat and air-condition the entire 140,000 sq. ft. building. A separate package of information about this geothermal system has been supplied in response to Rep. Goodwin's request on January 30th.

DEMOLITION/DISPOSAL

60+ Buildings 750,000 Square Feet

Of the 60 + buildings that have been demolished or sold approximately half, representing almost half the total square footage, has been, or will be, renovated by the private sector using energy efficient systems and materials. The Pineland Campus is an excellent example of this productive, energy efficient reuse.

INFRASTRUCTURE REPAIRS 1999-Present Completed/In Progress

The State's water and steam pipes are leaking and wasting energy. Major projects have recently been completed or are underway to remedy the problem in part.

Water	$2,500,000	- A major project is underway to fix the water system on the East Campus.
Steam Pipes	$300,000	- Steam pipe repairs at the Cultural Building will save an estimated $25,000 per year in water and oil usage.

METRICS

The State has made significant progress in developing its capacity to measure energy use. On a going forward basis the Power Logic system is the most important advance in this regard. This system will continuously monitor electricity use by building on the east and west campuses. Among other things, it will allow BGS to pinpoint energy consumption issues and document the effectiveness of energy saving modifications. The Department is also developing before and after numbers relating to major construction/renovation projects. For example, oil consumption in the Cross Building (which also heats the State House and the Cultural Building) has declined by 31,000 gallons or 12% since the renovation. Conversely, electricity use in the Cross Building has increased by nearly

30% in July and August and decreased by an average of approximately 13% during the non-cooling months. This is due to the installation of air-conditioning which serves both the Cross Building and the State House. Finally, the Department will be developing a system to measure energy use on a per square foot basis to facilitate comparisons and a system of benchmarks to use for comparison purposes.

PURCHASES

The Division of Purchases requires that all new copiers, appliances and office equipment have an Energy Star label. Personal computers and peripherals (printers, scanners, etc.) are purchased only from value added resellers who provide Energy Star products to state agencies.

VEHICLES

All motor vehicles purchased for use in state government are acquired through the Division of Purchases. Three major fleet groups exist, Central Fleet Management (CFM) (covering most state agency needs), Department of Transportation and Public Safety. All orders are reviewed for compliance or exception to statutory fuel efficiency requirements and approved by the Director. The current statutory standard of 45 miles per gallon for cars and 35 miles per gallon for light trucks is very difficult to meet. The current standard for trucks can only be met in model year 2002 by a two-wheel drive Ford Ranger powered by electricity. The passenger car fleet has a few more choices:

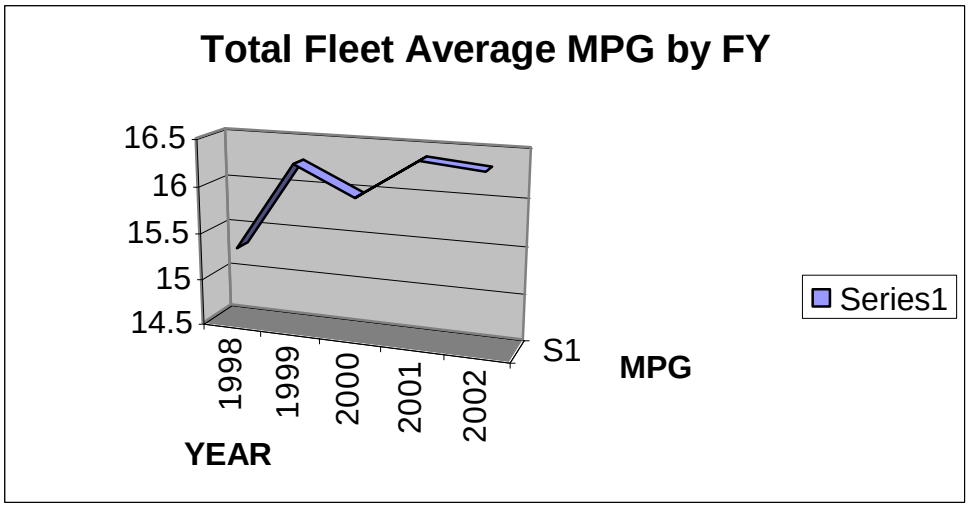
- Toyota Prius, compact, hybrid
- Honda Insight, subcompact 2 seater, hybrid
- VW Beetle, subcompact, diesel, manual transmission
- VW Jetta, compact, diesel
- VW Jetta Wagon, compact, diesel

Maine State Government has been aggressive in its efforts to acquire fuel efficient vehicles. CFM partnered with DEP to acquire converted propane vehicles in the mid 1990's and continues to explore bi fuel, propane and compressed natural gas options. CFM and DEP sponsored the first public access propane vehicle fueling station in Maine. CFM was able to purchase the first Honda Insight (hybrid technology two seater) issued to a government agency in the United States (February of 2000). Subsequently, Maine was able to acquire a Toyota Prius, the first four-passenger hybrid available in America.

Maine continues to expand its fleet of hybrid automobiles to a current number of 12. Agencies have been receptive to these vehicles, although the higher cost of acquisition is not offset by the higher fuel mileage.

All three fleets are managing for fuel economy and efficient operations. Low Emission Vehicles are specified for new passenger/light truck vehicles and in some cases the high Ultra Low Emission standards are required.

CFM operates the largest fleet of passenger and light truck type vehicles. The overall fleet mileage is captured annually and improvements tracked. CFM's fleet includes large postal vehicles, ¾ ton pickups with plows, multipurpose vans, large passenger vans, utility trucks, security vehicles to move clients/prisoners, as well as the more standard passenger vehicles.



The actual current miles per gallon for 4 door compact sedans purchased in 2001 and 2002 averages 34.26 per gallon. This is an improvement of over 4 ½ miles per gallon over year 2000 and prior models.

RECYCLING

Percent of paper products having recycled content meeting EPA guidelines.

1994	32.5%
1996	56%
1998	73%
2000	76%

WASTE RECYCLING	(Fiscal Year 2001)	(Fiscal Year 2002)
Recycled Loose News Paper -	43.15 Tons	9.18 Tons
Recycled Loose Mixed Paper -	41.16 Tons	31.81 Tons
Recycled Loose Cardboard -	14.42 Tons	69.65 Tons
Recycled Loose Office Waste -	98 Tons	98.56 Tons
Total Recycled Waste Paper	196.73 Tons	209.2 Tons

NATURAL GAS/DISTRIBUTED GENERATION TECHNOLOGY

DAFS is negotiating with Maine Natural Gas to bring natural gas to Augusta. This would facilitate the conversion of the main boiler on the East Campus from #6 fuel oil to natural gas and permit the exploration of distributed generation technology at the new Psychiatric Treatment Center. In anticipation of the availability of natural gas major buildings will have dual fuel capacity.

VIDEO TELECONFERENCING

Maine now has more than 200 video conferencing sites in virtually every corner of the state. Although many state agencies are making use of this technology, there is unused capacity. The use of teleconferencing can result in significant cost savings, increased productivity, and decreased use of energy. The Governor has directed agencies to make teleconferencing the norm. And a Web site has been established to facilitate the scheduling of teleconferences.

SECTION 1770 ENERGY SAVINGS PILOT PROGRAM

5MRSA Section 1770 requires that the state reduce its energy consumption by 25% by 2010. It must be noted that as the department replaces old office or program space with renovated space or new construction it is generally being air-conditioned for the first time. The Cross Building is an example. While the building is vastly more energy efficient than it was before the renovation, it is consuming more electricity.

The Bureau of General Services has qualified three energy service companies to develop and carry out energy efficiency improvements on State buildings. Combined Energies is currently developing a proposal for the Greenlaw Building on the East Campus. This project will assist in evaluating the effectiveness of this delivery system.

The PUC has approved a $725,000 project through its electricity conservation program to make energy efficiency improvements to the DHS Building on State Street in Augusta. An additional $775,000 is available for state buildings pending the identification of additional projects.

REPORT ON 9 ITEMS AGREED TO IN 2002

1. Status of ESCO pilot projects:

In accordance with 5 MRSA Section 1770 (5), BGS has conducted multiple meetings with Combined Energies of Augusta, to develop and define the first phase of the pilot program. Combined Energies is now conducting a survey of four buildings on the East Campus to determine energy savings opportunities. They will be inspecting all building systems including envelope, lighting, mechanical systems, insulation, etc.
Once a scope has been determined and the financial feasibility confirmed, a performance based contract will be negotiated to design the project and to do the work.

2. Number and description of ESCO's that responded to RFP's:

A request for proposals was advertised in the Kennebec Journal, the Lewiston Sun Journal, the Bangor Daily News, and the Portland Press Herald during the two week period beginning June 9th, 2002. Seven firms responded to the advertisement:

1. Combined Energies - Augusta, ME
2. Noresco - Westborough, MA
3. Honeywell Energy Services - Westbrook, ME
4. Ameresco, Inc. - Portland, ME
5. Select Energy Services - Natick, MA
6. Shooshanian Engineering - Boston, MA
7. Investment Engineering - Falmouth, ME

The three most qualified companies: Combined Energies, Noresco, and Honeywell were interviewed on 10/3/02. All three companies were pre-qualified to do work for the state.

3. Description of contracts that have been entered into with ESCO's:

No contracts have been executed. When the scope and feasibility referenced in section 1, above, have been confirmed, a contract will be executed.

Combined Energies has submitted a proposal to BGS for consideration for short-term payback energy savings measures for state facilities state wide. The proposal includes measures for reducing electrical power in egress lighting and vending machines.

4. Status of rules:

Rules have not yet been adopted, although general forms have been collected from other states. BGS has entered into a contract with a consultant to assist in the rulemaking effort.

5. State facility energy usage:

A summary of square foot energy costs is attached. It shows costs of: $0.45 for #6 fuel at the East Campus; $0.52 per square foot for #2 fuel at other facilities in Augusta and Hallowell; $0.84 per square foot for electrical service at the East Campus; $1.02 per square foot for electrical service at the Capital Complex (West Campus); $1.33 per square foot for electrical service at the Stevens School, Hallowell; $0.50 per square foot for #2 fuel at the Maine Criminal Justice Academy; and $0.46 for electrical service at the MCJA.

6. Status of construction renovation and construction projects:

Data on completed projects is listed on the first page of this report.

Current ongoing capital projects include the Harlow Building renovations on the East Campus and the Middle School at the Governor Baxter School for the Deaf. Both projects have as their top priorities employee health and safety, and energy conservation. Contracts with architects on both projects specify these as priorities. The Harlow Building will include such energy conservation measures as are consistent with renovation of a mid-1800 historic structure lying within a historic district.

The GBSD Middle School will include innovative energy solutions. Those that are being investigated are: biodiesel fuel; solar power; geothermal and possibly ocean thermal; and wind-generated power.

7. Energy savings from renovation and construction projects:

Cross Office Building data on page 2 of this Report is representative of our experience with renovated buildings. Energy usage will increase when air conditioning is added. We are developing baseline energy usage for all the State's new and renovated facilities and from that baseline we will develop benchmarks against which we will measure our performance and determine how our energy consumption may be reduced.

As to the remaining State facilities, BGS is working with the Public Utilities Commission to review the State property list and eliminate those facilities that either do not consume electricity or other power or energy sources, or that consume negligible amounts. When a list of energy consuming facilities is developed, those facilities will be audited by a consultant procured by BGS. It is our hope that the PUC will fund the energy audit. The audit will be closely coordinated with the PUC.

8. Status of Clean Government Initiative:

The Initiative is to become part of the philosophy of state government and the integration process will be ongoing. The team, in its development of a state environmental plan, focused on major goals it elected to accomplish in this first phase. Four priority areas were identified and are detailed below:

- environmental compliance
- energy efficiency, in terms of both vehicles and buildings
- recycling/recyclability/product substitution/waste management
- chemicals handling/product substitution/waste management

These four areas were selected based on the belief that they provide opportunity for the greatest gains in this first effort. Additionally, DAFS, in its central service role of building construction and management, procurement, waste handling, and other functions, has largely taken responsibility for these areas rather than require agencies to address them individually. The DEP provides technical and other assistance to DAFS and both agencies ensure compliance with the capital master plan.

For each of the priority areas, suggested metrics were developed to assist agencies in choosing a method of measurement through which the most useful and meaningful information could be obtained. The goals, objectives and measurement metrics are available on the State's web site and will be detailed in the Initiatives annual report to be delivered soon to the Legislature.

Again, in recognition of the need for central responsibility for certain priority areas, the team has organized user's groups to address the areas of fleet vehicles and leased space. A fleet vehicles managers group is comprised of representatives of DAFS Central Fleet Management, the Maine Department of Transportation (MDOT), and the Department of Public Safety. This group engages the managers of these fleets in discussion of ways in which to improve vehicle energy efficiency through vehicle selection and management, as well as in ways to better manage the overall state fleet of vehicles.

A leased space users group, composed of several agencies which lease a high volume of space from private entities, has also been formed. Specifically, the group has worked to strengthen and standardize the environmental considerations of the uniform lease agreement to address such areas as recycling, waste disposal, lighting, heating, cooling, and temperature control, and other issues. Customization for additional needs may be necessary. The DAFS Bureau of General Services is now incorporating these requirements in new and renewal leases for space. A copy is appended to this report.

The leadership team welcomes, as well as solicits input from all agencies, periodically evaluates its direction and accomplishments, considers input received from participating agencies and other sources, and identifies opportunities for improvement. The team will benchmark and measure effectiveness at least annually.

SUCCESSES

As required, each agency has appointed an individual who is responsible for incorporation of the Initiative into the operations of the agency. Contact between the leadership team and consultants is frequent.

Further, each agency has developed a biennial plan which outlines the efforts to be undertaken during the period of July 2002 through June of 2004.

A Clean Government Initiative web page to provide information to participating agencies as well as to promote the Initiative to the public has been developed. The site address is www.state.me.us/purchase/Cleangovt.

Former Governor King issued two Executive Orders in support of the Initiative. The first Order instructs state agencies, to the extent possible, to purchase products with no added mercury to reduce the amount of mercury contributed to the waste stream of Maine state government. This advances the goals of legislation enacted last year to require the DEP to develop a comprehensive strategy to reduce mercury emissions from products.

The second Order, consistent with the Global Climate Change Action Plan agreement between New England Governors and Eastern Canadian Premiers, instructs each agency to examine fleet vehicles to assess efficiency and emissions. Further, when replacing vehicles, fuel efficiency and emission guidelines must be met to the extent that resources allow.

DAFS and DEP have also created a battery recycling program for both rechargeable batteries and alkaline batteries and small electronic devices such as calculators. These prepaid collection and mailing boxes are available to all agencies through the central supply warehouse.

9. Status of geothermal pilot school construction project:

The Gorham Middle School Geothermal System is a Closed Loop bore field system. It uses ground heat as a heat sink to transfer energy. The system status is as follows:

a. The building is 52% complete and is expected to be 100% complete in September 2003.
b. The Wells for the Bore Field are 100% complete. There are 116 wells, each 354 feet deep. They are grouted solid with a grout system to induce the heat transfer to the surrounding rock.
c. All of the piping has been installed, about 10 miles of plastic high strength pipe.
d. The system should be operational in September, when we will know more about the system start-up.
e. We expect to monitor the system performance for the first 2 years rather intensely.
f. The construction contract was awarded to LaFrame Bois Well drilling of New Jersey in the amount of $593,352.00.

The Project Manual for this project and the Life Cycle Analysis are included in our responses to questions raised on January 30, 2003.

January 31, 2003
#6 FUEL AMHI

Gals	Cost	Sq Ft Cost
523,117	$284,660.00	$.45

#2 FUEL (Complex other than AMHI)

Gals	Cost	Sq Ft Cost
622,628	$564,599.00	$.52

ELECTRICAL (AMHI) East Campus

Cost	Sq Ft Cost
$533,209.00	$.84

ELECTRICAL (West Campus)

Cost	Sq Ft Cost
$1,114,765.00	$1.02

ELECTRICAL (Hallowell)

Cost	Sq Ft Cost
$124,894.00	$1.33

Total complex square footage 1,880,154
AMHI square footage 631,333
MCJA 165,089
Hallowell 93,771

- **ELECTRICAL (Highway Fund)**

Cost	Sq Ft
$222.503.00	$1.38

MAINE CRIMINAL JUSTICE ACADEMY

#2 FUEL	COST	SQ FT
	$83,012.00	$.50

ELECTRICAL

	Cost	Sq Ft
	$76,760.00	$.46

PROPANE (ALL CAMPUSES)

	Cost
	$17,913.00

Total complex square footage 1,880,154
AMHI square footage 631,333
MCJA 165,089
Hallowell 93,771

- Bureau of Motor Vehicle
- State Crime Lab
- Chief Medical Examiners
- State Police Headquarters
- State Police Garage

Total SF 160,419

Total complex square footage 1,880,154
AMHI square footage 631,333
MCJA 165,089
Hallowell 93,771

January 3, 2003

STATE OF MAINE
Leased Building Energy Efficiency Requirements

Requirements contained herein are drawn primarily from documents published by recognized and established standards organizations, including: the American Society of Heating, Refrigeration and Air-Conditioning Engineers (ASHRAE), The International Code Council (ICC), and the Federal Energy Management Program (FEMP).

1. COMPLIANCE REQUIREMENTS

1.1 A building or complex of buildings complies with this standard if the requirements of 1.1.2 and 1.1.3 have been met and recorded on Form A.

1.2 A person or persons determining compliance shall state in writing that the operating and maintenance requirements of Section 2 have been met.

1.3 A person or persons determining compliance shall state in writing that the building and equipment modification requirements of Sections 3, 4 and 5 have been met.

Exception: No individual requirement need be met that would compromise the historical integrity of a building or part of a building designated by a governmental body in a manner indicating the value of long-term preservation in its existing state (such as historical monuments, buildings, etc.). If an individual requirement does not affect the historical integrity of said building(s), the requirement shall be adhered to.

2. OPERATION AND MAINTENANCE

This section establishes requirements for the operation and maintenance of existing buildings.

2.1 INFORMATION AND FEEDBACK

2.1.1 The person who controls the energy used by a building shall maintain easily accessible records of the energy used by that building for at least the past two years or since occupancy, if the building is less than two years old.

2.1.2 All equipment shall be maintained according to its manufacturer's instructions.

2.1.3 A log of events shall be kept and maintained that includes such items as: replacement of equipment, major repairs, damage by wind or flood or fire, and building modifications.

2.1.4 The fluid content and direction of flow shall be clearly marked on all visible pumps and pipes.

2.2 BUILDING ENVELOPE

2.2.1 Exterior Joints: Exterior joints around windows and door frames, between wall and foundation, between wall and roof, between wall panels, at penetrations of utility services through walls, floors and roofs, and all other openings in the building envelopes shall be caulked, gasketed, weather-stripped, or otherwise sealed. Obsolete dumbwaiter shafts, chimneys, and other air chases shall be capped and caulked or otherwise sealed.

2.3 HEATING, VENTILATING, AND AIR-CONDITIONING SYSTEMS

2.3.1 Temperature Setbacks. When the building is not occupied during heating season, the interior temperature is to be setback to not greater than 60 deg. F.

Exception: A building is exempted from such setback of temperature if the capacity of the heating system is not sufficient to cause recovery to comfortable temperatures in time for occupancy. In such cases, a minimum setback is to be determined by observation.

2.3.2 Air Conditioning Shutdown. When the building is not occupied during cooling season, any central air conditioning systems or individual window units are to be shut down.

2.3.3Ventilation Systems

2.3.3.1 Ventilation System Operation. When the building is not occupied, outdoor air supply and interior exhaust fans are to be shut down or reduced to a minimum acceptable rate.

Exceptions:

1. Systems serving areas designed for continuous operation
2. Where restricted by health and life safety codes.

2.3.3.2 Ventilation System Maintenance. Ventilation system components shall be maintained in accordance with the systems Operation and Maintenance Manual or as summarized in Table 2.3.3.

Table 2.3.3
Minimum Ventilation System Maintenance Activity

Item	Activity	Min. Frequency*
Filters and air cleaning devices	A	According to O&M Manual
Outdoor air dampers and actuators	B	Every three months or in accordance with O&M Manual
Humidifiers	C	Every three months of use or in accordance with O&M Manual
Dehumidification coils	D	Regularly when dehumidification occurs, but no less than once per year or as specified in O&M Manual
Drain pans and other adjacent surfaces subject to wetting	D	Once per year during cooling season or as specified in O&M Manual
Outdoor air intake louvers, bird screens, mist eliminators, and adjacent areas	E	Every six months or as specified in O&M Manual
Sensors used for dynamic minimum outdoor air control	F	Every six months or periodically in accordance with O&M Manual
Air-handling systems except for units under 2000 cfm	G	Once every five years
Cooling towers	H	In accordance with O&M Manual or treatment system provider
Floor drains located in plenums or rooms that serve as air plenums	I	Periodically according to O&M Manual
Equipment/component accessibility	J	
Visible microbial contamination	K	
Water intrusion or accumulation	K	

ACTIVITY CODE:

A Maintain according to O&M Manual.
B Visually inspect or remotely monitor for proper function.
C Clean and maintain to limit fouling and microbial growth.
D Visually inspect for cleanliness and microbial growth and clean when fouling observed.
E Visually inspect for cleanliness and integrity and clean when necessary
F Verify accuracy and recalibrate or replace as necessary.
G Measure minimum quantity of outdoor air. If flow rates are less than 90% of minimum required rates of ventilation air, the system shall be adjusted or modified to bring them above 90%.
H Treat to limit the growth of microbiological contaminants.
I Maintain to prevent transport of contaminants from the floor drain to the plenum.
J Keep clear the space provided for routine maintenance and inspection.
K Investigate and rectify.

* Minimum frequencies may be increased or decreased if indicated in the O&M Manual.

2.4 SERVICE HOT WATER SYSTEMS.

2.4.1 Service (domestic) hot water shall not be hotter than 120 deg. F. measured at the closest tap to the water heater.

Exception: Systems dedicated to heating water for sterilization purposes or systems utilizing a water heater to meet domestic hot water and space-heating loads are exempted.

2.4.2 Circulating Hot Water Systems: Circulating hot water systems shall be arranged so that the circulating pump(s) will be turned off (automatically or manually) when the hot water system is not in use, (i.e. nights, weekends, etc.).

2.5 LIGHTING

2.5.1 Lighting Operation.

2.5.1.1 Lights shall be turned off in unoccupied rooms, except those required for emergency egress or a similar special purpose. Standard light switches may be replaced with automated controls, such as occupancy sensors, interval timers, or timed switches to meet this requirement.

2.5.1.2 Lights shall be turned off in areas adequately and properly illuminated by daylight. Standard light switches may be replaced with automated controls, such as photocell switches or automatic dimming systems to meet this requirement.

2.5.2 Lamp Maintenance/Replacement

2.5.2.1 Continuously burning incandescent lamps of 100 watts or less shall be replaced with compact fluorescent lamps to provide equal light output as long as such lamps have size and weight compatible with the fixture.

2.5.2.2 Mercury vapor lamps shall be replaced with metal halide or high-pressure sodium lamps of equal or greater light output, but fewer watts.

2.5.2.3 PAR incandescent flood lamps or spot lamps shall be replaced with a lower wattage tungsten halogen flood or spot lamp.

2.5.2.4 When the deterioration of lenses, diffusers, and shielding mechanisms reduces original light output by 20% or more, they shall be cleaned to a condition where output is at least 95% or the original or be replaced.

2.6 Chilled Drinking Water

Electric water coolers shall not produce water cooler than 55 deg. F. Compressor operation shall be restricted when there is no need for chilled water.

3. BUILDING AND EQUIPMENT MODIFICATIONS

This section establishes requirements for building and equipment modifications in existing buildings only. **When any major component or system of the building is modified or replaced, or the building itself is significantly altered, that component, system, or altered building section shall conform to the requirements of this section.** Additions to existing buildings, and all new construction must comply with the most recent ASHRAE Energy Standards as per existing Maine law, (currently Standard 90.1-2001, *Energy Standard for Buildings Except Low-Rise Residential Buildings*).

3.1 BUILDING ENVELOPE

This section establishes requirements for building envelope systems.

3.1.1 Envelope Insulation Criteria

3.1.1.1 Walls, above grade: Above-grade wood -framed cavity walls shall be insulated to an R-value of not less than R-19. Steel-framed buildings shall be insulated to not less than R-13 + R-3.8 ci (continuous insulation). Mass walled (concrete, concrete block, etc.) shall be insulated to not less than 9.5 ci.

3.1.1.2 Roofs: For above deck insulation, not less than R-19 ci, otherwise not less than R-24 for metal buildings and R-38 for wood truss and other attic spaces.

Exception: In buildings designed to rely on heat loss to reduce snow load to design levels, insulation values that meet the snow melt requirements will be permitted. Engineering reports that document this need are required.

3.1.1.3 Floors Over Unheated Spaces: Insulation of not less than R-30. This R-value may include carpet, carpet padding and other flooring material. Mass floors shall be insulated to not less than 8.3 ci.

3.1.1.4 Floors Over Semiheated Spaces: Insulation of not less than R-13. This R-value may include carpet, carpet padding and other flooring material.

3.1.2 Windows: Windows shall be at minimum, double-glazed, low-e, with an R-value of not less than R-2 (U-0.5).

3.1.3 Doors: Replacement manufactured doors shall be certified and labeled indicating that they meet the appropriate ANSI (American National Standards Institute) air infiltration requirements.

3.2 PIPING INSULATION

3.2.1 Piping Insulation. All piping serving as part of a heating or cooling system shall be thermally insulated in accordance with Table 3.4.1.

Exceptions:

(a) Factory-installed piping within HVAC equipment

(b) Piping that conveys fluids that have a design temperature between 55 deg. F. and 105 deg. F.

(c) Where it can be shown that the heat gain or loss to or from piping without insulation will not increase building energy costs.

Table 3.2.1
Minimum Pipe Insulation
(thickness in inches)

FLUID	NOMINAL PIPE DIAMETER	
	≤ 1.5"	> 1.5"
Steam	1.5	3.0
Hot Water	1.0	2.0
Chilled water, brine, or refrigerant	1.0	1.5

3.3 DUCT AND PLEMUM INSULATION AND SEALING

3.3.1 Air-Handling (Duct) System Insulation. All air-handling ducts and plenums installed as part of an HVAC air distribution system shall be thermally insulated with a minimum of R-5 insulation when located inside of the building envelope or in unconditioned spaces. When located outside the building envelope, the minimum insulation shall be R-8. When located within the building envelope, the duct or plenum must be separated from the building exterior by a minimum of R-8 insulation.

Exceptions:

(a) Factory-installed plenums, casings or ductwork furnished as part of HVAC equipment.

(b) Where it can be shown that the heat gain or loss to or from ductwork without insulation will not increase building energy costs.

3.3.2 Duct Sealing. All joints, longitudinal and transverse seams, and connections in ductwork shall be securely fastened and sealed with welds, gaskets, mastics (adhesives), or other recognized methods for sealing ductwork. **Duct tape** is not permitted as a sealant on any metal duct.

3.4 SERVICE WATER SYSTEMS.

3.4.1 Faucets. Faucets other than lavatory fixtures shall provide a flow rate of no greater than 2.0 gpm.

3.4.2 Lavatory Fixtures

3.4.2.1 Lavatory sinks shall be equipped with flow control devices that limit the flow of hot water to 0.6 gallons per minute.

3.4.3.2 Showers shall be equipped with showerheads that limit total flow to a maximum of 2.5 gallons per minute.

3.4.3.3 Toilets shall operate with no more than 2 gallons per flush.

3.4.3.4 Urinals shall operate with no more than 1 gallon per flush.

3.5 LIGHTING SYSTEMS. When lighting systems are replaced, the replacement lighting shall conform to this subsection.

3.5.1 Automatic Lighting Shutoff. Interior lighting in buildings larger than 5000 ft^2 shall be controlled with an automatic control device to shut off lighting in all spaces. This may be accomplished by using occupancy sensors, time of day control, or other systems that respond to an unoccupied area.

Exceptions:

(a) Areas designated as security or emergency areas that must be continuously lighted.

(b) Lighting in stairways or corridors that are elements of the means of egress.

3.5.2 Space Control. Each space enclosed by ceiling height partitions shall have at least one control device (switch) to independently control the general lighting within the space. The control device may be manually activated or by an occupancy sensing device.

3.5.2.1 Bi-Level Switching. Each area served by a manual control shall also allow the occupant to reduce the lighting load by at least 50%.

Exceptions:

(a) Areas that have only 1 luminaire.

(b) Corridors, storerooms, rest rooms, or public lobbies.

3.5.3 Additional Controls. Special lighting applications such as task lighting, accent lighting, case lighting, etc. must be controlled separately from general space lighting.

3.5.4 Exterior Lighting Controls. Automatic switching or photocell controls shall be provided for all exterior lighting not intended for 24-hour operation. Time switches shall have 7-day and seasonal schedule adjustment capabilities.

3.5.5 Interior Lighting Power Density. Lighting power density (W/ft^2) may be calculated by either of the two methods described in 3.5.5.1 or 3.5.5.2.

3.5.5.1 Space-by-Space Lighting Power Density Option. Lighting power density (W/ft^2) for listed activity areas shall not be greater than that listed in Table 3.5.4.

Table 3.5.5
Lighting Power Allowance
Space-by-space method

Area/Activity	W/ft^2
Office Enclosed	1.5
Office Open	1.3
Conference	1.5
Classroom/Training	1.6
Lobby	1.8
Corridor	0.7
Restroom	1.0
Active Storage	1.1
Inactive Storage	0.3

3.5.5.2 Total Building Area Lighting Power Density Option. Lighting power density (W/ft^2) for the entire building shall not exceed 1.3 W/ft^2 (office buildings only).

3.5.6 Fluorescent Lamps and Ballasts

3.5.6.1 Low-Mercury T-8 (or smaller diameter) fluorescent lamps, with electronic ballasts shall be the primary choice for general office space lighting.

Exception: Dimming circuits with specific design criteria.

3.5.6.2 Ballast Sharing. One-lamp or three-lamp fluorescent luminaires, recess-mounted within 10 ft. center-to-center of each other or pendant or surface mounted within 1 ft. of each other, and within the same room, shall be tandem wired to eliminate unnecessary use of single-lamp ballasts.

3.5.6.3 Ballast Efficacy Factor: Fluorescent lamp ballasts shall meet or exceed the minimum ballast efficacy factor (BEF) as shown in Table 3.5.6.3.

Exceptions:

(a) Not specifically designed for starting at temperatures below 40 deg. F.

(b) Not specifically designed for use with dimming controls.

Table 3.5.6.3
Fluorescent Lamp Ballast Efficacy Factor

Lamp Type	# of Lamps	Minimum BEF[1]	Best Available BEF
Four-Foot and U-Tube Lamps			
T8, 32 Watts	1	2.54 or higher	3.00
	2	1.44 or higher	1.54
	3	0.93 or higher	1.06
	4	0.73 or higher	0.79
Eight-Foot Lamps			
T8, 59 Watts	2	0.80 or higher	0.81

1. Ballast Efficacy Factor (BEF) is the ratio of the ballast factor (BF) to input watts; it measures the efficiency of the lamp/ballast system relative to others using the same type and number of lamps.

3.5.6.4 Ballast Power Factor. All ballasts shall have a power factor of 90% or greater.

Exceptions:

(a) Ballasts for circline and compact fluorescent lamps and low-wattage high-intensity discharge lamps of 100W or less.

(b) Dimming ballasts.

3.5.7 Exit Signs. Illuminated exit signs shall be low energy consumption units, lit either by LED lamps or by electroluminescent (LEC) technology. Photoluminescent Exit signs shall not be permitted.

3.6 ELECTRIC MOTORS. When electric motors rated at 1 hp and above are replaced, the replacement motor shall meet the following standards.

3.6.1 Efficiency rating. Replacement motors must be rated as meeting the efficiency standards designated as NEMA Premium™ or CEE Premium Efficiency motors.

3.5.2 Motor sizing. Motor horsepower should not exceed 125% of the calculated maximum load being served. If a standard motor size is not available within the range, the next largest standard motor size may be used.

4. HEATING, VENTILATION, AND AIR-CONDITIONING EQUIPMENT AND EQUIPMENT MODIFICATION REQUIREMENTS

4.1 GENERAL. HVAC equipment shall be supplied with the information necessary to determine compliance with this standard. Equipment ratings certified under a nationally recognized certification program or procedure, or data furnished by the equipment manufacturer shall be acceptable to satisfy these requirements.

4.2 PERFORMANCE STANDARDS FOR HVAC EQUIPMENT

4.2.1 Gas- and Oil-Fired Boilers. Minimum performance is to comply with Table 4.2.1.

Table 4.2.1 Gas- and Oil-Fired Boilers- Minimum Efficiency Requirements

Equipment Type	Size (Input)	Rating Condition	Minimum Efficiency	Reference Standard
Gas-Fired	<300,000 Btu/h	Seasonal Rating	80% AFUE	DOE 10 CFR Part 430
	≥300,000 Btu/h	Max. and Min. Rated Capacity	80% Thermal Efficiency	H.I. Htg. Boiler Std. 86
Oil-Fired	<300,000 Btu/h	Seasonal Rating	80% AFUE	DOE 10 CFR Part 430
	≥300,000 Btu/h	Max. and Min. Rated Capacity	83% Thermal Efficiency	H.I. Htg. Boiler Std. 86
Oil-Fired (Residual)	≥300,000 Btu/h	Max. and Min. Rated Capacity	83% Thermal Efficiency	H.I. Htg. Boiler Std. 86

4.2.2 Warm Air Furnaces and Combination Warm Air Furnace/Air-Conditioning Units. Minimum performance is to comply with Table 4.2.2.

. Table 4.2.2 Warm Air Furnaces and Combination WA/AC Units Minimum Performance Requirements

Equipment Type	Size (Input)	Rating Condition	Minimum Performance	Reference Standard
Gas-Fired & Oil-Fired	<225,000 Btu/hr	Seasonal Rating	78% AFUE	DOE 10 CFR Part 430
Gas-Fired	≥225,000 Btu/hr	Max. Rated Capacity	80% Thermal Efficiency	ANSI Z21.47.90
		Min. Rated Capacity	78% Thermal Efficiency	
Oil-Fired	≥225,000 Btu/hr	Max. and Min. Rated Capacity	81% Thermal Efficiency	U.L. 727-86

4.2.3 Unit Heaters. Minimum performance is to comply with Table 4.2.3.

Table 4.2.3 Unit Heaters Minimum Performance Requirements

Equipment Type	Rating Condition	Minimum Performance	Reference Standard
Gas-Fired	Max. Rated Capacity	78% % Thermal Efficiency	ANSI Z83.8-90
	Min. Rated Capacity	74% % Thermal Efficiency	
Oil-Fired	Max. and Min. Rated Capacity	81% Thermal Efficiency	U.L. 731-88

4.2.4 Water-Source and Groundwater-Source Heat Pumps. Minimum performance standards for electrically operated heat pumps of either type, <135,000 Btu/hr Cooling Capacity is to comply with Table 4.2.4.

Table 4.2.4 Water-Source and Groundwater-Source Heat Pumps Minimum Performance Requirements

Equipment Type	Rating Condition	Minimum Performance	Reference Standard
Groundwater Source	High Temperature Rating 70 deg. F. Low Temperature Rating 50 deg. F.	3.4 COP 3.0 COP	ARI 325-85
Water-Source	Standard Rating 70 deg. F.	3.8 COP	ARI 320-86 CTI 201-(86)

4.2.5 Air Source Heat Pumps. Minimum performance is to comply with Table 4.2.5.

Table 4.2.5 Air Source Heat Pumps (3-phase) Minimum Performance Requirements

Product Type and Size	Category	Minimum	Reference Standard
< 65 MBtu/h	Split System or Single Package	11.0 SEER	ARI 210/240
65 - 135 MBtu/h	Split System or Single Package	10.1 EER or 3.2 COP	
> 135 - 240 MBtu/h	Split System or Single Package	9.3 EER or 3.0 COP	ARI 340/360

4.2.6 Unitary Air Conditioners. Minimum performance of air-cooled Unitary Air Conditioners is to comply with Table 4.2.6.

Table 4.2.6 Unitary Air-Cooled Air Conditioners Minimum Performance Requirements (3-phase)

Product Type and Size	Category	Minimum	Reference Standard
< 65 MBtu/h	Split System or Single Package	11.0 SEER	ARI 210/240
65 - 135 MBtu/h	Split System or Single Package	10.5 EER	
> 135 - 240 MBtu/h	Split System or Single Package	10.0 EER	ARI 340/360

4.2.7 Room Air Conditioners. Window air conditioning units shall meet or exceed the minimum Energy Efficiency Ratio (EER) as shown in Table 4.2.7.

Table 4.2.7
Room Air Conditioning Efficiency Standards

Product Type and Cooling Capacity[1]	Recommended EER[2]	Best Available EER
with louvers[3]; <20,000 Btu/hr	**10.7 or more**	**11.7**
with louvers; >=20,000 Btu/hr	**9.4 or more**	**10.0**

1. Cooling Capacity is the amount of cooling that can be provided by the unit (in Btu/hr) at standard rating conditions.
2. EER, or Energy Efficiency Ratio is equal to the measured cooling capacity of the unit (in Btu/hr) divided by its electrical input (in watts) at standard rating conditions. EER is based on DOE test procedure; see 10 CFR 430, Sub-part B, Appendix F.
3. Louvered sides improve the energy performance of window-installed A.C. units by enhancing airflow over the outdoor coil. Units intended for through-the-wall installation require a smooth-sided cabinet (no louvers). Since there is very little range in the efficiencies of unlouvered products for sale, only louvered products are covered in this standard.

4.3 SIMULTANEOUS HEATING AND COOLING SYSTEMS. Systems that employ simultaneous heating and cooling to the same zone to achieve comfort conditions shall not be replaced with similar systems. (See also Section 4.4.2 Zone Controls.)

4.4 CONTROLS FOR HEATING, VENTILATION, AND AIR-CONDITIONING (HVAC) SYSTEMS

4.4.1 Temperature Controls

4.4.1.1 Temperature Controls, single zone systems. Each heating and cooling system shall have at least one solid-state programmable thermostat that has the capability for setback or shutdown based on the day of the week and time of day.

4.4.1.2 Temperature Controls, complex zone systems. Each heating and cooling zone shall be controlled by individual thermostatic controls capable of responding to temperature within the zone.

4.4.1.2.1 Off-hour controls. Each zone shall be provided with thermostatic setback controls that are controlled by either an automatic time clock or programmable control system.

4.4.1.2.2 Setback controls. Thermostatic setback controls shall have the capability to set back or temporarily operate the system to maintain zone temperatures down to 55 deg. F. or up to 85 deg. F.

4.4.1.2.3 Dual system controls. Where used to control both heating and cooling, zone thermostatic controls shall be capable of providing a temperature range or deadband of at least 5 deg. F.

Exception: Thermostats that require manual changeover between heating and cooling modes.

4.4.2 Zone Controls. *Zone* thermostatic controls shall be capable of operating in sequence the supply of heating and cooling energy to the *zone*. Such controls shall prevent (1) *reheating*, (2) *recooling*, (3) mixing or simultaneously supplying air that has been previously mechanically heated and air that has been previously cooled, either by mechanical cooling or by economizer systems and (4) other simultaneous operation of heating and cooling systems to the same *zone*.

Exceptions:

(a) Zones for which the volume of air that is reheated, recooled, or mixed is no greater that the volume of outside air required to meet the ventilation requirements of ASHRAE Standard 62.

(b) Zones where special pressurization relationships, cross-contamination requirements, or code-required minimum circulation rates exist.

(c) Zones where at least 75% of the energy for reheating or for providing warm air in mixing systems is provided from a site-recovered source (including condenser heat) or site solar energy source.

4.5 VENTILATION SYSTEMS CONTROL

4.5.1 Shutoff Damper Controls. Both outdoor air supply and exhaust ducts shall be provided with automatic means to reduce and shut off airflow when the systems or spaces served are not in use.

Exceptions:
1. Systems that are designed for continuous operation.
2. Individual supply systems with a design airflow rate of 3,000 cfm or less.
3. Where restricted by health and life safety codes.

4.6 ENERGY RECOVERY. Energy recovery is required for systems supplying greater than 5,000 cfm and 70% outside air.

4.6.1 Possible heat recovery devices include, but are not limited to: Enthalpy wheels, Heat wheels, Energy Wheels, Desiccant wheels and Membrane, fixed-plate heat exchangers.

4.7 HVAC COMPLETION REQUIREMENTS

4.7.1 System Balancing

4.7.1.1 General. Construction documents shall require that all HVAC systems be balanced in accordance with generally accepted engineering standards.

Construction documents shall require that a written balance report be provided to the owner and lessee for HVAC systems serving *zones* with a total conditioned area exceeding 3000 ft^2. Balance reports shall be provided by individuals or firms certified by one of the nationally recognized system balancing organizations such as: The National Environmental Balancing Bureau (NEBB); The Testing, Adjusting and Balancing Bureau (TABB); or The Associated Air Balance Council (AABC).

4.7.1.2 Air System Balancing. Air systems shall be balanced in a manner to first minimize throttling losses. Then, for fans with fan system power greater than 1 hp, fan speed shall be adjusted to meet design flow conditions.

4.7.1.3 Hydronic System Balancing. Hydronic systems shall be proportionately balanced in a manner to first minimize throttling losses; then the pump impeller shall be trimmed or pump speed shall be adjusted to meet design flow conditions.

Exceptions: Impellers need not be trimmed nor pump speed adjusted:
(a) For pumps with pump motors of 10 hp or less.
(b) When throttling results in no greater than 5% of the nameplate horsepower draw, or 3 hp, (whichever is greater), above that required if the impeller was trimmed.

4.7.2 System Commissioning. HVAC control systems shall be tested to ensure that control elements are calibrated, adjusted, and in proper working condition. For projects larger than 50,000 ft^2 conditioned area, except warehouses and semiheated spaces, detailed instructions for commissioning HVAC systems shall be provided by the designer of said system(s).

5. SERVICE WATER-HEATING EQUIPMENT AND EQUIPMENT MODIFICATION REQUIREMENTS

5.1 GENERAL. Service water-heating equipment shall be supplied with the information necessary to determine compliance with this standard. Equipment ratings certified under a nationally recognized certification program or procedure, or data furnished by the equipment manufacturer shall be acceptable to satisfy these requirements.

5.2 EQUIPMENT EFFICIENCY. All water heaters and hot water storage tanks shall meet the criteria of Table 5.2.

Exception: Storage water heaters and hot water storage tanks of more than 140 gallons storage capacity need not meet the standby heat loss requirements of Table 5.2 if the tank surface is thermally insulated to R-12.5 and if a standing pilot light is not used.

Table 5.2 Water-Heating Equipment Minimum Performance Requirements

Category	Type	Fuel	Input Rating	Volume	Energy Factor	Standby Loss	Test Method
NAECA Covered Water-heating Equipment	all	electric	≤12 kW	all	≥0.93	_	DOE Test Proc. 10 CFR, Part 43043
	storage	gas	≤75,000 Btu/hr		≥0.62	_	
	instantaneous	gas	≤200,000 Btu/hr		≥0.62	_	
	storage	oil	≤105,000 Btu/hr		≥0.59	_	
	instantaneous	oil	≤210,000 Btu/hr		≥0.59	_	
Unfired storage tanks	_	_	_	all	_	≤6.5Btuh/ft^2	_

Energy Factor measures the efficiency of the water heater by comparing the energy supplied in heated water to the total daily consumption of the water heater.

5.3 WATER HEATING CONTROLS.

5.3.1 Special Temperature Requirements. Where temperatures higher than 120 deg. F. are required at certain outlets for a particular use, separate remote heaters or booster heaters shall be installed for those outlets.

Exception: Where it can be shown that energy cost is not reduced by the application of this requirement or that the total installed cost of the equipment, maintenance, and energy used over the life of the equipment is not reduced.

5.3.2 Circulation Hot Water Systems and Heated Pipes. These systems shall be equipped with automatic time switches or other controls that can be set to turn off the system when use of hot water is not required.

5.4 ADDITIONAL EQUIPMENT EFFICIENCY MEASURES.

5.4.1 Electric Water Heaters. An economic evaluation shall be made on the potential benefit of using an electric heat pump water heater(s) instead of an electric resistance water heater(s). The analysis shall compare the extra installed costs of the heat pump unit with the benefits in reduced energy costs (less maintenance costs) over the estimated service life of the heat pump water heater.

Exception: Electric resistance water heaters used in conjunction with site-recovered or site-solar energy sources that provide 50% or more of the water-heating load.

5.4.2 Gas-Fired Water Heaters. All gas-fired storage water heaters not equipped with a flue damper that use indoor air for combustion and that are installed in conditioned spaces shall be equipped with a vent damper (unless the water heater is already so equipped). The vent damper shall be listed as meeting appropriate ANSI standards and shall be installed in accordance with the manufacturer's instructions and local codes.

Exception: Where the cost of the damper exceeds the value of reduced energy costs over the damper's lifetime.

5.4.3 Point-of Use Water Heaters. Point-of-use water heaters should be considered in applications where hot water use is minimal and their use would reduce annual energy cost.

5.4.4 Heat Traps. Storage water heaters not equipped with integral heat traps and having vertical pipe risers shall be installed with insulated heat traps on both the inlet and outlets. The heat trap shall be installed directly or as close as possible to the outlet fittings.

Exception: Water heaters that are used to supply circulating hot water systems.

FORM A-COMPLIANCE

1. Name of Project: _____
   Address: _____

2. Name of person requesting compliance: _____
   Address: _____
   _____
   Telephone: _____

3. Name of person(s) establishing compliance: _____
   Address: _____
   _____
   Telephone: _____

   Name: _____
   Address: _____
   _____
   Telephone: _____

4. Application of compliance to (check one):

   [ ] Building [ ] Complex

5. Have the operation and maintenance requirements of Section 2 been met?

   [ ] Yes [ ] No

6. Have the building and equipment modification requirements of Section 3,4 and 5 been met?

   [ ] Yes [ ] No

7. We state that this building complies with the State of Maine Clean Government Initiative Leased Building Energy Efficiency Standards.

   [ ] Yes [ ] No

8. Date: _____

9. Signature of person for whom compliance was determined: _____

10. Signature of person or persons determining compliance: _____

    _____

APPENDIX A

BIBLIOGRAPHY

1. *ANSI/ASHRAE/IESNA 100-1995, Energy Conservation in Existing Buildings*, 1996.

2. *ANSI/ASHRAE/IESNA 90.1-2001, Energy Standard for Buildings Except Low-Rise Residential Buildings*, 2001.

3. *ANSI/ASHRAE Standard 62-2001, Ventilation for Acceptable Indoor Air Quality*, 2001

4. International Code Council, *International Energy Conservation Code 2000*, 1999.

5. U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, Federal Register/ Volume 65, No. 195, 10 CFR Parts 434 and 435, October 6, 2000.

Revisions to State of Maine Leased Building Energy Efficiency Requirements (1/3/2003)

1. COMPLIANCE REQUIREMENTS

1.1 A building or complex of buildings complies with this standard if the requirements of 1.1.2 and 1.1.3 have been met and recorded on Form A.

1.2 A person or persons determining compliance shall state in writing that the operating and maintenance requirements of Section 2 have been met.

1.3 A person or persons determining compliance shall state in writing that the building and equipment modification requirements of Sections 3, 4 and 5 have been met.

Exception: No individual requirement need be met that would compromise the historical integrity of a building or part of a building designated by a governmental body in a manner indicating the value of long-term preservation in its existing state (such as historical monuments, buildings, etc.). If an individual requirement does not affect the historical integrity of said building(s), the requirement shall be adhered to.

4.7 HVAC COMPLETION REQUIREMENTS

4.7.1 System Balancing

4.7.1.1 General. Construction documents shall require that all HVAC systems be balanced in accordance with generally accepted engineering standards.

Construction documents shall require that a written balance report be provided to the owner and lessee for HVAC systems serving *zones* with a total conditioned area exceeding 3000 ft^2. Balance reports shall be provided by individuals or firms certified by one of the nationally recognized system balancing organizations such as: The National Environmental Balancing Bureau (NEBB); The Testing, Adjusting and Balancing Bureau (TABB); or The Associated Air Balance Council (AABC).