Minimum Efficiency Performance Standards, Labels, and Test Procedures in Canada, México, and the United States

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Note on terminology:

In the United States, the term "standard" is used to denote a minimum efficiency performance standard, and the term "test procedure" refers to test methods for determining energy performance.

In Canada, "standards" contain the test procedure, recommended minimum levels, and often marking or labelling instructions. The test procedure and minimum levels contained within the standard are not mandatory until regulated as an amendment to the Energy Efficiency Act. Similarly, in Mexico, the NOM generally includes the test procedure, recommended minimum levels, and labelling instructions. The term "norma" is used to refer to minimum efficiency performance standards.

To minimize confusion regarding terminology, whenever appropriate this document uses the following terms as defined below:

- **MEPS:** federal, mandatory minimum efficiency performance standard (the US "standard", the Méxican "norma")

- **Test Procedure:** A test method for determining energy performance

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I. SUMMARY OF MEPS AND LABELS IN NORTH AMERICA

Table 1. Existing MEPS and Labels in Canada, México, and the United States

Product	Canada	México	USA
Refrigerators	Lmc, Lve Sm	Lmc,Lve,Sm	Lmc,Lve,Sm
Freezers	Lmc, Lve Sm	Lmc,Lve,Sm	Lmc,Lve,Sm
Central AC	Lvc, Lve Sm	Lmc,Sm	Lmc,Lve,Sm
Heat Pumps	Lvc,Sm	Sm	Lmc,Lve,Sm
Room AC	Lmc, Lve Sm	Lmc,Lve,Sm	Lmc,Lve,Sm
Other AC/HP Categories	Lve Sm		
Clothes Washers	Lmc, Lve Sm	Lmc,Sm	Lmc,Lve,Sm
Clothes Dryers	Lmc,Sm		Lve,Sm
Dishwashers	Lmc,Lve,Sm		Lmc,Lve,Sm
Fluorescent Ballasts	Sm	Sv	Lmc,Sm
Fluorescent Lamps	Sm	Lmc,Lve,Sm	Lmc,Lve,Sm
Incandescent Lamps and Luminaires	Sm (lamps only)		Lve,Sm
Ranges/Ovens	Lmc, Lve Sm		Lve
Dehumidifiers	Lve Sm		Lve
Icemakers	Sm		
Televisions	Lve	Lve	Lve
VCRs	Lve		Lve
DVDs	Lve		Lve
Set Top Boxes			Lve
Radio Rcvr/Rcdr	Lve		Lve
Ceiling and Ventilating Fans			Lve
Direct Heating Equipment			Sm
Computers	Lve		Lve
Monitors	Lve		Lve
Copiers	Lve		Lve
Printers	Lve		Lve
Fax Machines	Lve		Lve
Scanners			Lve
Multi-Function Devices*	Lve		Lve
Furnaces	Lvc Lve,Sm		Lmc,Lve,Sm
Boilers	Lve Sm	Sm	Lmc,Lve,Sm
Water Heaters	Sm	Lmc,Sm	Lmc,Sm
Motors	Sm	Lmc,Sm	Sm
Transformers			Lve
Pumps		Lmc,Sm	
Commercial Refrigerators		Lmc	
Exit Signs	Lve		Lve
Water Coolers	Lve		Lve
Programmable Thermostats	Lve		Lve

Traffic Lights			Lve
Windows			Lve
Roof Products			Lve
Non-Residential Building Envelopes		Lmc	

L = Label, S= Standard, m = mandatory, v = voluntary, e = endorsement, c = comparative
*Multi-function Devices (MFDs) = Usually a combination of printer, fax, scanner, and/or copier

Table 2. Comparison of Test Procedures in Canada, México, and the United States

Refrigerators and freezers	All three countries use an equivalent test procedure.
Central air conditioners and heat pumps	Canada's TPs are based on ARI 210/240-89 and ASHRAE 37-1988. The US test procedure refers to ARI 310/380-93 and ARI 210/240-94. México's test method is ANSI/ASHRAE 37; the tolerances and efficiency levels are identical to that used in the US.
Room air conditioners	The test procedures are essentially the same in all three countries. A new edition of the Canadian TP will be issued soon.
Other AC/HP Categories	For packaged terminal AC and HP, the US test procedure is ASHRAE 90.1, which specifies a number of ANSI and ARI standards as the test methods. Canada's TP is identical to ARI-310/380-93; Canada is working toward publication of a new Joint Standard with ARI 310/380.
Clothes washers and dryers	All three countries have test procedures for clothes washers. Only Canada and the U.S. have test procedures for clothes dryers. The current Canadian and U.S. TPs are essentially identical for both clothes washers and clothes dryers. México's test procedure for clothes washers is different. The US just published a new TP (J1) which will be effective in 2004, Canada is developing new editions of the TPs for both products (clothes washer similar to US).
Dishwashers	Only Canada and the US have test procedures, which are similar. The US will soon publish new test procedures, and will begin an additional TP for "smart" equipment.
Fluorescent lamp ballasts	All three countries have test procedures. Canada and the US have similar test procedures. The Canadian test procedure has been amended and is similar to US test procedure. Information is needed on the Mexican test procedure.

Fluorescent lamps	US and Canada have essentially identical test procedures for general service fluorescent lamps; México has no test procedure. México and the US have different test procedures for CFLs; Canada has no test procedure.
Incandescent lamps and luminaires	The US and Canadian test procedures for incandescent reflector lamps are essentially the same. México has TPs for lighting in commercial buildings and exterior lighting. Canada has TPs for dusk to dawn luminaires and roadway luminaires. The US has a TP for incandescent non-reflector lamps.
Ranges and ovens	Canada and the US have test procedures for electric ranges; Canada is revising the TP to use the same usage factors as the US, also to include a volume specific formula for built-in ovens.
Dehumidifiers	Only Canada has a test procedure.
Icemakers	Only Canada has a test procedure.
Direct Heating Equipment	Only the US has a test procedure.
Furnaces and boilers	All three countries have different test procedures, although the TP for gas furnaces is identical in Canada and the U.S. The US will soon publish a revised test procedure for residential furnaces and boilers, which references ASHRAE 90.1. Canada has published a new version of of the TP for oil-fired furnaces and boilers (updating to ANSI) but it has not been referenced in the regulations.
Water heaters	The three countries have different test procedures. Canada also has a TP which is harmonized with the USA drawoff method, which is being considered for introduction into the Canadian regulations. A new test procedure is in progress in the US for commercial water heaters.
Motors	The three countries have similar test procedures, with some differences.
Transformers	Canada's test procedure for dry-type and liquid filled is essentially equivalent to NEMA TP2. The US has a test procedure underway that may be based on NEMA TP 2. NEMA has agreed to consider suggested revisions to TP 2. México has its own test procedures for transformers. Canada will soon publish a new TP for power transformers.

Pumps	The test procedure for small pumps in Canada will soon be published. Three of four test procedures for pumps in México are based on ISO-3555 standards. The US has no test procedure for pumps.
Refrigerated Display Cabinets/Commercial Refrigerators	Only Canada has a test procedure for refrigerated display cabinets. Only México has a test procedure for commercial refrigeration units.
Uninterruptible Power Supplies	Only Canada has a test procedure.
Exit Signs	Only Canada has a test procedure.
Mechanical Ventilation Systems	Only Canada has a test procedure.
High intensity discharge lamp ballasts	Only Canada has a test procedure.
Building Envelopes	Only México has a test procedure.

Table 3. Comparison of MEPS in Canada, México, and the United States

Refrigerators and freezers	All three countries have MEPS for refrigerators and freezers. All three countries had identical MEPS until July 2001, when Canada and the US adopted new (identical) MEPS.
Central air conditioners and heat pumps	For single-packaged central AC and HPs, Canada's cooling SEER is the same as the US1993 MEPS; for split-systems, Canada's SEER is the same as the US 1992 MEPS. For both types,Canada's heating HSPF is less stringent than the US level. In México, the MEPS for both split and packaged CACs is the same as the US and Canadian SEER for split system CACs, but heat pumps and CAC units with additional space heating capability are exempt. New MEPS for residential central AC are in progress in the US and Canada
Room air conditioners	Effective in 2002, Canada will implement increased MEPS, which will bring Canada in line with the Oct. 2000 US rule. México's rule was just revised and took effect in June 2001. The new levels may be comparable to the 2000 US MEPS; this needs confirmation.
Other AC/HP categories	Only Canada and the US have MEPS in this category. For packaged terminal AC and HP, the two countries have different MEPS. Other classes of products in this category are defined differently and not comparable between the two countries.

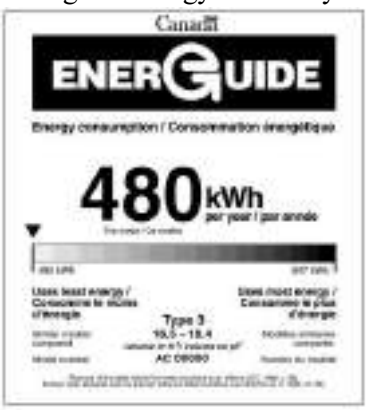
Clothes washers and dryers	All three countries have MEPS for clothes washers. Only Canada and the U.S. have MEPS for clothes dryers. Canada is working to develop new MEPS for clothes washers to harmonize with recent USDOE modifications. México's MEPS for clothes washers is different.
Dishwashers	Only Canada and the US have dishwasher MEPS. They are identical.
Fluorescent lamp ballasts	Only Canada and the US have MEPS. In late 2001 or early 2002, Canada will increase its levels to match the US levels scheduled to take effect in 2005 and 2010.
Fluorescent lamps	The US and Canada have identical MEPS for general service fluorescent lamps; México has no standard. México and the US have different standards for CFLs; Canada has no standard.
Incandescent lamps and luminaires	Canada is currently in the process of amending their MEPS for incandescent reflector lamps, which will make the US and Canadian scope and levels similar (except Canada plans to include ER lamps). México has a standard for lighting in commercial buildings and exterior lighting. The US has a standard for incandescent non-reflector lamps.
Ranges and ovens	Only Canada has MEPS. Depending on the results of the TP update, Canada may make changes to the levels. [n.b. United States regulations mandate that gas cooking products with an electrical supply cord shall not be equipped with a constant burning pilot light. Canada's regulations require that gas ranges may not have a continuously burning pilot light if the product has a cord set.]
Dehumidifiers	Only Canada has MEPS.
Icemakers	Only Canada has MEPS.
Direct Heating Equipment	Only the US has MEPS.
Furnaces and boilers	All three countries have different MEPS for residential furnaces and boilers. The US is undertaking a new rulemaking on this equipment.
Water heaters	All three countries have different levels; México's MEPS do not cover electric water heaters.

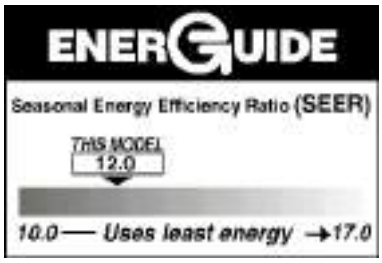
Motors	All three countries have MEPS. In Canada and the US, the MEPS relating to motors that conform with NEMA requirements are identical, but the Canadian program covers additional motor types. The efficiency levels for "high efficiency" motors in México are the same as the US and Canada levels for all motors, so México's MEPS levels are lower in general. Only México regulates 8 pole three-phase motors and single-phase motors. Canada is investigating establishing minimum efficiency levels for small motors and harmonization with México's MEPS. The US is considering a small motors MEPS.
Transformers	México has MEPS for liquid-type distribution transformers and voluntary standards for dry-type transformers. Canada will soon publish MEPS for dry-type distribution transformers (effective 2003/2004). Canada also is working on a voluntary agreement for minimum levels for liquid filled transformers. The US currently is beginning a rulemaking for both dry and liquid-filled transformers (effective date TBD).
Pumps	México has MEPS for four types of pumps: vertical turbine external motor, centrifugal residential water, submersible clean water, electromechanical systems of vertical turbine pumps. The US and Canada have no MEPS for pumps.
Commercial Refrigerators	Only México has MEPS for commercial refrigeration units.
Building Envelopes	Only México has MEPS for non-residential building envelopes.

Figure 1. Comparison Labels in Canada, México, and the United States

Canada

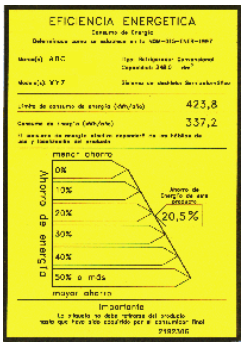
Mandatory EnerGuide Program: Labels display the annual energy (kWh/year) used by the appliance and how this compares with the lowest and highest energy consumption for similar products.
Voluntary EnerGuide Program: Labels demonstrate how the appliance compares with the lowest & highest energy efficiency for similar products, generally used for HVAC.





México

Refrigerator and central AC: Percent of Energy Savings relative to the MEPS Level.
Air conditioner: Efficiency Rating relative to the MEPS level, A to E (E best), and annual running costs.



USA

Energy Guide Program: Energy (kWh/year), operating cost and lowest & highest energy used for similar products (EER and or SEER for air conditioners).

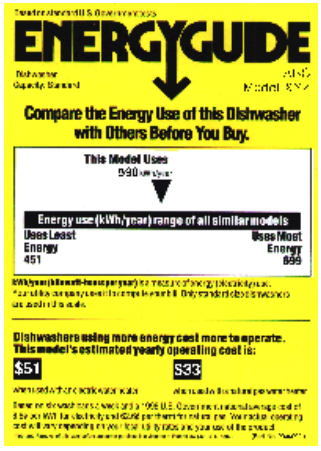
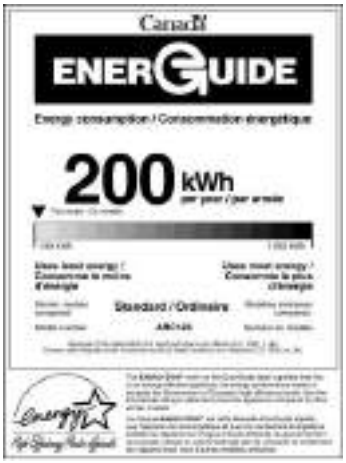


Figure 2. Endorsement Labels in Canada, México, and the United States

Canada	**México**	**USA**
Energy Star	Sello FIDE	Energy Star and Green Seal



II. MANDATORY MINIMUM EFFICIENCY PERFORMANCE STANDARDS AND TEST PROCEDURES

A. Refrigerators and freezers

i) Canada:

MEPS levels

Canada's regulations cover household refrigerators or refrigerator-freezers with a capacity of not more than 1100 L (39 cu ft), and freezers with a capacity of not more than 850 L (30 cu ft). The product categories, shown in Table 4, are aligned with the US program.

The Minimum Energy Performance Standard (MEPS) criteria, adopted in February 1995, were identical with those that became effective in the US in January 1993. Canada has recently regulated refrigerator-freezers to the new levels adopted in the United States. The new standard levels took effect in both Canada and the US in July 2001. MEPS levels for each product class are defined in terms of adjusted volume.

AV (Adjusted volume, cu ft) = Volume of fresh food compartment (cu ft) + (K × volume of freezer compartment (cu ft)).

The values of K are:

- 1.0 for a refrigerator without a freezing compartment;
- 1.44 for a single-door refrigerator with an internal freezing compartment
- 1.63 for a combination refrigerator-freezers
- 1.73 for a freezer.

Table 4: MEPS Levels for Refrigerator and freezer categories, Canada

Product Class	Description	Maximum annual energy consumption (kWh/yr)
1	Refrigerators and refrigerator-freezers with manual defrost	13.5 AV + 299
2	Refrigerator-freezers with partial automatic defrost	10.4 AV + 398
3	Refrigerator-freezers with automatic defrost with top-mounted freezer, no through-the-door ice service; and all refrigerators with automatic defrost	16.0 AV + 355
4	Refrigerator-freezers with automatic defrost with side-mounted freezer, no through-the-door ice service	11.8 AV + 501
5	Refrigerator-freezers with automatic defrost with bottom-mounted freezer, no through-the-door ice service	16.5 AV + 367
6	Refrigerator-freezers with automatic defrost with top-mounted freezer, and with through-the-door ice service	17.6 AV + 391
7	Refrigerator-freezers with automatic defrost with side-mounted freezer, with through-the-door ice service	16.3 AV + 527
[8](a)	Upright freezers with manual defrost	10.3 AV + 264
[9](a)	Upright freezers with automatic defrost	14.9 AV + 391
[10](a)	Chest freezers and all other freezers	11.0 AV + 160
11	Compact Refrigerators and Refrigerator-Freezers with Manual Defrost	10.70 AV+ 299.0
12	Compact Refrigerator-Freezer—partial automatic defrost	7.00 AV+ 398.0
13	Compact Refrigerator-Freezers automatic defrost with top-mounted freezer, no through-the-door ice service, and all refrigerators with automatic defrost	12.70 AV+ 355.0
14	Compact Refrigerator-Freezers - automatic defrost with side-mounted freezer, no through-the-door ice service	7.60 AV+ 501.0
15	Compact Refrigerator-Freezers - automatic defrost with bottom-mounted freezer, no through-the-door ice service	13.10 AV+ 367.0
16	Compact upright freezers with manual defrost	9.78AV + 250.8
17	Compact upright freezers with automatic defrost	11.4 AV + 391
18	Compact chest freezers	10.45 AV + 152

Source: NRCan (1999, 2001) AV=Adjusted volume in cubic feet. (a) Not given a product number in Canadian regulations; this is the corresponding class number in US regulations.

Test Procedures

The test procedure is in CAN/CSA-C300-00. It is essentially harmonized with US 10 Code of Federal Regulations (CFR) Part 430. The test is carried out at an ambient temperature is 32.3°C (90°F) with the doors closed and with the following target internal temperatures:

- 3.3°C (38°F) in the fresh food compartment of a refrigerator
- ≤ 7.22°C (45°F) in the fresh food compartment of a refrigerator-freezer;
- -9.4°C (15°F) in the freezer compartment for a refrigerator (Product Class 1);
- -15.0°C (5°F) in the freezer compartment for a refrigerator-freezer (Class 2 to 7);
- -17.8°C (0°F) for a separate freezer.

ii) México:

MEPS levels

MEPS for Mexican residential refrigerators are currently specified by NOM-015-ENER-1997, in effect since 1 August 1997. This NOM substituted the previous NOM-071-SCFI-1994 that had been in effect since 1 January 1995.

The current standard is basically identical to USDOE 1993 MEPS for residential refrigerator/freezers. Tests are even conducted at 115 Volts (instead of the 127 Volts as previously stipulated).

The NOM-015-ENER establishes MEPS limits for maximum yearly energy consumption as shown in Table 5. These limits are identical to those of USDOE 93.

Table 5. MEPS levels for refrigerators and freezers, México

	Description of Electric Refrigerators	Maximum energy
1	Refrigerators &Refrigerator–freezers by manual/semiauto defrost	0.476 VA + 299
2	Refrigerator – Freezers - partial automatic defrost	0.367 VA + 398
3	Refrigerator – Freezers - automatic defrost with top-mounted freezer without through-the-door ice service and all-refrigerators-automatic defrost.	0.564 VA + 355
4	Refrigerator – Freezers – automatic defrost with side-mounted freezer without through-the-door ice service.	0.416 VA + 501
5	Refrigerator – Freezers – automatic defrost with bottom-mounted freezer without through-the-door ice service.	0.582 VA + 367
6	Refrigerator – Freezers – automatic defrost with top-mounted freezer with through-the-door ice service.	0.620 VA + 391
7	Refrigerator – Freezers – automatic defrost with side-mounted freezer with through-the-door ice service.	0.575 VA + 527
8	Upright Freezers with manual defrost.	0.364 VA + 264
9	Upright Freezers with automatic defrost.	0.526 VA + 391
10	Chest Freezers with manual defrost.	0.388 VA + 160

Maximum energy consumption in kWh/year; VA = Adjusted volume in litres, Source: NOM-015-ENER-1997. MEPS levels above are identical to US DOE 1993 (see CFR430 Subpart C 430.32)

Test procedures

The test method for refrigerators and freezers in México is the same as CAN/CSA C300-M89 and US DOE CFR430 Subpart B Appendix A and B.

iii) USA:

MEPS levels

The MEPS regulations cover household refrigerators or refrigerator-freezers with a capacity of not more than 1100 L (39 cu ft), and freezers with a capacity of not more than 850 L (30 cu ft). Classes 1 to 10 in Table 6 were defined for the MEPS levels set under NAECA (which took effect on 1 January 1990) and those that took effect on January 1 1993.

For the new round of MEPS, which took effect on 1 July 2001, new classes of "compact" refrigerators and freezers have been defined. Compact refrigerators are those that are both less than 220 litres (7.75 cu ft) and less than 0.91 metres (36 inches) high.

MEPS levels for each product class are defined in terms of adjusted volume.

AV (Adjusted volume, cu ft) = Volume of fresh food compartment (cu ft) + (K × volume of freezer compartment (cu ft)).

The values of K are:

- 1.0 for a refrigerator without a freezing compartment;
- 1.44 for a single-door refrigerator with an internal freezing compartment
- 1.63 for a combination refrigerator-freezers
- 1.73 for a freezer.

Table 6: Refrigerator and Freezer categories, USA

Product Class	Description	Maximum annual energy consumption (kWh/yr)	
		Effective 1/1/93	Effective 7/1/01
1	Refrigerators and refrigerator-freezers with manual defrost	13.5 AV + 299	8.82 AV + 248.4
2	Refrigerator-freezers with partial automatic defrost	10.4 AV + 398	8.82 AV + 248.4
3	Refrigerator-freezers with automatic defrost with top-mounted freezer, no through-the-door ice service; and all refrigerators with automatic defrost	16.0 AV + 355	9.8 AV + 276
4	Refrigerator-freezers with automatic defrost with side-mounted freezer, no through-the-door ice service	11.8 AV + 501	4.91 AV + 501
5	Refrigerator-freezers with automatic defrost with bottom-mounted freezer, no through-the-door ice service	16.5 AV + 367	4.6 AV + 459
6	Refrigerator-freezers with automatic defrost with top-mounted freezer, and with through-the-door ice service	17.6 AV + 391	10.2 AV + 356
7	Refrigerator-freezers with automatic defrost with side-mounted freezer, with through-the-door ice service	16.3 AV + 527	10.1 AV + 406
8 (a)	Upright freezers with manual defrost	10.3 AV + 264	7.55 AV + 258.3
9 (a)	Upright freezers with automatic defrost	14.9 AV + 391	12.43 AV+ 326.1
10 (a)	Chest freezers and all other (non-compact) freezers	11.0 AV + 160	9.88 AV + 143.7
11 (b)	Compact Refrigerators and Refrigerator-Freezers with Manual Defrost	13.5 AV+ 299	10.70 AV+ 299.0
12 (b)	Compact Refrigerator-Freezer—partial automatic defrost	10.4 AV + 398	7.00 AV+ 398.0
13 (b)	Compact Refrigerator-Freezers automatic defrost with top-mounted freezer and compact all-refrigerators - automatic defrost	16.0 AV + 355	12.70 AV+ 355.0
14 (b)	Compact Refrigerator-Freezers - automatic defrost with side-mounted freezer	11.8 AV + 501	7.60 AV+ 501.0
15 (b)	Compact Refrigerator-Freezers - automatic defrost with bottom-mounted freezer	16.5 AV + 367	13.10 AV+ 367.0
16 (b)	Compact upright freezers with manual defrost	10.3 AV + 264	9.78AV + 250.8
17 (b)	Compact upright freezers with automatic defrost	14.9 AV + 391	11.4 AV + 152
18 (b)	Compact chest freezers	11.0 AV + 160	10.45 AV + 152

Source: CFR430, Subpart C, Clause 430.32. AV = Adjusted volume in cubic feet. (a) Not given a product class in Canadian regulations, but covered under “Freezers” (b) Compact products not separately defined under current Canadian regulations.

Test procedures

The test procedure is specified in CFR Part 430, Subpart B, Appendix A1. The test is carried out at an ambient temperature of 90°F (32.3°C) with the doors closed and with the following target internal temperatures:

- 38°F (3.3°C) in the fresh food compartment of a refrigerator or a refrigerator-freezer;
- 15°F (-9.4°C) in the freezer compartment for a refrigerator (Product Class 1);
- 5°F (-15.0°C) in the freezer compartment for a refrigerator-freezer (Class 2 to 7);
- 0°F (-17.8°C) for a separate freezer.

B. Central air conditioners and heat pumps

i) Canada:

a) Single-packaged central air conditioners and heat pumps

MEPS levels

The MEPS Regulations cover factory-assembled single-phase and three-phase single-package central air conditioners and heat pumps (air-sink and air-source only) with a rated cooling capacity of less than 19 kW (65,000 BTU/hr). The MEPS levels summarized in Table 7 became mandatory in February 1995 for single-phase units, and at the end of 1998 for three-phase units. The cooling SEER is the same as that adopted in the US in January 1993. The heating HSPF is less stringent than the US MEPS level.

Table 7: MEPS for single-package central air conditioners and heat pumps, Canada

Product Class/Function		Minimum SEER (a) (BTU/Wh)	Minimum HSPF (b) (BTU/Wh)
Air conditioners		9.7	
Heat pumps	Cooling mode	9.7	
	Heating mode (Region V)		5.7

Source: NRCan (1999) (a) SEER = Seasonal Energy Efficiency Ratio: total cooling output in BTU during nominal annual usage period for cooling divided by electric power input in Wh over the same period. (b) HSPF = Heating Seasonal Performance Factor: total heating output in BTU during nominal annual usage period for heating divided by electric power input in Wh over the same period.

Test procedures

The test procedure is in CAN/CSA-C656-M92, based on ARI 210/240-89 and ASHRAE 37-1988. US DOE climate region V is used to determine HSPF.

b) Split-system central air conditioners and heat pumps

MEPS levels

The MEPS Regulations cover factory-assembled single-phase and three-phase split-system central air conditioners and heat pumps (air-sink and air-source only) with a rated cooling capacity of less than 19 kW (65,000 BTU/hr). The MEPS levels summarized in

Table 8 became mandatory in February 1995 for single-phase heat pumps, and at the end of 1998 for the other units. The cooling SEER is the same as that adopted in the US in January 1992. The heating HSPF is less stringent than the US MEPS level.

Table 8: MEPS levels for single- and three-phase split-system central air conditioners and heat pumps, Canada

Product Class/Function		Minimum SEER (a) (BTU/Wh)	Minimum HSPF (b) (BTU/Wh)
Air conditioners		10.0	
Heat pumps	Cooling mode	10.0	
	Heating mode (Region V)		5.9

Source: NRCan (1999) (a) SEER = Seasonal Energy Efficiency Ratio: total cooling output in BTU during nominal annual usage period for cooling divided by electric power input in Wh over the same period. (b) HSPF = Heating Seasonal Performance Factor: total heating output in BTU during nominal annual usage period for heating divided by electric power input in Wh over the same period.

Test procedures

The test procedure is in CAN/CSA-C273.3-M91. North American climate region V is used to determine HSPF.

ii) México:

MEPS levels

NOM-011-ENER-1996 applies to central air conditioners since 8 February 1998. Central air conditioners with cooling capacities from 10.54 kW to 17.58 kW are subject to the MEPS requirements specified in Table 9. Both split and packaged electrical central air conditioners are included in this regulation provided they use mechanical compression, have an air to air evaporator and an air or water-cooled condenser. Heat pumps or central air conditioner units with an additional space heating capability are exempt.

Table 9. Central air conditioner MEPS requirements in México

Cooling capacity (W)	Minimum SEER (W/W) applicable from 8 Feb 1998
from 10540 to 17580	2.93

Source: NOM-011-ENER-1996, where SEER = seasonal energy efficiency ratio, this level is same as for US DOE SEER for “split system” central air conditioners (ie SEER = 10), see CFR430 Subpart C.

Table 10. Energy labelling classes for central air conditioners in México

Labelling class	Energy savings in percent (a)
arrow 1	0 %
arrow 2	10 %
arrow 3	20 %
arrow 4	30 %
arrow 5	40 %
arrow 6	50 % or more

Source: NOM-011-ENER-1996; (a) Compared to the minimum EER threshold specified.

Test procedures

The test method used is ANSI/ASHRAE 37. The tolerances and efficiency levels are identical to that used by USDOE.

iii) USA:

MEPS levels

NAECA and EP Act define a "central air conditioner" as a single-phase product, other than a "packaged terminal air conditioner", which is air-cooled, rated below 65,000 BTU/hr (19.1 kW) , and is not contained in the same cabinet as a furnace which is rated above 225,000 BTU/hr. It may be a cooling only unit or a heat pump.

The cooling MEPS requirements summarized in Table 11 became mandatory at the beginning of 1992 (for split systems) and 1993 (for single package systems).

Table 11: Old MEPS levels for central air conditioners and heat pumps, USA

Product Class	Minimum seasonal energy efficiency ratio (SEER) (d)		Heating seasonal performance factor (HSPF) (e)	
	BTU/Wh	W/W (a)	BTU/Wh	W/W (a)
Split systems	10.0 (b)	2.93	6.8 (b)	1.99
Single package systems	9.7 (c)	2.84	6.6 (c)	1.93

Source: CFR Part 430, Subpart C 430.32. (a) MEPS levels are specified in terms of SEER: Metric given for information only. (b) Effective January 1 1992 (c) Effective January 1 1993) (d) SEER = total cooling output in BTU during nominal annual usage period for cooling divided by electric power input in Wh over the same period. (e) HSPF = total heating output in BTU during nominal annual usage period for heating divided by electric power input in Wh over the same period.

A new residential central air conditioner and central air conditioning heat pump rule is currently in progress. The rule originally published in January 2001 stated that:

Central air conditioners and central air conditioning heat pumps manufactured on or after January 23, 2006, shall have Seasonal Energy Efficiency Ratio (SEER) and Heating Seasonal Performance Factor (HSPF) no less than the values shown in Table 12.

Table 12: New MEPS levels for central air conditioners and heat pumps, USA

Product Class	SEER	HSPF
Split system air conditioners	13	----
Split system heat pumps	13	7.7
Single package air conditioners	13	----
Single package heat pumps	13	7.7
Space constrained products	[reserved]	[reserved]

On July 25, 2001, The U.S. Department of Energy published a supplemental proposed rule and proposed withdrawal of final rule to consider amending the conservation standards for residential central air conditioners and heat pumps.

Test procedures

The test procedure is in 10 CFR 430 Subpart B, Appendix M, which refers to ARI 310/380-93, and ARI 210/240-94 (applies to split-system room air conditioner).

C. Room air conditioners

i) Canada:

MEPS levels

The Regulations cover single-phase air conditioners that are not "packaged terminal air conditioners" with a cooling capacity up to 10.55 kW (36,000 BTU/hr). Products with and without louvred sides are defined as distinct categories.

The MEPS requirements for air conditioners, summarized in Table 13, were adopted in February 1995. They are identical with those that became effective in the US in January 1990.

Table 13: MEPS levels for air conditioners, Canada

	Cooling capacity range	**Minimum EER (BTU/Wh)**	**Minimum EER (W/W)(a)**
Units with louvred sides	Less than 6,001 BTU/hr (1.76 kW)	8.0	2.34
	6,001 – 7,999 BTU/hr (1.76-2.34 kW)	8.5	2.49
	8,000 – 13,999 BTU/hr (1.76-4.10 kW)	9.0	2.64
	14,000 – 19,999 BTU/hr (4.10-5.86)	8.8	2.58
	20,000 – 36,000 BTU/hr (4.10-10.55 kW)	8.2	2.40
Units without	Less than 5,999 BTU/hr (1.76 kW)	8.0	2.34
	6,000 – 19,999 BTU/hr (1.76-5.86 kW)	8.5	2.49

louvred sides	20,000 – 36,000 BTU/hr (5.86-10.55 kW)	8.2	2.40

Source: NRCan (1999) (a) MEPS levels specified in terms of Btu/Wh: Metric given for information.

Test procedures

The test procedure is in CAN/CSA-C368.1-M90. It is based on ASHRAE standard 90-1-1989, which is also used in the USA. A new edition of this procedure will be issued soon.

In late 2001 or early 2002, Canada will be implementing increased TP levels for room air conditioners. This would essentially bring Canada in line with the US rule effective October 2000. The new Canadian levels will be effective in 2002.

ii) México:

MEPS levels

The law in force is NOM-021-ENER/SCFI/ECOL-2000 on energy efficiency and safety requirements for the use and elimination of chlorofluorocarbons (CFC's) in room air conditioners. This law, which includes limits, test procedures, and labeling, was published on April 24, 2001 and entered into effect on June 23 of 2001. This law replaces the previous room air conditioner law, NOM-073-SCFI-1994.

Room air conditioners with or without heating devices, are classified by their cooling capacity, as well as their specific design characteristics, as shown in the Table 14:

Table 14: Classifications for room air conditioners, México

Type	Class	Cooling Capacity
Without inverse cycle and with lateral grooves	1	Less than or equal to 1 758
	2	between 1 759 and 2 343
	3	between 2 344 and 4 101
	4	between 4 102 and 5 859
	5	between 5 860 and 10 600
Without inverse cycle and without lateral grooves	6	Less than or equal to 1 758
	7	between 1 759 and 2 343
	8	between 2 344 and 4 101
	9	between 4 102 and 5 859
	10	between 5 860 and 10 600
With inverse cycle and with lateral grooves	11	Less than or equal to 5 859
	13	between 5 860 and 10 600
With inverse cycle and without lateral grooves	12	Less than or equal to 4 101
	14	between 4 102 and 10 600

Console-type room air conditioners should be located according to their cooling capacity within classes 6 to 10, if they do not have an inverse cycle, and within classes 12

and 14 if they do have an inverse cycle.

The energy efficiency of the air conditioners referred to in this law is specified using the "Relación de Eficiencia Energética" (REE). The equipment subject to this law must have an REE value greater than or equal to the values specified in Table 15. The manufacturer must include on the label the value of the REE in W/W.

Table 15. REE Values (W/W)

Class	REE
1	2,84
2	2,84
.3	2,87
4	2,84
5	2,49
6	2,64
7	2,64
8	2,49
9	2,49
10	2,49
11	2,64
12	2,49
13	2,49
14	2,34

Test procedures

The test procedure used for determining equipment efficiency follows ANSI/ASHRAE-16-1988 and is also the same as US DOE CFR430.

iii) USA:

MEPS levels

The Regulations cover single-phase air conditioners that are not "packaged terminal air conditioners". Products with and without louvred sides are defined as distinct categories, as indicated in Table 16. The existing MEPS levels were introduced on 1 January 1990. More stringent levels were published in October 1997 and took effect on 1 October 2000. New product categories for units designed to be installed in casement windows (narrow vertical windows) also were added.

The MEPS requirements for each air conditioner category are summarized in Table 16. The MEPS requirements apply to cooling performance only, although different cooling MEPS may apply if the product heats as well as cools.

Table 16: MEPS levels for room air conditioners, USA

	Product Class: Reverse Cycle?	**Cooling capacity range**	**1990 Min EER (BTU/ Wh)**	**1990 Min EER (W/W) (a)**	**2000 Min EER (BTU/ Wh)**	**2000 Min EER (W/W) (a)**
Units with louvred sides	1. No	Less than 6,001 BTU/hr (<1.76 kW)	8.0	2.34	9.7	2.84
	2. No	6,001 – 7,999 BTU/hr (1.76 -2.34 kW)	8.5	2.49	9.7	2.84
	3. No	8,000 – 13,999 BTU/hr (2.34 -4.10 kW)	9.0	2.64	9.8	2.87
	4. No	14,000 – 19,999 BTU/hr (4.10-5.86)	8.8	2.58	9.7	2.84
	5. No	≥ 20,000 BTU/hr (≥5.86 kW)	8.2	2.40	8.5	2.49
	11. Yes	< 20,000 BTU/hr (<5.86 kW)	8.5	2.49	9.0	2.64
	13. Yes	≥ 20,000 BTU/hr (≥5.86 kW)	8.5	2.49	8.5	2.49
Units without louvred sides	6. No	Less than 6,000 BTU/hr (<1.76 kW)	8.0	2.34	9.0	2.64
	7. No	6,000 – 7,999 BTU/hr (1.76 - 2.34 kW)	8.5	2.49	9.0	2.64
	8. No	8,000 – 13,999 BTU/hr (2.34 - 4.10 kW)	8.5	2.49	8.5	2.49
	9. No	14,000 – 19,999 BTU/hr (4.10 -5.86 kW)	8.5	2.49	8.5	2.49
	10. No	≥ 20,000 BTU/hr (≥5.86 kW)	8.2	2.40	8.5	2.49
	12. Yes	< 20,000 BTU/hr (<5.86 kW)	8.0	2.34	8.5	2.49
	14. Yes	≥ 20,000 BTU/hr (≥5.86 kW)	8.0	2.34	8.5	2.49
	15. Casement-only		(b)		8.7	2.55
	16. Casement-slider		(b)		9.5	2.78

Source: 10CFR430 Subpart C Part 430.32 (a) MEPS levels are specified in terms of EER: EER metric given for information only. (b) New classification introduced for 2001 MEPS.

Test procedures

The test procedure is in Part CFR 430 Subpart B, Appendix F, referencing ANSI/AHAM RAC-1-82, ASHRAE 16-83-RA88 and ASHRAE 90-1-1989.

D. Other categories of Air Conditioners and Heat Pumps

i) Canada

a) Packaged terminal air conditioners and heat pumps

MEPS levels

The Regulations cover factory-assembled packaged terminal air conditioners and heat pumps intended for use in residential, commercial and industrial heating and cooling systems.

The MEPS requirements summarized in Table 17 became mandatory at the end of 1998.

Table 17: MEPS for packaged terminal air conditioners and heat pumps, Canada

Product Class	Minimum EER (BTU/Wh)	Minimum COP (W/W)
Cooling	9.115 – 0.0000638 x CAPc	
Heating		2.75-0.00001 x CAPh

Source: NRCan (1999) CAPc = sensible and latent cooling capacity in BTU/hr
CAPh = heating capacity in BTU/hr

Test procedures

The test procedure is in CAN/CSA-C744-93, which is identical to ARI-310/380-93.

Canada is working toward publication of a new edition of the Joint Standard for packaged terminal air conditioners and heat pumps with ARI 310/380, through the recognized standard development process.

b) Large air conditioners, heat pumps and condensing units

MEPS levels

The Regulations cover factory-assembled commercial and industrial unitary air conditioners, heat pumps and air-conditioning condensing units with a cooling capacity of between 19 kW (65,000 BTU/hr) and 73 kW (250,000 BTU/hr).

The MEPS requirements summarized in Table 18 became mandatory at the end of 1998.

Table 18: MEPS for large air conditioners, heat pumps and condensing units, Canada

ARI(a) Type classification	Cooling capacity range, kW (BTU/hr)	EER	COP at 8.3°C	COP at -8.3°c	IPLV (b)
SP-A, RC-A	>19≤40 (65,000-135,000)	8.9			8.3
	>40<73 (135,000-250,000)	8.5			7.5

RCU-A-C	>19≤40 (65,000-135,000)	8.9			8.3
SPY-A, RCY-A	>19≤40 (65,000-135,000)	8.9			8.3
	>40<73 (135,000-250,000)	8.3			7.5
RCU-A-CB, RCUY-A-CB	>19≤40 (65,000-135,000)	8.9			8.3
	>40<73 (135,000-250,000)	8.3			7.5
SP-E, SP-W, RC-E, RC-W	>19≤40 (65,000-135,000)	10.5			9.7
	>40<73 (135,000-250,000)	9.6			9.0
SPY-E,SPY-W,RCY-E,RCY-W	>19≤40 (65,000-135,000)	10.5			9.7
	>40<73 (135,000-250,000)	9.6			9.0
RCU-E-C,RCU-W-C	>19≤40 (65,000-135,000)	10.5			9.7
RCU-E-CB,RCU-W-CB, RCUY-E-CB,RCUY-W-CB	>40<73 (135,000-250,000)	9.6			9.0
HSP-A	>19≤40 (65,000-135,000)	8.9	3.0	2.0	8.3
	>40<73 (135,000-250,000)	8.5	2.9	2.0	7.5
HRC-A-C,HRCU-A-C,HRC-A-CB	>19≤40 (65,000-135,000)	8.9	3.0	2.0	8.3
HRCU-A-CB	>19≤40 (65,000-135,000)	8.9	3.0	2.0	8.3
	>40<73 (135,000-250,000)	8.3	2.9	2.0	7.5.
RCU-E,RCU-W	>40<73 (135,000-250,000)	12.9			12.9
RCU-A	>40<73 (135,000-250,000)	9.9			11.0

Source: NRCan (1999) (a) Air-Conditioning and Refrigeration Institute. (b) Integrated Part Load Value: a single number "figure of merit" which represents part-load efficiency. Its calculation for each product type is described in the test standard.

Test procedures

The test procedure is in CAN/CSA-C746-98.

c) Internal water-loop heat pumps

MEPS levels

The Regulations cover water-source heat pumps that are factory-built single packages or split-system matching assemblies that are intended for installation in internal water-loop systems and which do not exceed 40 kW (135,000 BTU/hr) in cooling or heating capacity.

The MEPS levels summarized in Table 19 became mandatory in February 1998.

Table 19: MEPS levels for internal water-loop heat pumps, Canada

Product Class/Function	Minimum EER (BTU/Wh)	Minimum COP (W/W)
Cooling	10.0	2.9 (a)

Heating		3.8 (b)

Source: NRCan (1999) (a) Cooling MEPS is expressed in BTU/WH; COP value is calculated for information only. (b) Excludes any supplementary heat.

Test procedures

The test procedure is in CAN/CSA-C655-M91.

d) Ground- or water-source heat pumps

MEPS levels

The Regulations cover factory-built ground- or water-source heat pumps intended for use in open- or closed-loop ground- or water-source systems. They may be single packages or split-systems matching assemblies rated at a capacity of less than 35 kW (120,000 BTU/hr).

The MEPS levels summarized in Table 20 became mandatory in February 1995.

Table 20: Energy efficiency levels for ground- or water-source heat pumps, Canada

Product Class/Function		Minimum EER (BTU/Wh)	Minimum EER (W/W)
Cooling	All units (10°C)	11.0	3.2(a)
	Closed loop (25°C)	10.5	3.1(a)
Heating	All units (10°C)	NA	3.0(b)
	Closed loop (0°C)	NA	2.5(b)

Source: NRCan (1999) (a) Both units actually given in Regulations (b) Excludes supplementary heat.

Test procedures

The test procedure is in CAN/CSA-C446-94.

ii) USA:

a) Small commercial package air conditioning and heating equipment

MEPS levels

The Regulations cover air-cooled, water-cooled, evaporatively-cooled or water source (not including ground water source) electrically operated, unitary central air conditioners and central air conditioning heat pumps for commercial applications which are rated below 135,000 BTU/hr (39.6 kW) cooling capacity

The MEPS requirements summarised in Table 21 took effect for equipment manufactured on or after January 1 1994.

Table 21: MEPS levels for small commercial package air conditioners and heat pumps, USA

Product Class	Minimum EER	Minimum EER	Minimum SEER	Minimum HSPF

	(Btu/Wh)	(W/W)	(Btu/Wh)	(W/W)	(Btu/Wh)	(W/W)
Air-cooled, 3-phase, split system, cooling capacity < 65,000 BTU/hr (19.1 kW)			10.0 (a)	2.93	6.8(a)	1.99
Air-cooled, 3-phase, single package, cooling capacity < 65,000 BTU/hr (19.1 kW)			9.7 (a)	2.84	6.6(a)	1.93
Air cooled, cooling capacity 65,000 – 135,000 BTU/hr (19.1 – 39.6 kW)	Cooling 8.9 (a) Heating 10.2	Cooling 2.61 Heating 3.0 (a)				
Water–cooled, evaporatively–cooled and water-source, cooling capacity < 65,000 BTU/hr (19.1 kW)	Cooling 9.3 (a) Heating 13.0	Cooling 2.73 Heating 3.8 (a)				
Water–cooled, evaporatively–cooled and water-source, cooling capacity 65,000 – 135,000 BTU/hr (19.1 – 39.6 kW)	Cooling 10.5(a) Heating 13.0	Cooling 3.08 Heating 3.8 (a)				

Source: AHAM (1993) (a) MEPS levels are specified in terms of Btu/Wh: conversion to other units given for information only.

Test procedures

The test procedure specified in the Energy Policy Act (1992) is ASHRAE 90.1, which in turn specifies a number of ANSI and ARI standards as the test methods. Chapter 10 of ASHRAE 90.1 provides details.

b) Large commercial package air conditioning and heating equipment

MEPS levels

The Regulations cover air-cooled, water-cooled, evaporatively-cooled or water source (not including ground water source) electrically operated, unitary central air conditioners and central air conditioning heat pumps for commercial applications which are rated at between 135,000 and 250,000 BTU/hr cooling capacity (39.5kW to 73.2kW).

The MEPS requirements summarized in Table 22 took effect for equipment manufactured on or after January 1 1995.

Table 22: MEPS levels for large commercial package air conditioners and heat pumps, USA

Product Class	**Minimum EER**	**Minimum EER**
	(BTU/Wh)	(W/W)
Air-cooled, cooling capacity 135,000 – 250,000 BTU/hr (39.6 – 73.3 kW)	Cooling 8.5 (a) Heating 9.9	Cooling 2.49 Heating 2.9 (a)

Water–cooled, evaporatively–cooled cooling capacity 65,000 – 135,000 BTU/hr (19.1 – 39.6 kW)	Cooling 8.9 (a)	Cooling 2.61

Source: AHAM (1993) (a) MEPS levels are specified in terms of Btu/Wh: conversion to other units given for information only.

Test procedures

The test procedure specified in the Energy Policy Act (1992) is ASHRAE 90.1, which in turn specifies a number of ANSI and ARI standards as the test methods. Chapter 10 of ASHRAE 90.1 provides details.

c) Packaged terminal air conditioners and heat pumps

MEPS levels

The term "packaged terminal air conditioner" means a wall sleeve and a separate encased combination of heating and cooling assemblies specified by the builder and intended for mounting through the wall. It includes a prime source of refrigeration, separable outdoor louvres, forced ventilation and either hot water, steam, or electricity as a heat source. A "packaged terminal heat pump" means a packaged terminal air conditioner on which reverse cycle refrigeration is the prime heat source, and either hot water, steam, or electricity is a supplementary heat source.

Each packaged terminal air conditioner and packaged terminal heat pump manufactured on or after January 1, 1994, shall meet the following standard levels:

(A) The minimum energy efficiency ratio (EER) of packaged terminal air conditioners and packaged terminal heat pumps in the cooling mode shall be 10.0 - (0.16 × Capacity (in thousands of Btu per hour at a standard rating of 95 degrees F DB, outdoor temperature)). If a unit has a capacity of less than 7,000 Btu per hour (2.05kW), then 7,000 Btu per hour shall be used in the calculation. If a unit has a capacity of greater than 15,000 Btu per hour (4.4kW), then 15,000 Btu per hour shall be used in the calculation.

(B) The minimum coefficient of performance (COP) of packaged terminal heat pumps in the heating mode shall be 1.3 + (0.16 × the minimum cooling EER as specified in subparagraph (A)) (at a standard rating of 47 degrees F DB).

Test procedures

The test procedure specified in the Energy Policy Act (1992) is ASHRAE 90.1, which specifies a number of ANSI and ARI standards as the test methods. Chapter 10 of ASHRAE 90.1 provides details.

d) Commercial unitary AC and commercial packaged terminal AC

MEPS levels

DOE is currently required to consider new standards for both commercial unitary AC and commercial packaged terminal AC. It is not clear what will happen with these rules.

Test procedures

A new test procedure is in progress for commercial air conditioners. It references

existing ASHRAE 90.1 test procedures, with some modifications.

E. Clothes washers and dryers

i) Canada:

MEPS levels

The Regulations cover:

- standard (≥ 45 L) or compact (<45 L) electrically operated household automatic clothes washers that are top- or front-loaded (but excluding wringer washers, twin-tub washers and spinners);
- standard (≥ 125 L) and compact (<125 L) electrically operated and electrically heated household tumble-type clothes dryers;
- integrated over/under washer-dryers, where the clothes dryer is located either above or below the clothes washer. The appliances have only one power source and controls on either the washer or dryer.

The minimum "energy factors" (EF) for clothes washers are expressed in litres capacity/kWh per cycle. The criteria, shown in Table 23, took effect in May 1995. The minimum EF for clothes dryers are expressed in kg load capacity/kWh per cycle. The criteria, shown in Table 24, took effect in May 1995 for standard dryers and the end of 1998 for compact dryers. The Canadian washer and dryer standards are identical to the US standards which took effect in May 1994.

The minimum energy factors for the washer and dryer components of integrated washer-dryers, which also came into effect in May 1995, are identical with those for separate clothes washers and for standard dryers. (There are no specified minimum energy factors for compact dryers if part of an integrated washer-dryer.)

Table 23: Minimum energy standards for clothes washers, Canada

Product Class	Minimum EF	
	L/kWh/cycle	cu ft/kWh/cycle
Compact (< 45 L capacity)	25.48	0.90
Standard (≥ 45 L capacity)	33.41	1.18

Source: NRCan (1999)

Table 24: Minimum energy standards for clothes dryers, Canada

Product Class		Minimum EF	
		kg/kWh	lbw/kWh
Compact (< 125 L capacity)	120 V	1.42	3.13
	240 V	1.31	2.90
Standard (≥ 125 L capacity)		1.36	3.01

Source: NRCan (1999)

Test procedures

The clothes washer tests are in CAN/CSA-C360-98, and the clothes dryer tests are in CAN/CSA-C361-92. These were essentially identical to the US 10CFR Part 430 requirements, until the new US test procedure was published in 2000.

Test procedure update

Canada is working toward the publication of a new edition of the national clothes dryer standard (C361) and investigating the adoption of the IEC standard, through the recognized standards development process. Canada is also working toward the publication of a new edition of the national clothes washer standard (C360), which is intended to harmonize with the recent USDOE modifications and minimum efficiency levels.

ii) México: Clothes washers

MEPS levels

The law in force is NOM-005-ENER-2000: Energy efficiency of domestic clothes washers. This law, which includes limits, test methods, and labeling, was published on August 28, 2000, and went into effect on October 26, 2000.

Table 25 shows the MEPS for clothes washers.

Table 25. Levels of maximum permissible energy consumption [kWh/yr] for residential clothes washers, México

Type and Capacity		Manual	Semiautomatic	Automatic
Impulsor	Less than 4,0 kg of clothes	24	26	70
	From 4,0 to 6,0 kg of clothes	24	30	70
	From 6,0 to 10,0 kg of clothes	30	30	120
	10,0 kg of clothes and up			120
Agitator	Less than 4,0 kg of clothes	40	48	100
	From 4,0 to 6,0 kg of clothes	55	120	100
	From 6,0 to 8,0 kg of clothes	100	175	175
	From 8,0 to 10,0 kg of clothes	100	175	218
	10,0 kg of clothes and up	130	200	250
Drum	Less than 4,0 kg of clothes			120
	From 4,0 to 6,0 kg of clothes			150
	6,0 kg of clothes and up			200
Drum Element Heater	Less than 4,0 kg of clothes			360
	From 4,0 to 6,0 kg of clothes			450
	6,0 kg of clothes and up			600

iii) USA:

MEPS levels

The Regulations cover:

- Top-loading standard (≥1.6 ft^3) or compact (<1.6 ft^3) electrically operated household automatic clothes washers; top-loading semi-automatic, front loading and suds saving types do not have a MEPS level, but are required to have an unheated rinse water option;
- standard (≥ 4.4 ft^3) and compact (<4.4 ft^3) electrically operated and electrically heated household tumble-type clothes dryers (gas dryers, which are outside the scope of the present study, are also covered).

The minimum "energy factors" (EF) for clothes washers are expressed in cubic foot capacity/kWh per cycle.

According to the rule published on January 12 2001, clothes washers shall have a modified energy factor no less than the values shown in Tables 26 and 27.

Table 26: MEPS for clothes washers manufactured 2004-2007, USA

Clothes washers manufactured on or after January 1, 2004 and before January 1, 2007, shall have a modified energy factor no less than:

Product Class	Modified Energy Factor (cu.ft./kWh/cycle)
i. Top-Loading, Compact (less than 1.6 ft.^{3} capacity).	0.65
ii. Top-Loading, Standard (1.6 ft.^{3} or greater capacity).	1.04
iii. Top-Loading, Semi-Automatic.	Not Applicable.[1]
iv. Front-Loading	1.04
v. Suds-saving	Not Applicable.[1]

[1] Must have an unheated rinse water option

Table 27: MEPS for clothes washers manufactured 2007 and after, USA

Clothes washers manufactured on or after January 1, 2007 shall have a modified energy factor no less than:

Product Class	Modified Energy Factor (cu.ft./kWh/cycle)
i. Top-Loading, Compact (less than 1.6 ft.^{3} capacity).	0.65
ii. Top-Loading, Standard (1.6 ft.^{3} or greater capacity).	1.26
• Top-Loading, Semi- • Automatic.	Not Applicable.[1]
iv. Front-Loading	1.26
v. Suds-saving	Not Applicable.[1]

[1] Must have an unheated rinse water option

The minimum EF for clothes dryers are expressed in cubic foot load capacity/kWh (also measured per cycle). The criteria for clothes dryers are shown in Table 28.

Table 28: MEPS for clothes dryers, USA

Product Class		Minimum EF	
		kg/kWh	lb/kWh(a)
Compact (<4.4 ft^3 (125 L) capacity)	120 V	1.42	3.13
	240 V	1.31	2.90
Standard (>= 4.4 ft^3 (125 L) capacity)		1.36	3.01

Source: CFR430, Subpart C (a) MEPS expressed in these units – other included for information only.

Test procedures

The clothes washer tests are in CFR Part 430 Subpart B Appendix J1. Clothes dryer test procedures are in CFR Part 430 Subpart B Appendix D which references AHAM HLD-1.

F. Dishwashers

i) Canada:

MEPS levels

The Regulations cover electrically operated automatic household dishwashers that are not commercial, industrial, or institutional machines.

The minimum energy factor (EF) requirements, expressed in cycles/kWh, are shown in Table 29. They took effect in February 1995, and are identical with the US dishwasher standards that took effect in May 1994.

Table 29: Minimum energy standards for dishwashers, Canada

Product Class	Minimum EF (cycles/kWh)
Compact (exterior width < 56 cm/22 in)	0.62
Standard (exterior width ≥ 56 cm/22 in)	0.46

Source: NRCan (1999)

Test procedures

The dishwasher tests are in CAN/CSA-C373-92. These are essentially identical to the US 10CFR Part 430 requirements.

ii) USA:

MEPS levels

The Regulations cover electrically operated automatic household dishwashers that are not commercial, industrial, or institutional machines.

The minimum energy factor (EF) requirements, expressed in cycles/kWh, in Table 30 took effect on 14 May 1994.

The EnergyGuide labels for dishwashers indicates the kWh used for 322 cycles per year.

Table 30: Minimum energy standards for dishwashers, USA

Product Class	Minimum EF (cycles/kWh)
Compact (exterior width < 22 in (56 cm))	0.62
Standard (exterior width ≥ 22 in (56 cm))	0.46

Source: CFR430, Subpart C (1998)

Test procedures

The dishwasher tests are in CFR Part 430 Subpart B Appendix C, which references AHAM DW-1.

G. Fluorescent lamp ballasts

i) Canada:

MEPS levels

The Regulations cover lamp ballasts for design voltages of 120, 277 and 347 V, and intended to operate with the lamp types listed in Table 31.

The minimum efficiency standards in Table 31 are expressed in terms of ballast efficacy factors. The ballast efficacy factor (BEF) is determined as the ratio of the relative light output of the test ballast/reference lamp combination (in comparison with the reference lamp/ballast system) divided by the total system power. The relative light output is defined as the ratio of the light output of the test system to the light output of the reference system (expressed as 100 when they are equal).

The higher the BEF ratio, the higher the efficiency of the ballast under test. The standards in Table 30, which took effect in February 1995, were similar to the US standards for the same products, which took effect in 1990, with the additional coverage of 4 foot T8's and 347 V ballasts.

Table 31: Energy efficiency standards, fluorescent lamp ballasts, Canada

Application for operation of:	Ballast input voltage	Total nominal lamp watts (a)	Minimum ballast efficacy factor
One F40T12 lamp (also 34W/48T12/RS and 40W/48T10/RS lamps)	120 V	40 W	1.805
	227 V	40 W	1.805
	347 V	40 W	1.750
Two F40T12 lamps (also 34W/48T12/RS and 40W/48T10/RS lamps)	120 V	80 W	1.060
	227 V	80 W	1.050
	347 V	80 W	1.020
Two F96T12 lamps (also 60W/96T12/IS)	120 V	150 W	0.570
	227 V	150 W	0.570
	347 V	150 W	0.560
Two 110W F96T12HO lamps (also 95W/96T12/HO lamps)	120 V	226 W	0.390
	227 V	226 W	0.390
	347 V	226 W	0.380
Two F32T8 lamps	120 V	64 W	1.250
	227 V	64 W	1.250
	347 V	64 W	1.250

Source: NRCan (1990)

Test procedures

The test standard is CAN/CSA-C654-M91

MEPS update

In late 2001 or early 2002, Canada will be amending the Energy Efficiency Regulations for fluorescent ballasts. Minimum levels for fluorescent ballasts will be increased to match the levels scheduled to take effect in the US in 2005 and 2010. The test procedure will remain CSA-C654-M91 (Amended 2001).

ii) México

Mexico does not have a mandatory energy efficiency standard for ballasts, but two general voluntary standards cover these equipment:

- NMX-J-156-ANCE. Electrical products: Electromagnetic ballasts for the quality and function of fluorescent lamps; and
- NMX-J-198- ANCE. Electrical products: Fluorescent lamp ballasts – measurement methods

iii) USA:

MEPS levels

The Regulations cover lamp ballasts for design voltages of 120 and 277 V, and intended to operate with the lamp types listed in Table 32.

The minimum efficiency standards are expressed in terms of ballast efficacy factors. The ballast efficacy factor (BEF) is determined as the ratio of the relative light output of the test ballast/reference lamp combination (in comparison with the reference lamp/ballast system) divided by the total system power. The relative light output is defined as the ratio of the light output of the test system to the light output of the reference system (expressed as 100 when they are equal). The higher the ratio, the higher the efficiency of the ballast under test.

The ballast standard, published September 19, 2000, stipulates that each fluorescent lamp ballast manufactured on or after April 1, 2005, sold by the manufacturer on or after July 1, 2005, or incorporated into a luminaire by a luminaire manufacturer on or after April 1, 2006; and designed:

- To operate at nominal input voltages of 120 or 277 volts;
- To operate with an input current frequency of 60 Hertz; and
- For use in connection with an F40T12, F96T12, or F96T12HO lamps;

shall have a power factor of 0.90 or greater and shall have a ballast efficacy factor not less than the following:

Table 32: MEPS for fluorescent lamp ballasts, USA

Application for Operation of	Ballast Input voltage	Total nominal lamp watts	Ballast efficacy factor
One F40 T12 lamp	120	40	2.29
	277	40	2.29
Two F40 T12 lamps	120	80	1.17
	277	80	1.17
Two F96T12 lamps	120	150	0.63
	277	150	0.63
Two F96T12HO lamps	120	220	0.39
	277	220	0.39

This standard does not apply to:

. A ballast that is designed for dimming to 50 percent or less of its maximum output;

. A ballast that is designed for use with two F96T12HO lamps at ambient temperatures of –20 degrees F or less and for use in an outdoor sign;

. A ballast that has a power factor of less than 0.90 and is designed and labeled for use only in residential building applications; or

. A replacement ballast.

A replacement ballast is defined as a ballast that:

- Is manufactured on or before June 30, 2010;
- Is designed for use to replace an existing ballast in a previously installed luminaire;
- Is marked "FOR REPLACEMENT USE ONLY";
- Is shipped by the manufacturer in packages containing not more than 10 ballasts;
- Has output leads that when fully extended are a total length that is less than the length of the lamp with which it is intended to be operated; and
- Meets or exceeds the ballast efficacy factor in the following table:

Table 33: Efficacy factors for replacement fluorescent lamp ballasts, USA

Application for Operation of	Ballast Input voltage	Total nominal lamp watts	Ballast efficacy factor
One F40 T12 lamp	120	40	1.805
	277	40	1.805
Two F40 T12 lamps	120	80	1.060
	277	80	1.050
Two F96T12 lamps	120	150	0.570
	277	150	0.570
Two F96T12HO lamps	120	220	0.390
	277	220	0.390

Test procedures

The test procedures are specified in DOE 10CFR430.27 Appendix Q which references ANSI C78.1 and ANSI C-82.2.

H. Fluorescent lamps

i) Canada:

MEPS levels

The Regulations apply to the four main categories of general service fluorescent lamps described in Table 34 and exclude coloured, cold-temperature, reprographic and certain other special purpose lamps.

The minimum efficacy levels specified in Table 34 took effect on 1 February 1996. They are identical to the minimum requirements for the same product classes that took effect in the US in 1994 and 1995.

Table 34: Energy efficiency standards, general service fluorescent lamps, Canada

Lamp type	Nominal lamp wattage	Minimum average CRI (a)	Minimum average lamp efficacy (lumens/W)

1200 mm (48 in) straight, medium bi-pin base, rapid-start, nominal power >=28W	>35 W	69	75.0
	≤ 35 W	45	75.0
560–635 mm (22–25 in) U-shaped, recessed double-contact base nominal power >=28W	>35 W	69	68.0
	≤ 35 W	45	64.0
2400 mm (96 in) straight, recessed double-contact base, rapid start, high output nominal power >=95W	>100 W	69	80.0
	≤ 100 W	45	80.0
2400 mm (96 in) straight, single pin base, instant start, high output nominal power >=52W	>65 W	69	80.0
	≤ 65 W	45	80.0

Source: NRCan (1999) (a) CRI = Colour Rendering Index

Test procedures

The test procedures are in CSA C819-95, referring to American National Standards Institute (ANSI) standards ANSI C78.1, C78.3, C78.385, C82.3, International Commission in Illumination (CIE) standard CIE 13.3, and Illuminating Engineering Society of North America (IES) standards IES LM9, LM16, LM40, LM54 and LM58.

ii) México: CFLs

MEPS levels

NOM-017-ENER-1997 applies to compact fluorescent lamps and the ballasts used in them up to 28 watts total circuit power. The NOM took effect on 1 January 1999. The CFLs are tested using the procedure given by NMX-J-295-ANCE. Table 35 and Table 36 show the minimum efficacy values required for CFL lamps and their ballasts, respectively.

Table 35: Minimum efficacy values for CFLs, México

Designation	Nominal power (W)	Nominal voltage of operation (V)	Nominal current of operation (mA)	Base	Bulb	Minimum efficacy (lm/W)
5W/5T4/T/G23/PH	5	38	180	G23	T-4	38
7W/5T4/T/G23/PH	7	45	180	G23		50
9W/6T4/T/G23/PH	9	59	180	G23		55
13W/T4/T/GX23/PH	13	59	285	GX23		52.5
9W/4T4/Q/G23-2/PH	9	59	180	G23-2	T-4	51
13W/5T4/Q/GX232/PH	13	59	285	G23-2		52
18W/7T4/Q/G24/PH	18	100	220	G24d-2		60.5
26W/8T4/Q/G24/PH	26	105	325	G24d-3		61.5

Nominal power, voltage, and current are specified to identify lamps. Source: NOM-017-ENER-1997.

Table 36: Minimum ballast efficacy values for CFLs, México

Nominal Power Rating of the Lamp (W)	Minimum ballast factor (%)	Minimum BEF
7	92.5	9.00
9		7.80
13		5.10
18 (108 V_{OCV})		4.00
18 (198 V_{OCV})		3.30
26		2.50

BEF = ballast efficacy factor. Source: NOM-017-ENER-1997. Ballast factor = power factor

Test procedures

The lamp efficacy is determined using NMX-J-295-ANCE, while the ballast efficacy is determined using NMX-J-156-ANCE. NOM-017-ENER-1997 is partly based on IEC60901-1987, as amended in 1989 and 1992.

The Energy Secretariat and the Federal Consumer Advocate are the authorities in charge of the verification and certification that CFLs and ballasts sold comply with this standard.

iii) USA:

a) Compact fluorescent lamps
MEPS levels

The Regulations apply medium base compact fluorescent lamps, which are integrally ballasted fluorescent lamp with a medium screw base and a rated input voltage of 115 to 130 volts and which is designed as a direct replacement for a general service incandescent lamp.

The following information must be included in a "principal display panel" on the lamp package:

- The number of lamps included in the package, if more than one;
- The design voltage of each lamp included in the package, if other than 120V:
- The light output of each lamp included in the package in average initial lumens;
- The electrical power consumed by each lamp in the package, in average initial wattage;
- The life of each lamp included in the package, in hours.

CFR Part 305 specifies the layout and size of the principal display panel, and also specifies the wording of warning messages about deterioration in performance or life of compact fluorescent lamps is operated outside the design voltage.

Test procedures

The standard to be used for measuring light output is IES LM 66, and the standard to be used for measuring operating life is IES LM 40.

b) Fluorescent lamps
MEPS levels

The Regulations apply to the four main categories of general service fluorescent lamps described in Table 36 and exclude colored, cold-temperature, reprographic and certain other special purpose lamps.

The minimum efficacy levels specified in Table 37 took effect in 1994 and 1995.

Table 37: MEPS for general service fluorescent lamps, USA

Lamp type	Nominal lamp wattage	Minimum average CRI (a)	Minimum average lamp efficacy (lumens/W)
4 foot (1200 mm) straight, medium bi-pin base, rapid-start, nominal power >=28W	>35 W	69	75.0 (b)
	≤ 35 W	45	75.0 (b)
2 foot (22–25 in; 560–635 mm) U-shaped, recessed double-contact base nominal power >=28W	>35 W	69	68.0 (b)
	≤ 35 W	45	64.0 (b)
8 foot (2400 mm) high output: straight, recessed double-contact base, rapid start, nominal power >=95W	>100 W	69	80.0 (c)
	≤ 100 W	45	80.0 (c)
8 foot (2400 mm) slimline: straight, single pin base, instant start, nominal power >=52W	>65 W	69	80.0 (c)
	≤ 65 W	45	80.0 (c)

Source: CFR430, Subpart C (1998) (a) CRI = Colour Rendering Index (b) Effective date 1 November 1995 (c) Effective date 1 May 1994

Test procedures

The test procedures are in American National Standards Institute (ANSI) standards ANSI C78.1, 78.3, C78.385, International Commission in Illumination (CIE) standard CIE 13.3, and Illuminating Engineering Society of North America (IES) standards IES LM9, LM16 and LM58.

I) Incandescent Lamps and Luminaires

i) Canada:

a) Incandescent reflector lamps

MEPS levels

The Regulations apply to general service incandescent reflector lamps:

- with an R bulb shape, a PAR bulb shape similar to R or PAR that is neither ER nor BR, as described in ANSI C79.1;
- with an E26 medium-screw base;
- with a nominal voltage or voltage range that lies at least partially between 100 volts and 150 volts;
- with a diameter greater than 70 mm (2.75 inches); and
- that has a nominal power of not less than 40W and not more than 205 W.

The Regulations do *not* apply to colored, vibration- or impact-resistant lamps or certain other special purpose lamps.

The minimum efficacy levels specified in Table 38 took effect on 1 April 1996.

Table 38: Energy efficiency standards, general service incandescent lamps, Canada

Rated lamp wattage	Minimum average lamp efficacy (lumens/W)
40 – 50	10.5
51 – 66	11.0
67 – 85	12.5
86 – 115	14.0
116 – 155	14.5
156 – 205	15.0

Source: NRCan (1999)

Test procedures

The test procedure is in CAN/CSA-C862-97. It is essentially the same as US DOE requirements.

Canada expects to soon publish a new edition of the national standard for dusk to dawn luminaires (C329). Committee work has been completed.

Canada is working toward the publication of a new edition of the national standard for roadway luminaires (C653) through the recognized standard development process. The revised standard is expected to include new product definitions and minimum efficiency levels.

MEPS update

In late 2001 or early 2002, the scope of regulations for incandescent reflector lamps will be increased to include some BR and ER lamps. This will bring Canada close to the coverage of the US rule (except for the additional coverage of ER lamps).

ii) México:

MEPS levels

México has two MEPS related to incandescent lighting: NOM-007-ENER-1995 (commercial buildings) and NOM-013-ENER-1996 (exterior lighting).

NOM-007-ENER-1995 applies to interior and exterior lighting in new non-residential buildings with demand of more than 20 kW, or for expansions of more than 20 kW in currently existing non-residential buildings. Buildings covered by this MEPS are catalogued as: a) offices; b) schools and educational facilities; c) hospitals and clinics; d) hotels and motels; e) restaurants and cafeterias; and f) commercial establishments. Exempt from this MEPS are: dance centers, discotheques and other recreation areas requiring special illumination; interiors of freezer chambers; cinema studios; temporary areas used for exhibitions, expositions, conventions, or spectacles; stores selling lighting equipment, and lighting demonstration education centres. Also exempt are areas of hospitals and clinics with special lighting needs such as: autopsy rooms, operation rooms,

expulsion rooms, post-anaesthesia recuperation rooms (intensive therapy), resuscitation and emergency rooms. Other exempt situations are new buildings located in artistic and cultural patrimony areas; independent emergency lighting systems; equipment for emergency and evacuation signals; lighting equipment that is an integral part of other equipment; lighting equipment used for preparation or heating of food; lighted advertisements; lighting for aviation; and other buildings different than those expressly stated (such as airline terminals, public safety buildings, bus terminals, churches, industrial buildings, etc.).

The standard allows maximum values of lighting power density in Watts of lighting connected per square meter of building floor area. These values are given in Table 39.

Table 39: Maximum power density for lighting of non-residential buildings, México

Building Type	Interior Lighting max power density W/m^2	Exterior Lighting max power density W/m^2
Offices	16.0	1.8
Schools	16.0	1.8
Hospitals	14.5	1.8
Hotels	18.0	1.8
Restaurants	15.0	1.8
Commerce	19.0	1.8
Warehouses or storage areas.*	8.0	
Interior parking lots.*	2.0	

* Only for areas in buildings covered by NOM-007-ENER-1995

To promote the use of lighting controls, the NOM credits the use of controls such as occupancy sensors, dimmers, day-lighting sensors and timers (and/or combinations). The lighting control credits are subtracted from the calculated lighting power density, depending on how they are used; varying from 5% up to 50% of the installed wattage.

Verification of compliance with the standard rests with the Energy Secretariat, both during the process of approval of the projects and once they are completed.

NOM-007-ENER-1995 is based on ASHRAE/IES 90.1 Code 9/13/93. It uses a simplified version for the interior lighting as it sets a general value for the six building types, without subdividing these into specific use areas.

NOM-013-ENER-1996 applies to street lighting, lighting in open parking lots and exterior building lighting. Exempt from this standard are airport operations lights; emergency lighting; lighting within single and multi-family land; holiday lighting; marine platforms, lighthouses and other safety lights; temporary lighting for construction; lighted advertising signs; special surveillance areas; areas where labor agreements limit lighting levels (ports, storage and loading/unloading areas, etc.); mechanical games; bicycle storage areas; and street signs. It has been in effect since May 16, 1998.

The standard requires a minimum lighting efficacy of 22 lumens/Watt from exterior

lighting systems used in building fronts and logos, lakes, waterfalls, fountains, monuments, sculptures, flags, parks, gardens, alamedas (promenades or boulevards) and kiosks. A minimum of 40 lumens/watt are required of lighting systems for sidewalks, bus stops, plazas and zocalos (main squares).

The standard also stipulates the maximum values of electric power density allowed for lighting as shown in Tables 40 to 42.

Table 40: Maximum Power Density for Street Lighting, México

Illuminance lux	Width 7.5m	Width 9.0m	Width 10.5m	Width 12.0m
3	0.26	0.23	0.19	0.17
4	0.32	0.28	0.26	0.23
5	0.35	0.33	0.30	0.28
6	0.41	0.38	0.35	0.31
7	0.49	0.45	0.42	0.37
8	0.56	0.52	0.48	0.44
9	0.64	0.59	0.54	0.50
10	0.71	0.66	0.61	0.56
11	0.79	0.74	0.67	0.62
12	0.86	0.81	0.74	0.69
13	0.94	0.87	0.80	0.75
14	1.01	0.95	0.86	0.81
15	1.06	1.00	0.93	0.87
16	1.10	1.07	0.99	0.93
17	1.17	1.12	1.03	0.97

Source: NOM-013-ENER-1996, Allowable power densities in W/m^2 depends on street width

Table 41: Maximum power density in open parking lots, México

Area to illuminate m^2	Power Density W/m^2
<300	1.80
300 - 500	0.90
500 - 1 000	0.70
1 000 - 1 500	0.58
1 500 - 2 000	0.54
>2 000	0.52

Source: NOM-013-ENER-1996.

Table 42: Maximum Power Density in Street Lighting, México

Area to illuminate m^2	Power density W/m^2
< 2500	0.52
2500 - 5000	0.49
5000 - 12 500	0.46
>12 500	0.44

Source: NOM-013-ENER-1996, applicable to super light-posts (over 18 metres tall)

The Energy Secretariat is in charge of verifying compliance with this NOM, both during the approval of public lighting projects and after completion of their construction.

The NOM is based on the IES LEM-6-1987 guidelines for unit power density for new roadway lighting installations.

iii) USA:

a) Incandescent non-reflector lamps
MEPS levels

The Regulations apply to incandescent lamps rated at between 30W and 199W and between 115V and 130V, and with an E26 medium-screw base.

The following information must be included in a "principal display panel" on the lamp package:

- The number of lamps included in the package, if more than one;
- The design voltage of each lamp included in the package, if other than 120V:
- The light output of each lamp included in the package in average initial lumens;
- The electrical power consumed by each lamp in the package, in average initial wattage;
- The life of each lamp included in the package, in hours.

CFR Part 305 specifies the layout and size of the principal display panel.

Test procedures

The standard to be used for measuring light output is IES LM45, and the standard to be used for measuring operating life is IES LM49.

b) Incandescent reflector lamps
MEPS levels

The Regulations apply to general service incandescent reflector lamps:

- with an R bulb shape, a PAR bulb shape similar to R or PAR that is neither ER nor

BR, as described in ANSI C79.1;

- with an E26 medium-screw base;
- with a nominal voltage or voltage range that lies at least partially between 115 volts and 130 volts;
- with a diameter greater than 2.75 inches (70 mm); and
- that has a nominal power of between 40W and 205 W.

The Regulations do *not* apply to colored, vibration- or impact-resistant or certain other special purpose lamps.

Table 43: MEPS for general service incandescent lamps, USA

Rated lamp wattage	Minimum average lamp efficacy (lumens/W)
40 – 50	10.5
51 – 66	11.0
67 – 85	12.5
86 – 115	14.0
116 – 155	14.5
156 – 205	15.0

Source: CFR430, Subpart C (1998)

Test procedures

The standard to be used for measuring light output is IES LM 20, and the standard to be used for measuring operating life is IES LM 49.

J. Ranges and Ovens

i) Canada: Ranges

MEPS levels

The Regulations for electric ranges cover:

- free-standing appliances equipped with one or more surface elements and one or more ovens;
- built-in appliances equipped with one or more surface elements and one or more ovens;
- built-in appliances equipped with one or more ovens and no surface elements;
- wall-mounted appliances equipped with one or more ovens and no surface elements; and
- counter-mounted appliances equipped with one or more surface elements and no ovens.

Microwave cooking appliances, appliances designed for 120V, and appliances with one

or more tungsten-halogen heating element are excluded.

The minimum efficiency criteria (expressed as maximum kWh/month), which took effect in February 1995, are indicated in Table 44.

Table 44: Maximum energy use standards for electric ranges, Canada

Product Class	**Maximum allowable energy consumption (kWh/month)**
Free-standing or built-in appliances with one or more surface elements and one or more ovens	0.93V + 14.3
Wall-mounted appliances equipped with one or more ovens and no surface elements	38
Counter-mounted appliances with one or more conventional (ie not modular) surface elements and no ovens.	34
Counter-mounted appliances with one or more modular surface elements and no ovens (a)	43

Source: NRCan (1999) (a) Interchangeable surface elements that may be plugged into a receptacle on the range cooktop.

The regulations for gas ranges apply to household propane or natural gas ranges with electrical power sources that are used for food preparation and that have one or any combination of: top or surface cooking; oven cooking, or broiling. The regulations require that there be no continuously burning pilot light if the product has a cord set. This requirement was effective February 1995.

Test procedures

The electric range tests are in CAN/CSA-C358-95. Canada is working toward the publication of a new edition of the national standard (C358) and investigating the adoption of the IEC standard through the recognized standards development process.

There is no test procedure for the gas ranges.

ii) USA

United States regulations mandate that gas cooking products with an electrical supply cord shall not be equipped with a constant burning pilot light. This standard was effective on January 1, 1990.

K. Dehumidifiers

i) Canada:

MEPS levels

The Regulations cover electrically operated, mechanically refrigerated dehumidifiers with a daily water-removal capacity of up to 30 litres (6.6 imperial gallons). Desiccant dehumidifiers, compressed air dehydrators and dehumidifiers used in commercial and industrial applications are excluded.

The minimum "Energy Factor" (liters removed per kWh) is 1.0. This requirement took effect at the end of 1998.

Test procedures

The dehumidifier test requirements are in CAN/CSA-C749-94.

L. Icemakers

i) Canada:

MEPS levels

The Regulations cover factory-assembled ice-makers with a standard capacity rating of between 23 and 1000 kg per day, including self-contained and split-system machines that produce cubed, flaked, crushed or fragmented ice, in either a batch or continuous process. The following categories are covered:

- Air cooled batch automatic ice makers ("cubers") in the capacity ranges 23 to <150 kg/d and 150–1000 kg/d;
- Water cooled batch automatic ice makers ("cubers") in the capacity ranges 23 to <150 kg/d and 150–1000 kg/d;
- Air cooled continuous automatic ice makers ("flakers") in the capacity ranges 23 to <300 kg/d and 300–1000 kg/d;
- Water cooled continuous automatic ice makers ("flakers") in the capacity ranges 23 to <300 kg/d and 300–1000 kg/d;

Ice makers installed in household refrigerators, automatic ice-dispensing machines, and cold-plate drink dispensers are excluded.

The minimum energy efficiency standards (expressed as maximum energy per kg ice made), which took effect at the end of 1998, are indicated in Table 45.

Table 45: Maximum energy inputs, automatic icemakers, Canada

Product Class		Capacity (kg ice per day)	Maximum Energy Input (kJ/kg ice)
Batch automatic ice-makers (cubers)	Air Cooled	23 to < 150	1630 – 6.008 x capacity
		150 to 1000	807.2 – 0.5229 x capacity
	Water Cooled	23 to < 150	1234 – 4.381 x capacity
		150 to 1000	621.8 – 0.2985 x capacity
Continuous automatic ice-makers (flakers)	Air Cooled	23 to < 300	875.2 – 1.122 x capacity
		300 to 1000	538.6
	Water Cooled	23 to < 300	740.5 - 0.8976 x capacity
		300 to 1000	471.2

Source : NRCan (1999)

Test procedures

The automatic icemaker test requirements are in CAN/CSA-C742-98.

M. Direct Heating Equipment

i) USA:

MEPS levels

MEPS levels for direct heating equipment in the USA are shown in Table 46.

Table 46: MEPS for direct heating equipment, USA

Product Class	**Annual fuel utilization efficiency, Jan 1, 1990 (percent)**
Gas wall fan type up to 42,000 Btu/hour	73
Gas wall fan type over 42,000 Btu/hour	74
Gas wall gravity type up to 10,000 Btu/hour	59
Gas wall gravity type over 10,000 Btu/hour up to 12,000 Btu/hour	60
Gas wall gravity type over 12,000 Btu/hour up to 15,000 Btu/hour	61
Gas wall gravity type over 15,000 Btu/hour up to 19,000 Btu/hour	62
Gas wall gravity type over 19,000 Btu/hour up to 27,000 Btu/hour	63
Gas wall gravity type over 27,000 Btu/hour up to 46,000 Btu/hour	64
Gas wall gravity type over 46,000 Btu/hour	65
Gas floor up to 37,000 Btu/hour	56
Gas floor over 37,000 Btu/hour	57
Gas room up to 18,000 Btu/hour.	57
Gas room over 18,000 Btu/hour up to 20,000 Btu/hour	58
Gas room over 20,000 Btu/hour up to 27,000 Btu/hour	63
Gas room over 27,000 Btu/hour up to 46,000 Btu/hour	64
Gas room over 46,000 Btu/hour	65

Test procedures

Information on the test procedure for direct heating equipment is needed.

N. Furnaces and Boilers

i) Canada:

MEPS levels

Canada's performance requirements apply to automatic operating gas-fired central forced-air furnaces that use propane or natural gas and have an input of not more than 117.23 W (400 000 Btu/h).

The regulations apply to oil fired warm air furnaces that have an input rate of less than or equal to 66 kilowatts (225 000 Btu/h).

MEPS apply to self contained gas fired boilers that use propane or natural gas, and oil fired boilers that are intended for use in a low-pressure steam or hot water central heating system, and have an input rate of less than 88 kW (300 000 Btu/h).

Furnaces for mobile homes or recreational vehicles are excluded.

Table 47. Canada's Minimum performance requirements for furnaces and boilers

	Product Class	Minimum AFUE*	Minimum TE**	Minimum SEUE***	Test Standard
Gas Furnace (≤ 117.23 kW or 400 000 Btu/h)	≤ 65.92 kW (225 000 Btu/h) using single phase electric current	78			CGA-2.3-M93
	≤ 65.92 kW (225 000 Btu/h) using three-phase electric current	78	80		
	> 65.92 kW (225 000 Btu/h)		80		
Oil Furnace (≤ 66 kW)				78	CSA-B212-M93
Gas Boiler (< 88 kW or 300 000 Btu/h)	Low pressure steam systems	75			CGA P.2-1991
	Hot water systems	80			
Oil Boiler (< 88 kW or 300 000 Btu/h)				80	CSA-B212-M93

*AFUE is Annual Fuel Utilization Efficiency (%)
** TE is Thermal Efficiency (%)
*** SEUE is Seasonal Energy Utilization Efficiency (%)

Source : NRCan (2001)

Commercial gas and oil products are not regulated but minimum combustion levels are mandated through the Gas Safety codes enforced by the provinces.

Test procedures

The Canadian test procedure for oil fired furnaces and boilers references (B212-M93) ANSI D2156-80(R1988). A new version of the TP has been published (B212-00) updating to ANSI D2156-94(R1999) but has not been referenced in the regulations. The test procedure for gas furnaces is identical to the US, referencing ANSI .

ii) México:

MEPS levels

The Mexican NOM-002-ENER-1995 requires the following:

Table 48: Mexican NOM for Large Package Boilers:

Capacity (KW)	Efficiency (%)	Fuel
Boilers with SmokeTubes		
100-200	76	Natural gas or propane
100-200	80	Fuel oil or deisel oil
200-8000	76	Natural gas or propane
200-8000	80	Fuel oil or deisel oil
Boilers with Water Tubes		

100-200	74	Natural gas or propane
100-200	78	Fuel oil or deisel oil
200-8000	76	Natural gas or propane
200-8000	80	Fuel oil or deisel oil

Test procedures

México has its own test procedure. The test method calculates stack loss from charts (using measured stack temperature, percent excess airs, and carbon monoxide) and casing loss.

iii) USA:

MEPS levels

Efficiency standards for space conditioning equipment were enacted in 1987. The date of initial implementation depends upon the type of equipment (see Table 49).

Table 49: Efficiency standards for furnaces and boilers, USA:

Type	Effective Date	Minimum Efficiency
Gas Furnace	Jan 1, 1992	78 AFUE
Oil Furnace	Jan 1, 1992	78 AFUE
Mobile Home Furnace	Sept 1, 1990	75 AFUE
Gas Boiler	Jan 1, 1992	80 AFUE
Oil Boiler	Jan 1, 1992	80 AFUE
Gas Steam Boilers	Jan 1, 1992	75 AFUE

AFUE is Annual Fuel Utilization Efficiency (%)

USDOE is currently undertaking a new rulemaking on residential furnaces and boilers. The Final Rule is expected to be published in 2004.

Test procedures

A new test procedure is in progress for residential furnaces and boilers. It references existing ASHRAE 90.1 test procedures, with some modifications.

O. Water Heaters

i) Canada: Water heaters

MEPS levels

The Regulations cover stationary electrically heated storage tank water heaters with a capacity of not less than 50 liters (11 imperial gallons) and not more than 450 liters (100 imperial gallons) that are intended for use on a pressure system.

The Regulations cover stationary gas heater water containers with a capacity of not less than 76 litres (20 US gallons) and not more than 380 litres (100 US gallons) that use propane or natural gas and that have an input rating of not more that 21.97 kw (75 000 Btu/h).

The Regulations cover oil fired water heater that have an input rating of not more than 30.5 kW (0.75 US gallons per hour) and storage capacity of not more than 190 litres (50 US gallons)

The MEPS that took effect in February 1995 are indicated in Table 50.

Table 50: MEPS for water heaters, Canada

	Product Class	Maximum allowable standby loss (Watts)	Minimum EF**
Electric	50 to 270 litres	61 + 0.20 x V*	
	271 to 450 litres	0.472 × V – 12.5	
Gas			0.62 – 0.0005V
Oil			0.59 – 0.0005V

* V is the volume of storage tank in litres

** EF is the energy factor calculated as a dimensionless quantity

Source : NRCan (2001)

Test procedures

The electric water heater tests are in CAN/CSA-C191.1-M90. This procedure has been updated (CAN/CSA-C191.1-00) as well as test method (CAN/CSA-C745-00), which is harmonized with the USA CFR 430 drawoff method, and which is being considered for introduction into the Canadian regulations.

Gas water heaters are tested using CAN1-4.1-M85 and oil fired water heaters use CAN/CSA-B211-M90.

ii) México:

MEPS levels

México has MEPS for residential and commercial water heaters, defined in NOM-003-ENER-2000. These regulations do not cover electric water heaters.

The thermal efficiency of the water heaters covered by this law must meet the levels indicated in Table 51.

Table 51. Minimum thermal efficiency for residential and commercial water heaters

Year	Thermal efficiency (%)	
	Residential	Commercial
2000	72,0	77,0
2002	74,0	79,0

The temperature of the hot water obtained at the output of the residential and commercial water heaters is shown in Table 52.

Table 52. Hot water temperatures

Water Heater	Operation	Cut-off temperature in ºC	Minimum temperature increments in ºC
Residential	Storage	70 ± 5 (1)	
	Rapid recovery		25 (2)
	Instantaneous		25 (2)
Commercial	Low-temperature storage	70 ± 5 (1)	
	High-temperature storage	82 ± 5 (1)	
	Rapid recovery		25 (2)
	Instantaneous		25 (2)

(1) Without water flow until the cut-off of the interrupter(s) for temperature (thermostat or semiautomatic valve).

(2) Higher than feeding water.

Test procedures

The test procedures for water heaters in México are different from those in the US and Canada.

iii) USA:

MEPS levels

The Code of Federal Regulations cover the following types of electric water heaters (in addition to water heaters of other fuel types):

- electric storage water heaters with a capacity between 20 and 140 US gallons (76 to 530L) and an input of 12 kW or less and with a storage temperature of less than

180°F; and

- electric instantaneous water heaters with an input of 12 kW or less; and
- heat pump type units with a maximum current rating of 24 Amps and a voltage no greater than 250V.

that are intended for use on a pressure system.

The Energy Policy Act (1992) covers electric commercial water heaters as follows:

- storage water heaters with an input rating of < 4,000 Btu per hour per US gallon of water stored;
- instantaneous water heaters with an input rating of ≥ 4,000 Btu per hour per US gallon of water stored;

Requirements are also specified for water heaters of other fuel types and unfired water heaters that use an external source of heating.

Under CFR Part 430 for products manufactured after 15 April 1991, the Energy Factor shall be not less than:

$$0.93 - (0.00132 \times \text{rated storage volume in US gallons})$$

In CFR Part 430 Subpart B Appendix E, the Energy Factor is defined as "a measure of water heater overall efficiency" and is essentially the overall task efficiency for the delivery of 64.3 US gallons over a 24 hour period.

The MEPS requirements for commercial water heaters under the Energy Policy Act 1992 took effect on 1 January 1994 and are as follows for electric water heaters:

- Storage water heaters - maximum standing heat loss criteria, expressed in percent per hour,:

$$0.30 + (27/\text{measured storage volume in US gallons})$$

- Instantaneous water heaters with a storage of less than 10 US gallons (38 litres) shall have an efficiency of ≥ 80% (intended mainly for gas/oil);
- Instantaneous water heaters with a storage of greater than 10 US gallons (38 litres) shall have an efficiency of ≥ 77% (in addition the maximum standby losses for these units shall be 2.30 + (67 / volume in US gallons) (intended mainly for gas/oil);

Storage water heaters and hot water storage tanks having more than 140 gallons of storage capacity need not meet the standby loss requirements if the tank's surface is thermally insulated to R 12.5 (imperial units).

A new rule, published January 17, 2001 states that the energy factor of water heaters shall not be less than the following for products manufactured on or after the dates indicated in Table 53.

Table 53: MEPS for water heaters, USA

Product Class	Energy Factor as of January 1, 1990	Energy Factor as of April 15, 1991	Energy Factor as of January 20 2004
1. Gas-fired Water Heater	0.62 - (.0019 x Rated Storage Volume in gallons).	0.62 - (.0019 x Rated Storage Volume in gallons).	0.67 - (0.0019 x Rated Storage Volume in gallons).
2. Oil-fired Water Heater	0.59 - (.0019 x Rated Storage Volume in gallons).	0.59 - (.0019 x Rated Storage Volume in gallons).	0.59 - (0.0019 x Rated Storage Volume in gallons).
3. Electric Water Heater	0.95 - (0.00132 x Rated Storage Volume in gallons).	0.93 - (0.00132 x Rated Storage Volume in gallons).	0.97 - (0.00132 x Rated Storage Volume in gallons).
4. Tabletop Water Heater	0.95 - (0.00132 x Rated Storage Volume in gallons).	0.93 - (0.00132 x Rated Storage Volume in gallons).	0.93 - (0.00132 x Rated Storage Volume in gallons).
5. Instantaneous Gas-fired Water Heater	0.62 - (0.0019 x Rated Storage Volume in gallons)	0.62 - (0.0019 x Rated Storage Volume in gallons)	0.62 - (0.0019 x Rated Storage Volume in gallons)
6. Instantaneous Electric Water Heater	0.95 - (0.00132 x Rated Storage Volume in gallons).	0.93 - (0.00132 x Rated Storage Volume in gallons).	0.93 - (0.00132 x Rated Storage Volume in gallons).

Note: The Rated Storage Volume equals the water storage capacity of a water heater, in gallons, as specified by the manufacturer.

Test procedures

Under CFR430, electric water heaters are tested to CFR Part 430 Subpart B Appendix E. Under the Energy Policy Act 1992, water heater test procedures are referenced to ASHRAE 90.1, which in turn references ANSI Z21.10.3 (which is for gas water heaters, but presumably sets test conditions).

A new test procedure is in progress for commercial water heaters. It references existing ASHRAE 90.1 test procedures, with some modifications.

P. Motors

i) Canada:

MEPS levels

The Regulations cover continuous-duty single speed motors in the range 1 to 200 HP or 0.746 to 150 kW. There are separate specifications for motors that conform with National Electrical Manufacturers Association (NEMA) requirements, and those which conform with International Electrotechnical Commission (IEC) requirements, although the most significant difference is that motor sizes are expressed in HP in the former and kW in the latter. The requirements relating to NEMA motors are identical with the definitions of "electric motor" in the US Energy Policy Act of 1992. However, the Canadian program covers some motor types not regulated in the USA.

Different minimum nominal full-load efficiency levels are specified for 2, 4 and 6 pole motors and for enclosed and open designs. The levels in Table 54 and 55 took effect in November 1997. The compliance date for explosion-proof motors and motors contained within an integral gear assembly is November 1999. The levels in Table 54 are identical with those which took effect in the US in October 1997.

Table 54: Minimum nominal energy efficiency MEPS for NEMA motors, Canada

Power	Open			Enclosed		
HP	2-Pole	4-Pole	6-Pole	2-Pole	4-Pole	6-Pole
1	75.5	82.5	80.0	75.5	82.5	80.0
1.5	82.5	84.0	84.0	82.5	84.0	85.5
2	84.0	84.0	85.5	84.0	84.0	86.5
3	84.0	86.5	86.5	85.5	87.5	87.5
5	85.5	87.5	87.5	87.5	87.5	87.5
7.5	87.5	88.5	88.5	88.5	89.5	89.5
10	88.5	89.5	90.2	89.5	89.5	89.5
15	89.5	91.0	90.2	90.2	91.0	90.2
20	90.2	91.0	91.0	90.2	91.0	90.2
25	91.0	91.7	91.7	91.0	92.4	91.7
30	91.0	92.4	92.4	91.0	92.4	91.7
40	91.7	93.0	93.0	91.7	93.0	93.0
50	92.4	93.0	93.0	92.4	93.0	93.0
60	93.0	93.6	93.6	93.0	93.6	93.6
75	93.0	94.1	93.6	93.0	94.1	93.6
100	93.0	94.1	94.1	93.6	94.5	94.1
125	93.6	94.5	94.1	94.5	95.0	95.0
150	93.6	95.0	94.5	94.5	95.0	95.0
175	94.5	95.0	94.5	95.0	95.0	95.0
200	94.5	95.0	94.5	95.0	95.0	95.0

Source: NRCan (1999)

Table 55: Minimum nominal energy efficiency MEPS for IEC motors, Canada

Power	Open			Enclosed		
kW	2-Pole	4-Pole	6-Pole	2-Pole	4-Pole	6-Pole
0.75	75.5	82.5	80.0	75.5	82.5	80.0
1.1	82.5	84.0	84.0	82.5	84.0	85.5
1.5	84.0	84.0	85.5	84.0	84.0	86.5
2.2	84.0	86.5	86.5	85.5	87.5	87.5
3.0	84.0	86.5	86.5	85.5	87.5	87.5
3.7	85.5	87.5	87.5	87.5	87.5	87.5
4.0	85.5	87.5	87.5	87.5	87.5	87.5
5.5	87.5	88.5	88.5	88.5	89.5	89.5
7.5	88.5	89.5	90.2	89.5	89.5	89.5
11	89.5	91.0	90.2	90.2	91.0	90.2
15	90.2	91.0	91.0	90.2	91.0	90.2
18.5	91.0	91.7	91.7	91.0	92.4	91.7
22	91.0	92.4	92.4	91.0	92.4	91.7
30	91.7	93.0	93.0	91.7	93.0	93.0
37	92.4	93.0	93.0	92.4	93.0	93.0
45	93.0	93.6	93.6	93.0	93.6	93.6
55	93.0	94.1	93.6	93.0	94.1	93.6
75	93.0	94.1	94.1	93.6	94.5	94.1
90	93.6	94.5	94.1	94.5	95.0	95.0
110	93.6	95.0	94.5	94.5	95.0	95.0
132	94.5	95.0	94.5	95.0	95.0	95.0
150	94.5	95.0	94.5	95.0	95.0	95.0

Source: NRCan (1999)

Test procedures

The test procedure is in CAN/CSA-C390-99. This is based on IEEE Method B.

ii) México:

MEPS levels

There are two sets of MEPS for electric motors in México. NOM-014-ENER-1997 is for single-phase, general use induction, squirrel cage motors of 0.180 to 1.5 kW nominal rated power. This law replaces NOM-074-SCFI-1994 and has been in effect since 17 October 1998.

NOM-016-ENER-1997 is for three-phase general use, induction, squirrel cage motors of 0.746 to 149.2 kW nominal rated power. NOM-016-ENER-1997 has been in effect since 17 September 1998.

The MEPS levels for both single and three-phase motors are defined using a two-stage process. First, the type, size, voltage and number of poles (as applicable) are used to determine the "nominal" efficiency for that motor size and type. The nominal efficiency is then used to determine the MEPS efficiency, which is based on a fixed relationship to the nominal efficiency.

The nominal efficiencies for single-phase motors are set out in Table 56. Three-phase motors are split into open and closed as well as standard and high efficiency types. The nominal efficiency for each of these types is set out in Table 57 to Table 60. The nominal efficiencies and the corresponding MEPS levels are set out in Table 61.

The nominal efficiency levels set out below for so called "high efficiency" motors (Table 59 and Table 60) are the same as for US 1997 MEPS levels for motors (which in turn are almost the same as for Canada). This in effect means that the actual MEPS levels for México are somewhat below those set for the USA and Canada, even for high efficiency motors (as these nominal levels are adjusted downwards in accordance with Table 61). Note that México also regulates 8 pole three-phase motors and single-phase motors for efficiency while Canada and the USA do not. The precise scope of motors covered by the various MEPS schemes for these economies also varies slightly as well.

Table 56: Nominal efficiency for single-phase induction motors, México

Nominal Power from kW	Up to kW	115 V	127 V	200 V to 240 V
0.180	0.249	50.5	48.0	48.0
0.249	0.295	52.5	50.5	50.5
0.295	0.373	55.0	52.5	52.5
0.373	0.475	57.5	55.0	55.0
0.475	0.560	59.5	57.5	57.5
0.560	0.746	62.0	59.5	59.5
0.746	0.885	64.0	62.0	62.0
0.885	1.119	66.0	64.0	64.0
1.119	1.290	68.0	66.0	66.0
1.290	1.492	70.0	68.0	68.0
1.492	1.500	72.0	70.0	70.0

Source: NOM-014-ENER-1997, Nominal efficiencies shown as percentage at full load.

Table 57: Nominal efficiency for closed three-phase standard efficiency motors, México

Nominal Power Rating kW	2 Poles	4 Poles	6 Poles	8 Poles
0.746	74.0	75.5	75.5	72.0
1.119	77.0	80.0	78.5	75.5
1.492	80.0	81.5	78.5	75.5
2.238	81.5	81.5	80.0	75.5
3.730	82.5	84.0	81.5	82.5
5.595	84.0	86.5	82.5	84.0
7.460	85.5	86.5	84.0	85.5
11.19	85.5	87.5	85.5	85.5
14.92	86.5	87.5	86.5	86.5
18.65	86.5	89.5	86.5	86.5
22.38	87.5	90.2	87.5	87.5
29.84	88.5	90.2	88.5	88.5
37.30	88.5	91.0	88.5	89.5
44.76	89.5	91.7	89.5	89.5
55.95	89.5	91.7	90.2	89.5
74.60	90.2	92.4	90.2	90.2
93.25	91.0	92.4	91.0	91.0
111.9	91.0	92.4	91.0	91.7
149.2	91.7	93.0	91.7	91.7

Source: NOM-016-ENER-1998, Nominal efficiencies shown as percentage, at full load.

Table 58: Nominal efficiency for open three-phase standard efficiency motors, México

Nominal Power Rating kW	2 Poles	4 Poles	6 Poles	8 Poles
0.746	72.0	72.0	72.0	72.0
1.119	72.0	74.0	74.0	74.0
1.492	74.0	75.5	75.5	75.5
2.238	80.0	81.5	80.0	78.5
3.730	80.0	81.5	80.0	80.0
5.595	81.5	82.5	81.5	81.5
7.460	82.5	82.5	82.5	82.5
11.19	84.0	84.0	84.0	84.0
14.92	84.0	84.0	84.0	84.0
18.65	86.5	86.5	86.5	86.5
22.38	87.5	88.5	87.5	87.5
29.84	88.5	89.5	88.5	88.5
37.30	89.5	89.5	89.5	89.5
44.76	90.2	90.2	90.2	90.2
55.95	90.2	90.2	90.2	90.2
74.60	90.2	91.0	90.2	90.2
93.25	91.0	92.4	91.0	91.0
111.9	91.0	92.4	91.0	91.0
149.2	91.7	93.0	91.7	91.7

Source: NOM-016-ENER-1998, Nominal efficiencies shown as percentage, at full load.

Table 59: Nominal efficiency for closed high-efficiency three-phase motors, México

Nominal Power Rating kW	2 Poles	4 Poles	6 Poles	8 Poles
0.746	75.5	82.5	80.0	74.0
1.119	82.5	84.0	85.5	77.0
1.492	84.0	84.0	86.5	82.5
2.238	85.5	87.5	87.5	84.0
3.730	87.5	87.5	87.5	85.5
5.595	88.5	89.5	89.5	85.5
7.460	89.5	89.5	89.5	88.5
11.19	90.2	91.0	90.2	88.5
14.92	90.2	91.0	90.2	89.5
18.65	91.0	92.4	91.7	89.5
22.38	91.0	92.4	91.7	91.0
29.84	91.7	93.0	93.0	91.0
37.30	92.4	93.0	93.0	91.7
44.76	93.0	93.6	93.6	91.7
55.95	93.0	94.1	93.6	93.0
74.60	93.6	94.5	94.1	93.0
93.25	94.5	94.5	94.1	93.6
111.9	94.5	95.0	95.0	93.6
149.2	95.0	95.0	95.0	94.1

Source: NOM-016-ENER-1998, Nominal efficiencies shown as percentage, at full load.

Table 60: Nominal efficiency open high-efficiency three-phase motors, México

Nominal Power Rating kW	2 Poles	4 Poles	6 Poles	8 Poles
0.746	----	82.5	80.0	74.0
1.119	82.5	84.0	84.0	75.5
1.492	84.0	84.0	85.5	85.5
2.238	84.0	86.5	86.5	86.5
3.730	85.5	87.5	87.5	87.5
5.595	87.5	88.5	88.5	88.5
7.460	88.5	89.5	90.2	89.5
11.19	89.5	91.0	90.2	89.5
14.92	90.2	91.0	91.0	90.2
18.65	91.0	91.7	91.7	90.2
22.38	91.0	92.4	92.4	91.0
29.84	91.7	93.0	93.0	91.0
37.30	92.4	93.0	93.0	91.7
44.76	93.0	93.6	93.6	92.4
55.95	93.0	94.1	93.6	93.6
74.60	93.0	94.1	94.1	93.6
93.25	93.6	94.5	94.1	93.6
111.9	93.6	95.0	94.5	93.6
149.2	94.5	95.0	94.5	93.6

Source: NOM-016-ENER-1998, Nominal efficiencies shown as percentage, at full load.

Table 61: Mexican nominal motor efficiency and corresponding MEPS levels

Column A Nominal efficiency	Column B Minimum efficiency	Column A Nominal efficiency	Column B Minimum efficiency
99,0	98,8	90,2	88,5
98,9	98,7	89,5	87,5
98,8	98,6	88,5	86,5
98,7	98,5	87,5	85,5
98,6	98,4	86,5	84,0
98,5	98,2	85,5	82,5
98,4	98,0	84,0	81,5
98,2	97,8	82,5	80,0
98,0	97,6	81,5	78,5
97,8	97,4	80,0	77,0
97,6	97,1	78,5	75,5
97,4	96,8	77,0	74,0
97,1	96,5	75,5	72,0
96,8	96,2	74,0	70,0
96,5	95,8	72,0	68,0
96,2	95,4	70,0	66,0
95,8	95,0	68,0	64,0
95,4	94,5	66,0	62,0
95,0	94,1	64,0	59,5
94,5	93,6	62,0	57,5
94,1	93,0	59,5	55,0
93,6	92,4	57,5	52,5
93,0	91,7	55,0	50,5
92,4	91,0	52,5	48,0
91,7	90,2	50,5	46,0
91,0	89,5	48,0	43,0

Note: The nominal efficiency values of column A are obtained from 99%, with loss increments of 10%. The minimum associated efficiency values of column B are obtained taking 20% loss increments. The nominal efficiency is determined for the motor type and size and the MEPS level is them determined from this table.

Both electric single and three-phase motor NOMs require that the measured efficiency values of the motors be displayed on their nameplates.

Test procedures

The test procedure used for NOM-014-ENER-1997 for single-phase motors is based on the IEEE Standard 114 and CSA-C747. For the three-phase motors (NOM-016-ENER-1998), the test procedure is based on CAN/CSA-C390 and IEEE Standard 112 Method B.

iii) USA:

a) General purpose motors, 230/460 volts
MEPS levels

The Regulations cover "general purpose T-frame, single-speed, foot-mounting, polyphase squirrel-cage induction motor[s] of the National Electrical Manufacturers Association [NEMA] Design A and B, continuous rated, operating on 230/460 volts and constant 60 Hertz line power", in the capacity range 1 to 200 HP (0.746-150 kW).

Different minimum nominal full-load efficiency levels are specified for 2, 4 and 6 pole motors and for enclosed and open designs (8 pole motors are not covered). The levels in Table 62 took effect in October 1997, after a 5-year lead time.

Table 62: MEPS for NEMA motors, USA

Power	Open			Enclosed		
HP	2-Pole	4-Pole	6-Pole	2-Pole	4-Pole	6-Pole
1	75.5	82.5	80.0	75.5	82.5	80.0
1.5	82.5	84.0	84.0	82.5	84.0	85.5
2	84.0	84.0	85.5	84.0	84.0	86.5
3	84.0	86.5	86.5	85.5	87.5	87.5
5	85.5	87.5	87.5	87.5	87.5	87.5
7.5	87.5	88.5	88.5	88.5	89.5	89.5
10	88.5	89.5	90.2	89.5	89.5	89.5
15	89.5	91.0	90.2	90.2	91.0	90.2
20	90.2	91.0	91.0	90.2	91.0	90.2
25	91.0	91.7	91.7	91.0	92.4	91.7
30	91.0	92.4	92.4	91.0	92.4	91.7
40	91.7	93.0	93.0	91.7	93.0	93.0
50	92.4	93.0	93.0	92.4	93.0	93.0
60	93.0	93.6	93.6	93.0	93.6	93.6
75	93.0	94.1	93.6	93.0	94.1	93.6
100	93.0	94.1	94.1	93.6	94.5	94.1
125	93.6	94.5	94.1	94.5	95.0	95.0

150	93.6	95.0	94.5	94.5	95.0	95.0
175	94.5	95.0	94.5	95.0	95.0	95.0
200	94.5	95.0	94.5	95.0	95.0	95.0

Source: AHAM (1999)

Test procedures

The test procedure specified in the Energy Policy Act (1992) is NEMA MG1-1987.

b) Small motors

Section 346(b) of the Energy Policy and Conservation Act (EPCA) directs the Department of Energy to determine whether MEPS for certain small motors are technically feasible, economically justified, and would save a significant amount of energy. The horsepower ratings for these small motors are in two-digit frame size, generally from one-quarter horsepower to 5 horsepower, and either in single phase or three-phase electrical designs. Typical applications for such motors include pumps, fans and blowers, woodworking machinery conveyors, air compressors, commercial laundry equipment, service industry machines, food processing machines, farm machinery, machine tools, packaging machinery, and major residential electrical appliances. The population of small motors is estimated to exceed the population of large motors by a factor of about 9, and the energy consumption for all small motors is estimated to be 133 billion kWh per year. Of those small motors under consideration by the Department of Energy for MEPS, the energy consumption is estimated to be 4.4 billion kWh per year.

The Department of Energy, in concert with manufacturers and energy efficiency advocates, is investigating the economic and technical implications that would occur if the efficiency of these motors is increased. A public workshop to gather information and exchange views is envisioned for late autumn 2001.

Q. Transformers

i) Canada:

MEPS levels

In late 2001 or early 2002, Canada will be imposing minimum levels for low and medium voltage dry-type distribution transformers. The anticipated effective date will be 2003/2004.

Canada is also working on a voluntary agreement for liquid filled low and medium voltage distribution transformers. The industry is essentially compliant with the levels specified in CSA C803.2 which are similar to NEMA TP1. This agreement would prevent “backsliding” to lower levels.

Test procedures

Canada’s test procedure for dry-type distribution transformers is specified in CSA C802.2-00, which is essentially equivalent to NEMA TP2. For liquid-filled transformers,

CSA 803.2-00, is similar to NEMA TP2.

Canada is working toward the publication of a new test procedure for power transformers (CSA C802.3) through the recognized standards development process.

ii) México:

MEPS levels

Mexico began regulating distribution transformers more than two decades ago when it enacted NOM-J116 in 1977. A revised mandatory standard, NOM-001-SEMP-1994, was enacted in 1994 to regulate the energy efficiency and safety of electrical equipment including distribution transformers. A new mandatory standard regulating the efficiency of distribution transformers, NOM-002-SEDE-1997, was enacted in 1999.

Approximately ninety percent of all liquid-type distribution transformers sold in Mexico are purchased by one of the two major electric utilities, Comisión Federal de Electricidad (CFE) and Luz y Fuerza del Centro (LyFC) [1]. Before NOM-002 was enacted, these utilities implemented their own efficiency and safety requirements for quality control. Only large domestic manufacturers and importers could meet the utilities' efficiency specification. The remaining ten percent of liquid-type distribution transformers sold in Mexico are either imported or built by smaller domestic producers. The Secretaría de Energía (Energy Secretariat, SE) developed NOM-002 as the official mandatory standard that will enforce efficiency and safety requirements for all liquid-type distribution transformers installed in Mexico.

NOM-002 sets minimum efficiency and safety standards for all liquid-type distribution transformers sold in Mexico. According to NOM-002, all liquid-type distribution transformers covered by the following characteristics must meet the specified requirements in Table 63.

Table 63. MEPS for Liquid-type Distribution Transformers, México

Characteristic	Specification
Power Supply	Single phase Three phase
Nominal Capacity	5 to 167 kVA (1 phase) 15 to 500 kVA (3 phase)
Insulation Class	Up to 15 kV Up to 25 kV Up to 34.5 kV
Installation Application	Pad Pole Substation Submersible

[1] Secretaría de Energía, Mexico. *Manifestación de Impacto Regulatorio, Proyecto de Norma Oficial Mexicana NOM-002-SEDE-1997.* Mexico D.F. 1997.

The definitions of the Installation Applications are given as:

> Pad: integral unit including a transformer, casing, and connectors; usually connected to an underground distribution system and it is place on a pedestal or base in outdoor locations.
>
> Pole: unit specially designed to be fastened or secured to a post or similar structure.
>
> Substation: unit designed to be installed on a concrete platform or similar structure and some sort of protective barrier or fence restricts access to the unit.
>
> Submersible: unit designed to be installed in a ditch or other locations prone to flooding.

NOM-002 provides two sets of tables with the specified minimum efficiency levels (tested at 100% of nameplate load) and the core and winding losses in watts. The first set of tables, Table 64 and Table 65, shows the efficiency requirements under NOM-002 for large manufacturers and importers of distribution transformers in México. The second set of tables, Table 66 and Table 67, provides a less stringent, transitional MEPS for small manufacturers with cumulative annual production under 9 MVA.

The second set of tables is a temporary standard, established for eighteen months to ease the transition of small manufacturers to the new MEPS. In May 2001, with the transition period ending, officials from the Energy Secretariat (SE) met with small manufacturers. SE found that small manufacturers have not had enough time to bring their production up to the standards in NOM-002. Because these manufacturers represent an important source of employment, SE decided to extend the transitional period for small manufacturers. At this time however, the duration of this extension has not been specified[2].

While there is only one MEPS on distribution transformers, there are several Voluntary Mexican Standards (NMXs).

[2] Ing. Rene Perez Lara. Dirección General de Gas LP y de Instalaciones Eléctricas. Secretaría de Energía. Telephone Interview, Arthur D. Little. May, 2001.

Table 64. Minimum efficiency levels for distribution transformers, NOM-002-SEDE

Phases	Capacity kVA	Insulation Class Up to 15 kV (%)	Up to 25 kV (%)	Up to 34.5 kV (%)
Single Phase	5	97.90	97.80	97.70
	10	98.25	98.15	98.05
	15	98.40	98.30	98.20
	25	98.55	98.45	98.35
	37.5	98.65	98.55	98.45
	50	98.75	98.65	98.55
	75	98.90	98.80	98.70
	100	98.95	98.85	98.75
	167	99.00	98.90	98.80
Three Phase	15	97.95	97.85	97.75
	30	98.25	98.15	98.05
	45	98.35	98.25	98.15
	75	98.50	98.40	98.30
	112.5	98.60	98.50	98.40
	150	98.70	98.60	98.50
	225	98.75	98.65	98.55
	300	98.80	98.70	98.60
	500	98.90	98.80	98.70

Note: These efficiency levels should be achieved at 100% of nameplate load. [3]

Table 65. Maximum allowed losses in watts, NOM-002-SEDE

Phases	Capacity kVA	Insulation Class Up to 15 kV (Watts)		Up to 25 kV (Watts)		Up to 34.5 kV (Watts)	
		Core	Winding	Core	Winding	Core	Winding
Single Phase	5	30	77	38	74	63	55
	10	47	131	57	131	83	116
	15	62	182	75	184	115	160
	25	86	282	100	294	145	274
	37.5	114	399	130	422	185	405
	50	138	495	160	524	210	526
	75	186	648	215	696	270	718
	100	235	826	265	898	320	946
	167	365	1322	415	1443	425	1603
Three Phase	15	88	226	110	220	135	210
	30	137	397	165	400	210	387
	45	180	575	215	587	265	583
	75	255	887	305	915	365	932
	112.5	350	1247	405	1308	450	1379
	150	450	1526	500	1630	525	1759
	225	750	2094	820	2260	900	2410
	300	910	2734	1000	2951	1100	3160
	500	1330	4231	1475	4598	1540	5046

Table 66. Transitional minimum efficiency levels for small manufacturers, NOM-002-SEDE

[3] Jose Antonio Gomez, Engineer. ANCE. Telephone Interview, Arthur D. Little. June, 2001.

Phases	Capacity kVA	Insulation Class Up to 15 kV (%)	Up to 25 kV (%)	Up to 34.5 kV (%)
Single Phase	5	97.50	97.40	97.30
	10	97.75	97.70	97.60
	15	97.95	97.90	97.80
	25	98.15	98.10	98.00
	37.5	98.35	98.25	98.15
	50	98.50	98.40	98.25
	75	98.60	98.50	98.40
	100	98.70	98.55	98.50
	167	98.80	98.60	98.55
Three Phase	15	97.50	97.40	97.30
	30	97.80	97.70	97.60
	45	98.00	97.90	97.80
	75	98.15	98.05	97.95
	112.5	98.25	98.15	98.05
	150	98.35	98.25	98.15
	225	98.45	98.35	98.20
	300	98.50	98.45	98.25
	500	98.55	98.50	98.35

Note: These efficiency levels are applicable to manufacturers with less than 9 MVA annual production, and should be achieved at 100% of nameplate load. [4]

Table 67. Transitional maximum losses for small manufacturers, NOM-002-SEDE

Phases	Capacity kVA	Insulation Class Up to 15 kV (Watts)		Up to 25 kV (Watts)		Up to 34.5 kV (Watts)	
		Core	Winding	Core	Winding	Core	Winding
Single Phase	5	36	92	45	88	74	65
	10	61	169	71	164	103	143
	15	80	261	93	229	141	196
	25	110	361	123	361	176	334
	37.5	139	490	157	511	221	486
	50	166	595	190	623	254	637
	75	238	827	270	872	333	887
	100	292	1025	335	1136	385	1138
	167	439	1589	530	1841	515	1942
Three Phase	15	108	277	133	267	156	260
	30	173	502	206	500	260	478
	45	218	700	259	706	316	696
	75	316	1098	374	1118	442	1128
	112.5	439	1565	501	1619	551	1686
	150	573	1944	627	2045	650	2177
	225	934	2608	1005	2770	1121	3003
	300	1141	3428	1195	3528	1380	3964
	500	1760	5597	1848	5766	2055	6333

(Scholand and Garcia-Lopez, 2001)

[4] Jose Antonio Gomez, Engineer. ANCE. Telephone Interview, Arthur D. Little. June, 2001.

iii) USA:

MEPS levels

USDOE is currently undertaking a rulemaking for distribution transformers. The timetable for the Final Rule is as yet undetermined.

Test procedures

The test procedure development for distribution transformers was initiated in 1998. During that year, NEMA developed and published NEMA Standard TP 2-1998 for Distribution Transformers, which presented a method to demonstrate compliance with the suggested efficiency levels of NEMA Standard TP 1. DOE's Notice of Proposed Rulemaking proposed that DOE would incorporate, as its test procedure for transformer efficiency, either portions of the recognized industry test procedures or NEMA Standard TP 2-1998. DOE held a public hearing on January 6, 1999, on the proposed test procedure rule. Based on the comments received, DOE concluded that a number of significant issues had been raised that required additional analysis. In June 1999, the Department reopened the comment period on the proposed rule.

In reviewing the test procedure rulemaking record and preparing the final rule, representatives of the Department developed concerns about whether NEMA Standard TP 2-1998 had the level of detail required for a mandatory Federal test procedure. The Department is attempting to clarify NEMA Standard TP 2-1998, and NEMA has agreed to consider revisions to TP 2 suggested by the Department.

R. Pumps

i) Canada

Test Procedure

Canada has a national test procedure (C820) for small pumps. The publication of a new edition of the national standard is expected soon; committee work has been completed. The new standard will include product definitions, efficiency testing, and descriptor.

ii) México:

MEPS levels

There are four MEPS for fluid pumps: NOM-001-ENER-2000, NOM-004-ENER-1995, NOM-006-ENER-1995, and NOM-010-ENER-1996. NOM-001-ENER-2000 applies to vertical turbine pumps with an external electrical vertical motor. This law, which includes limits and a test method, was published on September 1 2000 and took effect on December 29, 2000. This law replaced the previous 1995 law. The efficiency limits are listed in Table 68.

Table 68. Minimum efficiency values for the optimum point, the pump capacity, and the number of "pasos".

Size	Pump Capacity (l/s)		Minimum efficiency %	No. of Pasos
4	1,0	3,0	64,0	8
5	3,66	11,55	71,0	5
6	2,9	24,97	70,0	7
7	4,7	34,65	70,0	6
8	10,0	68,0	73,0	7
9	17,0	69,3	77,0	5
10	20,4	66,6	77,0	7
11	39,7	75,0	80,0	5
12	32,0	150,0	80,0	5
13	85,8	141,6	80,0	5
14	61,1	250,0	80,0	5
15	101,0	209,0	81,0	7
16	139,4	256,8	81,0	5
18	222,6	353,9	81,0	5
20	321,8	818,9	81,0	5
24	533,6	902,2	81,0	5

NOM-004-ENER-1995 applies to centrifugal residential water pumps of 0.187 to 0.746 kW power rating. This MEPS attempts to limit the electric consumption of the millions of residential water pumps used in México to fill rooftop water tanks due to the low water pressure in the water mains. It has been enforced since June 1996. The minimum efficiency levels required are shown in Table 69. These values are obtained using a test procedure similar to that of ISO-3555-1997-Class B.

Table 69. MEPS values for centrifugal residential water pumps, México

Rated Power kW	Efficiency %
0,187	45
0,373	45
0,560	50
0,746	55

Source: NOM-004-ENER-1995

NOM-006-ENER-1995 applies to electromechanical pumping systems of vertical turbine pumps with external or submersible motor of 5.5 kW to 261 kW (7.5 to 350 hp) used in deep agricultural wells. The purpose of the MEPS was to guide efforts to retrofit agricultural deep-well pumps and ensure that new wells use efficient equipment. Retrofit improvements could focus on the electric motor, the pump, the structure of the deep well, or a combination of these. It has been in effect since November 1996. The test method used to determine the pump system (not component) efficiency was designed in México and does not follow any foreign standard test procedure. The minimum efficiency values

required are shown in Table 70.

Table 70. MEPS values for deep-well pumping systems, México

Rated Power kW	Rated Power hp	Electromechanical Efficiency %
5.6 - 14.9	7.5-20	52
15.7 - 37.3	21-50	56
38.0 - 93.3	51-125	60
94.0 - 261	126-350	64

Source: NOM-006-ENER-1995.

Operators of deep wells will have six months to improve their pump systems efficiency if it is found to be less than 40%. The Energy Secretariat is in charge of verifying compliance with this MEPS.

NOM-010-ENER-1996 applies to submersible clean water pumps. It has been enforced since January 1998. The submersible pumps are characterized in terms of their pump and electric motor efficiencies. The minimum efficiency levels required for each of these components are shown in Tables 71 and 72. These values are obtained using a test procedure based on ISO-3555-1997-Class B.

Table 71: Pump efficiency values for submersible pumps, México

Pump Capacity litres/second	Pump Efficiency %
Up to 2.0	48
From 2.0 to 5.0	61
From 5.0 to 15.0	71
From 15.0 to 25.0	72
From 25.0 to 30.0	74
From 30.0 to 60.0	77
Greater than 60.0	78

Source: NOM-010-ENER-1996.

Table 72: Electric motor efficiency values for submersible pumps, México

Motor Rating kW	Motor Rating hp	Efficiency %
Up to 1.5	Up to 2.0	68
From 1.5 up to 2.2	From 2.0 up to 3.0	72
From 2.2 up to 3.7	From 3.0 up to 5.0	73
From 3.7 up to 5.6	From 5.0 up to 7.5	75
From 5.6 up to 7.5	From 7.5 up to 10.0	77
From 7.5 up to 11.2	From 10.0 up to 15.0	79
From 11.2 up to 14.9	From 15.0 up to 20.0	80
From 14.9 up to 22.4	From 20.0 up to 30.0	81
From 22.4 up to 29.8	From 30.0 up to 40.0	83
From 29.8 up to 44.7	From 40.0 up to 60.0	86
Greater than 44.7	Greater than 60.0	87

Source: NOM-010-ENER-1996.

The NOM requires that the overall efficiency at the guaranteed point (in percentage points to one decimal place) is included on the nameplate.

S. Refrigerated Display Cabinets/Commercial Refrigerators

i) Canada

Canada is initiating a review of their standard for refrigerated display cabinets (C657), and working toward the publication of a new edition of the standard through the recognized standard development process. The revised standard is expected to include product definitions, and minimum efficiency levels will be examined.

ii) Mexico
Mexico's NOM-022-ENER/SCFI/ECOL-2000 mandates energy efficiency and safety requirements for the use and elimination of chlorofluorocarbons (CFC's) for self-contained commercial refrigeration units. These equipment are utilized to cool drinks and snacks (e.g., ham, cheese). The rule, which includes limits, test methods, and labeling, was published on April 25, 2001 and entered into effect on June 24 2001.

T. Uninterruptible Power Supplies
i) Canada
Test Procedure
The publication of a new edition of Canada's national test procedure on uninterruptible power supplies (C813) is expected soon. Committee work has been completed.

U. Exit Signs
i) Canada
Test Procedure
The publication of a new edition of Canada's national test procedure on exit signs (C860) is expected soon. Committee work has been completed.

V. Mechanical Ventilation Systems
i) Canada
Test Procedure
Canada is working toward the publication of a revision to the national test procedure for mechanical ventilation systems (F326) through the recognized standard development process.

W. High-Intensity Discharge Lamp Ballasts
i) Canada
Test Procedure
Canada is working toward the publication of a new national test procedure for High-Intensity Discharge Lamp Ballasts (C863) through the recognized standard development process. The revised standard is expected to include new product definitions and minimum efficiency levels.

X. Non-Residential Building Envelopes
i) México
Mexico has MEPS for non-residential buildings: NOM-008-ENER-2001 on energy efficiency in construction of non-residential building envelopes, published April 25, 2001 and entering into effect at the end of August 2001.

Y. Additional products under consideration
i) Canada:
The Canadian Standards Association is currently working toward the publication of new test procedures for the following products:

- Power transformers (CSA-C802.3)

- Gas fireplaces (CSA-P4): The new standard is expected to include product definitions and efficiency test method and descriptor.
- Small motors (CSA-C747): Canada is investigating establishing minimum efficiency levels, and harmonization with Mexican NOM-016-ENER1997, and working toward publication of a revised national standard.
- Water chillers (CSA-C743): Canada is working toward the publication of a national standard, and investigating harmonization with ARI standard 550/590.

ii) México: To be added

iii) USA

According to a House of Representatives bill under consideration (HR4), the United States is considering expanding its MEPS program to include the following products:

- residential furnace fans
- residential central air conditioner fans
- heat pump circulation fans
- suspended ceiling fans
- refrigerated bottled or canned beverage vending machines.

III. COMPARISON LABELS

A. Description of Canada's EnerGuide program

Natural Resources Canada administers the national comparative labeling program, EnerGuide, which has both mandatory and voluntary labeling elements.

a) Mandatory component: This component mandates that room air conditioners, freezers, refrigerators, refrigerator-freezers, clothes dryers, clothes washers, clothes washer/dryers, dishwashers, and ranges/ovens be labeled. The EnerGuide labels display the energy (kWh/year) used by the appliance and how this compares with the lowest and highest energy consumption for similar products. Air conditioner ratings are based on the Energy Efficiency Ratio (EER) of the unit.

The EnerGuide label for major household appliances and HVAC products is administered under the Regulations of Canada's Energy Efficiency Act. The label applies to both domestic and imported products. An annual appliance directory is published as a guide for purchasers, listing all available models on the market. Separate guides are available for major appliances and air conditioners. All product listings are also available on the EnerGuide web site. The Energy Efficiency Regulations specify all details pertaining to the labels including placement on products. The program has strong support through internet sites and retailer liaison and training programs.

Canada will be increasing the labeling of commercial and industrial type products either through the Energy Star or EnerGuide mechanism.

b) Voluntary component: This component of the program has been implemented by Natural Resources Canada since 1998. Appliances labeled in this program include air conditioners (single packaged central & heat pump and split system), heat pumps, and gas and propane furnaces. The labels demonstrate how the appliance compares with the lowest and highest energy efficiency for similar products. Air conditioner and heat pump ratings are based on the Seasonal Energy Efficiency Ratio (SEER) of the unit. Furnace ratings are based on annual fuel utilization efficiency (AFUE).

The HVAC industry designed this voluntary label program to pre-empt a regulated scheme. This label appears at the back of the manufacturers' brochures (not directly on the product), since consumers are more likely to view this type of product in a brochure, not on the sales floor. The comparative rating provides users with the equipment's MEPS level as the lowest rating and the AFUE or SEER of the best product available in the Canadian marketplace as the highest.

Voluntary programs under the EnerGuide banner include cars, vans, light trucks and homes.

B. Description of México's comparative labeling program

México's mandatory comparative labeling program is implemented by the Comisión Nacional de Ahorro de Energía (CONAE). Products covered include room and central air conditioners, refrigerators and/or refrigerator-freezers, clothes washers, centrifugal residential pumps, gas water heaters, commercial refrigeration, and non-residential building envelopes.

Products that require efficiency labels are rated as part of the MEPS process. The label for refrigerators shows how efficient the appliance is in comparison to one operating at the MEPS level. The Air Conditioner label displays the EER and allows calculation of running costs. It ranks the product relative to the MEPS level (which is shown on the label) from A to E, with E being the best. The labeling system in México is under review.

C. Description of the U.S. Energy Guide program

In 1975 the Energy Policy and Conservation Act required the US Federal Trade Commission (FTC) to establish a labeling program and the Department of Energy (DOE) to set voluntary efficiency targets. The mandatory comparative labeling program, Energy Guide, became effective from about 1980 when manufacturers were obliged to place energy labels indicating energy consumption on their appliances. Appliances labeled include central and room air conditioners, clothes washers, dishwashers, freezers, furnaces, refrigerators, refrigerator-freezers, water heaters, heat pumps, boilers, ballasts, and lamps.

The FTC is responsible for the design, implementation and compliance of this program. The National Institute of Standards and Technology (NIST) is responsible for the test procedures. The label originally showed only the annual cost of operation; however, problems arose when national average electricity price changed from year to year. In 1994, the FTC revised the Energy Guide label to make annual energy use (in kWh) rather than average annual operating cost the main comparative indicator. The rating system shows energy (kWh/year), operating cost, and the lowest and highest energy used for similar products. Energy efficiency ratios (i.e., EER or SEER) are used for climate-control appliances, for which energy consumption varies by region and seasons. The annual cost appears on the label in the case of room air conditioners, and on fact sheets and in industry-produced product directories for the other climate-control appliances.

To enable manufacturers to produce the correct label, the FTC collects data on the range extremes from time to time, and the DOE publishes the average energy prices to be used in the calculations.

D. Comparative analysis

Tables 73 and 74 highlight the similarities and differences among the comparative labels in Canada, México, and the United States.

Table 73. Products Covered by Comparison Labels

Product	Canada (EnerGuide)	México	USA (Energy Guide)
Room AC	**M**	**M**	**M**
Central AC		**M**	**M**
Single Packaged Central AC and HP	**V**		
Split System AC	**V**		
Heat Pumps	**V**		**M**
Refrigerators	**M**	**M**	**M**
Freezers	**M**		**M**
Refrigerator/ Freezers	**M**	**M**	**M**
Clothes Dryers	**M**		
Clothes Washers	**M**	**M**	**M**
Clothes Washer/Dryers	**M**		
Dishwashers	**M**		**M**
Ranges/Ovens	**M**		
Furnaces	**V**		**M**
Boilers			**M**
Ballasts		**M**	**M**
Lamps			**M**
Water Heaters			**M**
Centrifugal Residential Pumps		**M**	

M = Mandatory
V = Voluntary

Table 74. Characteristics of Comparative Labels

Product	Canada (EnerGuide)	México	USA (Energy Guide)
Information Displayed on Label:	Mandatory labels: Energy (kWh/year) used by the appliance		Energy (kWh/year) used by the appliance
	How energy use compares with the lowest and highest energy consumption for similar products		How energy use compares with the lowest and highest energy consumption for similar products
			Estimated annual energy cost based on energy consumption of the model

Refrigerators		Percentage energy savings relative to the relevant MEPS level shown as an arrow with a % sign.	
AC ratings	Mandatory label: Air conditioner ratings based on EER Voluntary label: AC and HP ratings based on SEER	For CAC: same as refrigerators. For room AC: Label displays EER and allows calculation of running costs. It ranks the product relative to the MEPS level from A to E, with E best.	Ratings based on EER or SEER. Energy costs appear on label for room AC, and on fact sheets and in industry-produced product directories for the other climate-control appliances.
Furnace ratings	Voluntary label: Furnace ratings based on AFUE		
Clothes washer/ dryers	Labels show kWh used for 416 cycles per year for washers and 392 cycles per year for dryers.		Labels for clothes washers show kWh used for 416 cycles per year (clothes dryers do not carry a label).
Label placement	Mandatory label: On product. Voluntary label: At the back of manufacturers' brochures	On product	On product
Domestic vs. imported	Label applies to both domestic and imported products	?	?
Other program elements	The mandatory program includes cars, vans, light trucks and homes.		
Future	Canada will be increasing the labeling of commercial and industrial type products perhaps through the EnerGuide mechanism.	The labeling system in México is under review.	

IV. ENDORSEMENT LABELS

A. Description of Canada's Energy Star - High Efficiency / Haute Efficacité

In 2001, The Government of Canada through Natural Resources Canada (NRCan) became a partner of International Energy Star. The International Energy Star Program began in October 1995 with an agreement between the governments of Japan and the United States. NRCan and other partner countries recognize and promote the criteria and logo established under the USA energy star scheme. The logo administered in Canada includes the bilingual *High Efficiency/Haute Efficacité* tagline which identifies it as Canadian. The following products are part of the initial agreement: refrigerators, dishwashers, clothes washers, bottled-water coolers, room air conditioners, dehumidifiers, condensing gas furnaces, central air conditioners and heat pumps, programmable thermostats, office equipment and home electronics (TVs, VCRs, and DVDs). Other products will be added in the future. Products in the agreement that currently have an EnerGuide label will have the Energy Star logo on the same label. Products approved in one country are licensed to display the label in any of the other participating countries. Product information is then shared among the participants. The US EPA and US DOE are responsible for developing the endorsement criteria, but NRCan is consulted when developing new specifications.

B. Description of México's Sello FIDE program

In 1995, México introduced the Sello FIDE, a voluntary energy efficiency endorsement seal given by the Fideicomiso para el Ahorro de Energía Eléctrica (FIDE). FIDE is a non-profit association that draws membership from a collaborative of Mexican utilities, labor organizations and businesses including CONAE and Comisión Federal de Electricidad (CFE, or Federal Electricity Commission).

Appliances labeled under this program are room air conditioners, fluorescent lamps and CFLs, refrigerators, refrigerator-freezers, and televisions. Manufacturers have to submit certified test results on their products to confirm that they cover the Sello FIDE requirements. A certified laboratory tests the product to verify manufacturer claims. If approved, manufacturers pay for certification and sign an agreement stipulating length of validity of the Sello FIDE endorsement, how it can be displayed, cancellation of certification, etc. Manufacturers can then display the Sello FIDE on their products. FIDE advertises the Sello FIDE in order to entice consumers to look for it when purchasing electrical equipment.

C. Description of the U.S. Energy Star and Green Seal programs

<u>i) Energy Star®</u>

The Energy Policy Act of 1992 directed DOE to support a voluntary office equipment program (Energy Star®). Energy Star® is a joint effort with DOE and the US Environmental Protection Agency (EPA); the lead agency depends on the product.

Appliances labeled under this program include computers, monitors, printers, fax machines, central and room air conditioners, ventilating fans, ceiling fans, copiers, furnaces, boilers, heat pumps, transformers, dishwashers, refrigerators, clothes washers, MFDs, residential lighting products, scanners, TVs, VCRs, set top boxes, audio products, DVDs, CFLs, programmable thermostats, water coolers, dehumidifiers, windows, roof products, exit signs, and traffic lights.

For office equipment such as personal computers and photocopiers, and household electronic equipment such as video cassette recorders, the Energy Star label indicates that the model has certain power management capabilities, and that the manufacturer has undertaken to supply the product with those capabilities turned on, or "enabled." For other types of equipment, the Energy Star label indicates that the product is among the most efficient of its type, either because it is in the top percentile of the range on the market, or because it exceeds the MEPS level by a specified margin. The amount by which an appliance must exceed the MEPS differs for each product and is dependent on available technology in each product category. For photocopiers, the product must have certain paper handling as well as power management capabilities. The program is exploring endorsement criteria for ceiling fans, spot ventilation fans, motors, and water heaters.

ii) Green Seal

A non-profit organization called Green Seal has implemented a voluntary ecolabel since 1992—the Green Seal of Approval—which endorses energy efficient products. Appliances Labeled under this program include lamps, clothes washers and dryers, dishwashers, freezers, ranges/ovens, refrigerators, refrigerators-freezers, residential air conditioners, and heat pumps. The products eligible for a label are selected according to the significance of their potential environmental impact and in consultation with industry, environmentalists, consumer groups, and the public. Criteria are then established addressing the areas where the product has most negative impact. Manufacturers pay Green Seal to organize the testing and monitoring of their product. Once the label is awarded, the product is checked annually. The label displays the program logo and clearly states the criteria for which the award was given e.g. "Meets Green Seal Environmental Criteria for high Energy Efficiency, low Noise, and recycled Packaging".

D. Comparative analysis/discussion

Tables 75 and 76 highlight the similarities and differences among the endorsement labels in Canada, México, and the United States.

Table 75. Products Covered by Endorsement Labels

Product	Canada (Energy Star)	México (Sello FIDE)	USA (Energy Star)*	USA (Green Seal)
Room AC	**X**	**X**	**X**	**X**
Central AC	**X**		**X**	**X**

Heat Pumps			**X**	**X**
Refrigerators	**X**	**X**	**X**	**X**
Freezers	**X**			**X**
Refrigerator/ Freezers	**X**	**X**		**X**
Clothes Dryers				**X**
Clothes Washers	**X**		**X**	**X**
Dishwashers	**X**		**X**	**X**
Ranges/Ovens				**X**
Furnaces	**X**		**X**	
Boilers			**X**	
Lamps		**X**		**X**
CFLs		**X**	**X**	
Residential Lighting Products			**X**	
Ventilating Fans			**X**	
Ceiling Fans			**X**	
Computers	**X**		**X**	
Monitors	X		**X**	
Printers	**X**		**X**	
Copiers	**X**		**X**	
Fax Machines	**X**		**X**	
MFDs	**X**		**X**	
Scanners	**X**		**X**	
Televisions	**X**	**X**	**X**	
VCRs	**X**		**X**	
DVDs	**X**		**X**	
Set Top Boxes			**X**	
Audio Products	**X**		**X**	
Exit Signs	**X**		**X**	
Traffic Lights			**X**	
Transformers			**X**	
Water coolers	**X**		**X**	
Dehumidifiers	**X**		**X**	
Windows			**X**	
Roof Products			**X**	
Programmable Thermostats	**X**		**X**	

*The Energy Star program is exploring endorsement criteria for motors, water heaters, air cleaners, light commercial HVAC, reach-in refrigerators and freezers, telephony, and vending machines.

Table 76. Characteristics of Endorsement Labels

AGREEMENTS WITH PARTNERS	
Energy Star - High Efficiency / Haute Efficacité (Canada)	Voluntary. US EPA and US DOE develop endorsement criteria but all partners are consulted when developing new specifications. Products approved in the US are licensed to display the label in Canada. Promotion and implementation of the bilingual program is the responsibility of NRCan.
Sello FIDE	Voluntary. Manufacturers pay for certification and sign an agreement stipulating length of validity of the Sello FIDE endorsement, how it can be displayed, etc.
Energy Star	Voluntary. Manufacturers pay the costs for printing and applying the Energy Star logos.
Green Seal	Voluntary. The products eligible for a label are selected in consultation with industry, environmentalists, consumer groups, and the public.
CRITERIA	
Energy Star - High Efficiency / Haute Efficacité (Canada)	See Energy Star. US EPA and US DOE are responsible for developing endorsement criteria, but NRCan is consulted when developing new specifications.
Sello FIDE	Products must have a high level of efficiency compared to the market in general. [More information needed.]
Energy Star	For office and household electronic equipment, the label indicates that the model has certain power management capabilities that are enabled (e.g., for TVs, standby power ≤ 3W). For other equipment, the label indicates that the product is among the most efficient of its type, either because it is in the top percentile of the range on the market, or because it exceeds the MEPS level by a specified margin (this margin differs for each product and depends on available technology, e.g., 20% for refrigerators and 15% for room AC). For photocopiers, the product must have certain paper handling as well as power management capabilities.
Green Seal	Eligible products are selected according to the significance of their potential environmental impact and in consultation with industry, environmentalists, consumer groups, and the public. Criteria are then established addressing the areas where the product has most negative impact.
COMPLIANCE	
Energy Star - High Efficiency / Haute Efficacité (Canada)	See Energy Star below – Manufacturers report their energy efficiency levels (as tested by a third party) to NRCan as part of the regulatory compliance which allows for additional verification for those Energy Star products that also have MEPS.

Sello FIDE	Manufacturers submit certified test results on their products. A certified laboratory tests the product to verify manufacturer claims.
Energy Star	Manufacturers are responsible for ensuring their own compliance. USDOE and EPA can test products to check compliance if necessary; non-compliant products/manufacturers are removed from the program.
Green Seal	Manufacturers pay Green Seal to organize the testing and monitoring of their product. Once the label is awarded, the product is checked annually.

V. DISCUSSION

A. Categorization of Products

i) Products with similar or identical MEPS and test procedures in the three countries

Table 77 lists products that have—or will soon have—identical or nearly identical MEPS and test procedures in Canada, México, and the United States:

Table 77. Products with similar or identical MEPS and test procedures in Canada, México, and the United States

MEPS	Test Procedures
Refrigerators and freezers	Refrigerators and freezers
Split system central AC	Central AC and heat pumps
Room AC	Room AC
	Motors

ii) Products with different MEPS and test procedures, but which could (in the short term) share common MEPS and labels.

Table 78 lists products for which one of the following applies:

- Canada, México, and the United States all have MEPS and/or test procedures, but the details of these regulations differ between one or more of the countries; or
- Only two countries have MEPS and/or test procedures, but these are the same or similar.

Table 78. Products that could share common MEPS and labels

MEPS	Test Procedures
Clothes washers	Clothes washers and dryers
Dishwashers	Dishwashers
Fluorescent lamp ballasts	Fluorescent lamp ballasts
Fluorescent lamps	Fluorescent lamps
Incandescent reflector lamps	Incandescent reflector lamps
Motors	Water heaters
Small motors	Transformers
Single packaged CAC and HPs	

iii) Products that do not have MEPS and labels in all of the three countries, but which could develop and share common MEPS and labels in the longer term

The following products and activities show potential for common programs in Canada, México, and the United States:

a. Standby losses

Relevant activities: On July 31, 2001, US President George Bush issued an executive order on energy efficient standby power devices. The order directs federal agencies, when purchasing commercially available products that use external standby power devices or that contain an internal standby power function, to buy products that use no more than one watt in their standby power consuming mode, or use the lowest wattage available. Agencies must adhere to these requirements when life-cycle cost-effective and practicable and where the relevant product's utility and performance are not compromised as a result. By December 31, 2001, and on an annual basis thereafter, the Department of Energy, in consultation with the Department of Defense and the General Services Administration, will compile a preliminary list of products to be subject to these requirements. The Department of Energy will finalize the list and may remove products deemed inappropriate for listing. Independent agencies are encouraged to comply with the provisions of this order.

b. Uniform endorsement label

Relevant activities: Canada has recently signed an administrative agreement with the US Environmental Protection Agency (EPA) and Department of Energy (DOE) to administer the voluntary Energy Star program in Canada. The logo will include the bilingual *High Efficiency/Haute Efficacité* tagline that will identify it as Canadian. Products in the agreement that currently have an EnerGuide label will have the Energy Star logo on the same label. The following products are part of the initial agreement: refrigerators, dishwashers, clothes washers, bottled-water coolers, room air conditioners, dehumidifiers, condensing gas furnaces, central air conditioners and heat pumps, programmable thermostats, office equipment and home electronics (TVs, VCRs, and DVDs). Other products will be added in the future. Canada will be increasing the labeling of commercial and industrial type products either through the Energy Star or EnerGuide mechanism.

c. New standard or label on windows

Relevant activities: The US and Canada have been working to standardize the process for determining and reporting energy efficiency properties of windows. Both countries have been involved in the writing of ISO15099, which documents the technical algorithms used by computer programs to simulate window thermal performance properties. This standard is now in FDIS form and is expected to be adopted in 2002.

The National Fenestration Rating Council (NFRC) in the US and the Canadian Standards Association (CSA-A440) in Canada have been working to standardize the logistical procedures for rating and labeling windows with thermal performance properties. This

work has been ongoing for several years and is continuing. CSA also is working with the US American Architectural Manufacturers Association (AAMA) to standardize reporting of non energy parameters for windows (structural, water infiltration).

Recently, México's CENIDET (Centro Nacional de Investigacion y Desarrollo Tecnológico or the National Center for Research and Technology Development, associated with the National University of México) has become involved in working with US and Canadian researchers on technical topics relating to determing window thermal performance parameters.

B. Legal basis for MEPS and labels in each of the three countries

i) Canada:

The *Energy Efficiency Act* passed in 1992 provides for the making and enforcement of regulations concerning minimum energy performance standards (MEPS) for energy-using products, as well as the labelling of energy-using products and the collection of data. The first Regulations under the Act came into effect in 1995, following extensive consultations with the provincial governments, affected industries, utilities, environmental groups, and others. (Labelling had commenced in 1978 under earlier legislation). The Regulations established MEPS for a wide range of energy-using products, with the objective of eliminating the least energy-efficient models from the Canadian market.

The Regulations apply to dealers (manufacturers or importers) who import regulated products into Canada or ship them from one Canadian province to another. The Federal Regulations do not apply to products that are manufactured and sold within one province. However, most provinces have their own energy efficiency regulations, which may differ from the Federal Regulations or may apply to other classes of equipment. The Federal Regulations, which are administered by Natural Resources Canada (NRCan), do not take precedence over provincial regulations for locally made and sold products.

For the products covered in the Federal Regulations, the MEPS levels apply equally where the products are incorporated into other products (eg where fluorescent lamps and ballasts are sold as part of a complete luminaire). Exports and products which are shipped between provinces only in order to be exported from Canada are exempt from the Federal Regulations.

ii) México:

The Ley Federal Sobre Metrología y Normalización of July 16, 1992 defined two types of standards: Normas Mexicanas - NMX (Mexican Standards) of voluntary compliance, and Normas Oficiales Mexicanas - NOM (Official Mexican Standards) of compulsory compliance. The NOM are enacted by the Federal Secretariats according to their areas of competence.

The Sello FIDE has been implemented by the Fideicomiso para el Ahorro de Energía Eléctrica (FIDE) since mid-1995.

iii) USA:
The Energy Policy Conservation Act, 1975 (EPCA) directed the Department of Energy (DOE) to develop voluntary appliance efficiency targets. The National Energy Conservation Policy Act, 1978 (NECPA) directed DOE to set MEPS in replacement of the EPCA voluntary targets, and gave federal MEPS preemption over state standards. The National Appliance Energy Conservation Act of 1987 and amendments of 1988 (NAECA) established MEPS for the twelve categories of appliances covered under EPCA and NECPA, and instructed DOE to set MEPS for one additional product if technically feasible and economically justified. It also required DOE to review and update the MEPS to keep pace with technological improvements, and strengthened the preemption of federal MEPS over state standards. The Energy Policy Act of 1992 (EPAct) directed DOE to develop voluntary national testing and information programs for widely used types of office equipment. It established MEPS for nine categories of energy- and water-using commercial sector products, electric motors, lighting products, plumbing products and office equipment. It instructed DOE to set MEPS on three additional products if technically feasible and economically justified.

NECPA also required the Federal Trade Commission (FTC) to mandate labels for appliances that indicate their energy consumption. The FTC issued guidelines for the comparative label in a rule promulgated in November 1979. This required manufacturers of the major home appliance types to place energy labels on their appliances from mid-1980.

C. National procedures and protocols for the development of mandatory and/or voluntary MEPS and labels in each of the three countries.

i) Canada:

Test procedures are generally developed by consensus method at the Canadian Standards Association with participation from regulators (federal / provincial governments), manufacturers, and other interested stakeholders. These documents (generally called "standards") contain the test procedure, recommended minimum levels, and often marking or labelling instructions.

NRCan, through a process of public consultation (bulletins, workshops) and analysis (consumer economics, environmental impact), determines the recommended MEPS and labelling requirements. The proposed amendments to the regulations are pre-published in the Canada Gazette. A 75 day period for receiving public comments must follow. Depending on the nature of the comments the proposal may be modified, after which it is published in the Canada Gazette for the final time and enacted into law by parliament.

All regulated energy-using products imported into Canada or shipped between provinces must carry an energy efficiency verification mark from a certification organisation accredited by the Standards Council of Canada. The mark, which must be placed on the outside of the product, indicates that the energy performance of the product has been verified.

Before importing products or shipping them between provinces, dealers must ensure that an energy efficiency report for that product has been filed with NRCan. The data in the report are used to verify compliance with MEPS, and also to develop energy labels and directories of labelled products. The Canadian EnerGuide labelling program commenced in 1978. A dealer who imports a covered product or ships it from one province to another must ensure that it is properly labelled, and that the label remains on the product until it is sold at the retail level or leased.

The label shows the energy consumption in kWh/year (for air conditioners the label indicates the EER) derived from the standard tests. It also shows:

- a bar scale comparing the model's energy consumption (or EER) to other models on the market that are in the same product group;
- the energy consumption (or EER) of the most and least energy efficient models on the market that are in the same product group;
- the product group type and size category (cooling capacity category in the case of air conditioners) and
- the model number.

The Energy Efficiency Regulations specify the exact format, size, shape and color of the EnerGuide label and how it is to be placed on the product.

Information on all labelled appliances is collected in two EnerGuide directories, one for appliances and one for heating, ventilation and air conditioning. The EnerGuide program also has extensive support through Internet sites and retailer liaison and training

programs.

Other details of Canada's mandatory labeling program are found in Sections III and IV.

ii) México:

Several organizations are involved in the enactment of México's performance standards (NOM). These include:

- Secretaria de Energia—Involved when MEPS affect their areas of competence;
- National Energy Savings Commission (CONAE) (Comisión Nacional de Ahorro de Energía)—Responsible for the design and enactment of MEPS and labels related to energy efficiency;
- National Standards Consultative Committee for the Preservation and Rational Use of Energy Resources (CCNNPURRE) (Comité Consultivo Nacional de Normalización para la Preservación y Uso Racional de los Recursos Energéticos). This committee is responsible for reviewing all MEPS proposals. CONAE presides over and defines membership in CCNNPURRE which includes representatives from the SECOFI (Secretariat of Commerce and Industrial Promotion), SE (Secretaria de Energia), IIE (Electric Research Institute - Instituto de Investigaciones Eléctricas); ANFAD, ANFEEA, CANAME (trade associations) and academics.

Enactment of a new MEPS typically takes about two years. Initially it takes 10 to 12 months to prepare a MEPS proposal and another 210 days to enact the MEPS. A MEPS proposal is presented to the CCNNPURRE who has 75 days to provide comments. The CCNNPURRE comments are incorporated within the next 30 days and the proposal is then published in the Diario Oficial de la Nación - DON. A period of 60 days for public comment is followed by another 45 days of consultation within CCNNPURRE to incorporate the public comments and approve the final MEPS and/or label and its publication in the DON.

The NOM includes both the minimum energy performance levels required and the test procedure for determining the equipment performance.

Until recently, the Dirección General de Normas - DGN (General Standards Directorate) of SECOFI was in charge of certifying testing laboratories and verifying compliance with the MEPS and/or labelling requirements. CONAE is now in charge of verifying compliance.

The Asociación Nacional de Normalización y Certificación del Sector Eléctrico - ANCE (National Association of Standardisation and Certification of the Electric Sector) is in charge of elaborating the NMX related to the electric sector. It also can certify others and has its own laboratory for conducting various standardised test procedures.

SECOFI enacts NOM related to user safety, commercial information (e.g., food labels) and practices. SECOFI through its DGN certifies testing laboratories. Besides the ANCE and IIE test laboratories, many manufacturers' laboratories have been certified to do the tests specified in the NOMs.

México's mandatory labeling program is described in Sections III and IV.

iii) USA:

The US Department of Energy (DOE) is required by legislation to set MEPS for a wide range of nominated products. Additionally, those products which are not covered by MEPS but which consume more than a specified amount of energy are to be considered for MEPS. However, MEPS can only be set after a prescribed process of research and consultation, and the MEPS levels must be demonstrated to be technically feasible and cost-effective. MEPS levels are periodically reviewed by DOE, and higher levels are set if the analysis justifies a revision.

A number of analyses are performed in the setting of each MEPS. An engineering analysis identifies and quantifies the cost of energy-saving technologies. Economic analysis analyzes historical and projected costs and benefits to consumers, manufacturers, utility companies, and the country. Environmental impacts, including reducing emissions of carbon dioxide and nitrogen oxides, and utilization of chlorofluorocarbons, also are analyzed.

New process rules were published in July 1996. The new rules were designed to: 1) provide for early input from stakeholders and support efforts to build consensus on MEPS, 2) increase the predictability of the rulemaking timetable, 3) reduce the time and cost of developing MEPS, 4) ensure increased use of outside expertise, 5) eliminate design options early in the process, 6) ensure thorough analyses of impacts and the use of transparent and robust analytical methods, 7) ensure consideration of non-regulatory approaches, and 8) articulate policies to guide the selection of MEPS. Central to the new process is the consultation with stakeholders at all stages. DOE created an advisory committee to guarantee stakeholders access to the process and the continuing process evaluation and improvement.

The US mandatory labeling program is described in Sections III and IV.

D. Additional data worth collecting

Additional information that may be helpful to compile for the North America Energy Working Group, Expert Group on Energy Efficiency includes:

i) Manufacturers of products in North America

ii) Product flows among Canada, México, and the United States

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Canada
http://energuide.nrcan.gc.ca/ - EnerGuide
http://office.nrcan.gc.ca/tools/label_e.htm - Office of Energy Efficiency
http://oee.nrcan.gc.ca/regulations - Natural Resources Canada Regulations
www.scc.ca - Standards Council of Canada
http://www.csa.ca/standards/ - Canadian Standards Association
http://www.oee.nrcan.gc.ca/energystar/english/consumers/buying_home.cfm - Canadian Energy Star site

México
www.conae.gob.mx - Comisión Nacional de Ahorro de Energía (CONAE - National Energy Savings Commission)
www.fide.org.mx/ - Fideicomiso para el Ahorro de Energía Eléctrica (FIDE Trust for saving Electrical Energy)
www.secofi.gob.mx/normas - Dirección General de Normas (Mexican Standards Association)
www.energia.gob.mx - Secretaria de Energia (Ministry of Energy)
www.cre.gob.mx - Comisión Reguladorade Energía (CRE Energy Regulatory Commission)
www.cfe.gob.mx - Comisión Federal de Electricidad (CFE Federal Electricity Commission)

USA
www.eren.doe.gov/buildings/codes_standards/stkappl.htm – DOE Codes and Standards appliance-specific information
www.eren.doe.gov/buildings/consumer_information/energyguide.html - DOE Labeling Page
www.energystar.gov - ENERGY STAR®
www.nist.gov - National Institute of Standards and Technology
www.greenseal.org - Green Seal

Annex I:

Standards-Making Process: Comparison of Agencies and Stakeholders Involved in Canada, México, and the United States

Type of Entity/Role	Canada	México	United States
Entities with Formal Standards-making Roles			
Government			
Coordination/Overall Responsibility	**OEE** - Office of Energy Efficiency, Natural Resources Canada (Note: Provincial governments have jurisdiction to set local MEPS)	**National Standardization Commission** (*Comisión Nacional de Normalización*) -- Coordinates national standardization activities **General Direction of Standards** (*Dirección General de Normas*) of the Ministry of the Economy (*Secretaría de Economía*)	**DOE** -- Department of Energy. Conducts rulemakings and sets standards.
Review/Advisory Role	**Department of Justice Canada** **Department of Foreign Affairs and International Trade** **Industry Canada**	**National standards advisory committees** (*Comités consultivos nacionales de normalización*) -- Chaired by the relevant ministry	**DOJ** -- Department of Justice. Reviews DOE's rules to determine any anticompetitive effects. **US Congress** -- Option to review rules.
Approval	**Special Committee of Council (Office of the Privy Council)** --Regulations		**OMB** -- Office of Management and Budget. Approves DOE's rules.
Test Procedures	**CSA** - Canadian Standards Association (non-government)	**National Metrology Center** (*Centro Nacional de Metrología*): Primary calibration laboratory.	**NIST** -- National Inst. Of Standards and Technology. Assists DOE in developing new test procedures
Labeling	**OEE**		**FTC** -- Federal Trade Commission. Administers appliance labeling program.

Conformity Assessment			
Standards Writing		**ANCE** -- Asociación de Normalización y Certificación (non-mandatory standards) **ONNCE** -- Organismo Nacional de Normalización de la Industria de la Construcción (non-mandatory standards)	
Accreditation	**SCC** - Standards Council of Canada	**EMA** - Entidad mexicana de acreditación	
Certification		**ANCE** -- Asociación de Normalización y Certificación **ONNCE** -- Organismo Nacional de Normalización de la Industria de la Construcción	
Verification	**CSA International** **ULI** - Underwriters Laboratories **Intertek Testing Services** **ARI** – Air Conditioning and Refrigeration Institute **Provincial Governments**	**Verification Units** (*Unidades de verificación*) -- for systems standards, not products.	
Testing	**CSA International** **ULI** **Intertek Testing Services** **ARI** **Provincial Governments**	**Independent testing laboratories** **Manufacturers' testing laboratories** **Calibration laboratories**	**Manufacturers' testing laboratories**

Compliance	**CCRA** -- Canada Customs and Revenue Agency **Provincial Governments**		**US DOE**
Other Participating Stakeholders			
Stakeholders Associations			
Appliance and Equipment Manufacturers	**EFC** - Electro-Federation of Canada (includes **CAMA**-Canadian Association of Appliance Manufacturers and **EEMAC**-Electrical Equipment Manufacturers Advisory Council) **HRAI** - The Heating, Refrigeration and Air Conditioning Institute of Canada **CIPH** - Canadian Institute of Plumbing and Heating **CWDMA** - Canadian Window and Door Manufacturer's Association	**ANFAD** (*Asociación Nacional de Fabricantes de Aparatos Domésticos*) -- national Association of Appliance Manufactures. **CANAME** (*Cámara Nacional de Empresas de Manufacturas Eléctricas*) -- manufactures of power generation, transmission and distribution equipment, and appliance manufacturers.	**AHAM** -- Association of Home Appliance Manufacturers **ARI** -- Air-Conditioning and Refrigeration Institute **NEMA** -- National Electrical Manufacturers Association **EIA** -- Electronic Industries Alliance **CEA** -- Consumer Electronics Association **GAMA** -- Gas Appliance Manufacturers Association
Utilities	**CEA** - Canadian Electricity Association **Electrical utilities** **Gas utilities** such as Union Gas, Enbridge, Gazifere, Gaz Metro		**AGA** -- American Gas Association **Edison Electric Institute**
Advocacy Groups			
	Pembina Institute		**ACEEE** -- American Council for an Energy Efficient Economy

	FOE -- Friends of the Earth		**Alliance to Save Energy**
	CAC -- Consumers Association of Canada		**NRDC** -- Natural Resources Defense Council
			OOE -- Oregon Office of Energy
			CEC -- California Energy Commission
Other			
		FIDE (*Fideicomiso para el Ahorro de Energía Eléctrica*) – Private non-profit organization, created by the national utility (CFE) in 1990 to promote the rational use of the electric power. Operates the Sello FIDE program, which is voluntary but out of the categories defined by the Law.	**Home Depot**

Annex 2:

Comparison of Test Procedures in Canada, México, and the United States

The NAEWG Energy Efficiency Experts Group is performing preliminary, detailed comparisons of four test procedures that are similar in Canada, México, and the United States: Refrigerators and freezers, integral horsepower 3-phase electric motors, room air conditioners, and central air conditioners. The preliminary results from the refrigerator and freezer comparison are below; the motors comparison is in process. The central and room air conditioner test procedure comparisons will be performed in the near future.

1) Refrigerator and Freezer Standards

The Mexican and Canadian refrigerator and freezer test procedures have very similar formats. The U.S. references an AHAM Standard for much of the test requirements. The 1988 revision of the AHAM referenced standard is used for comparison, although DOE standard references the1979 version. In some cases the tolerances are basically equivalent but in converting from degree F to C values are rounded. [Resolution specifications can not be equivalent and still make sense, C or F has to have a higher resolution because instruments do not come with 1.8□F resolution (for cases where a 1□C resolution is specified)].

U.S.A	Canada	Mexico
US DOE 10 CFR, Part 430, Subpart B, Appendix A1 (1-1-01Edition) Uniform Test Method for Measureing the Energy Consumption of Electric Refrigerators and Electric Refrigerator-Freezers	**C300-00 Energy Performance and Capacity of Household Refrigerators, Refrigerator-Freezers, and Freezers**	**Norma Oficial Mexicana NOM-015-ENER-1997, Eficiencia Energetica De Refrigeratdores Y Congeladores Electrodomesticos. Limites, Metodos de Prueba Y Etiquetado**
Definitions		
Subpart A – General Provisions		
Electric refrigerator single phase alternating current designed for temp. above 38□F does not provide for a compartment temp. < 8□F		

Electric refrigerator freezer min. of one compartment above 38□F one compartment < 8□F ; can be set to below 0□F		
Freezer below 0□F		
Subpart B-- Test Procedures		
[1.1] references: AHAM HRF-1-1979 & ANSI B 38.1-1970 (same as above) [used for volume measurements and temperature measurement locations]		
AHAM HRF-1-1988		
[AHAM 7.2] **TEST ROOM**		
[AHAM 7.2.1] Ambient Temperature	Same	Same
[AHAM 7.2.2] Ambient Relative Humidity	Same (both say measure when required)	**NOT INCLUDED**, only needed for optional test that is not part of the Mexican standard
[AHAM 7.2.3] Air Circulation	Same	Same
[AHAM 7.2.4] Radiation	Same (equates 5C with 10F) delta 5C is really delta 9F	Same (equates 5.6C with 10F)
[AHAM 7.3] **INSTRUMENTS**		
[AHAM 7.3.1] Temperature accuracy ±1□F (±0.6□C) analog resolution □ 2F digital resolution □0.1F (0.1C)	[3.2.1] excludes glass thermometers, otherwise the same Accuracy ±0.5□C (±1□F) digital resolution □ 0.1C (0.2F)	Same as DOE

[AHAM 7.3.2] Electrical Watt-hr meters: analog 0.01resolution; digital 0.001 res. (or better) Voltmeters: analog min. res. 1V digital min. res. 0.1V **Accuracy for voltage and energy ±0.5% of quantity measured**	[3.2.4] Watt-hr: resolution □1 W-hr **Max. error □2% of the measured value for any consumption greater than 50W-hr** Voltmeters: accuracy ±0.5% of quantity measured	[9.5.2] Same as DOE
[AHAM 7.3.3] Time Synchronous self-starting electric clock or a similar time-integrator **(no accuracy specified)**	[3.2.5] **accurate to within ±0.5 seconds per hour**	Same as DOE
[AHAM 7.3.4] Relative Humidity a) psychrometric chart and wb & db with suitable psychrometric instrumentation ; accurate to ± 0.5□F (0.3□C) b) equivalent direct reading instrumentation ±2% RH	[3.1.2] When required in clauses 5.1.2 & 5.2.2 , wb & db accuracy not stated but wb bulb temp. is required to be ±1□F	RH is not mentioned (probably not in test procedure)
[AHAM 7.3.5 Weight; scales accurate to ±0.01 lbs. (4.5 g)	**not specified**	Same as DOE
[AHAM 7.4] **GENERAL TEST REQUIREMENTS**		
[AHAM 7.4.1] Power Supply - 115v±1volt, 60Hz (tolerance specified on volts but not Hz)	[3.3.2] same as DOE	[9.3] Same as DOE
[AHAM 7.4.2] Test Sample The evaporator in manual defrost models **need not be defrosted** prior to each test unless frost accumulation exceeds 1/4 inch in average thickness	[3.3.3.5] Same as DOE	[9.6.1] **In models without defrost the evaporator requires defrosting before each test.**

[AHAM 7.4.3] **Temperature Measurement**		
[AHAM 7.4.3.2] Ambient Temperature 3 feet above floor, 10 inches from refrig. side ±1□F (o.6C)	[3.3.4] ±0.5□C (±1□F) **a weighted thermocouple may be used (e.g., attach a 200 gram brass weight)**	[9.2.1] Same as DOE
[AHAM 7.4.3.2] Fresh Food Comp. Temp. (household refrigerators) 3 locations Fig. 7-1; 1 inch distance from hardware, minimum. Thermal mass on temperature measuring device		

[AHAM 7.4.3.3] Freezer Compartment of *(household refrigerators & household freezers)* [AHAM 3.1] household refrigerator includes: all-refrigerator, combination refrigerator-freezer (doesn't specify defrost type) Geometric center of filled packages, specified in detail, **sawdust or frozen food such as chopped spinach.** Unweighted thermocouples Loaded 75% of the maximum number of filled packages that can be fitted into the compartment. Packages approx. 5x4x1.5 inches approx. 13x10x4 cm	[3.2.3] Same as DOE	[9.7] Temperatures of the food compartments of refrigerators and refrigerator/freezers and of the **freezer compartment of refrigerator/freezer with automatic defrost and household freezers are measured using temperature sensors whose end shall be taken up by a metal mass that meets the conditions of section 9.5.1** CHECK TRANSLATION 9.8 conditions of simulated load [simulated load is same as DOE & Canada] <u>Simulated Load Not Used:</u> [9.8.1] In tests of *all-refrigerator, **refrigerator-freezers with automatic defrost*** <u>Simulated Load Used in Freezer Compartment:</u> [9.8.2] Basic refrigerators and refrigerator/freezers with manual defrost, semi-automatic defrost and partial automatic defrost, and freezers with a freezer compartment with volume greater than 14.5 L
DOE CFR [1.2] Adjusted total volume - ref. HRF-1-1-1979 also approved as ANSI B 38.1-78 *I compared with HRF-1-1-1988*		[9.1] See Appendix A for household refrigerators See Appendix B for household freezers

[1.3] Anti-sweat heater *[AHAM 7.4.2 says set at highest energy consuming setting, but this is superceded by the DOE instructions]*	[5.1.3] Test in both ON & OFF positions same as DOE	[9.6.3] if shipped with anti-sweat heater in OFF position, measure in both ON and OFF positions and average results. [assume same if shipped in ON position] SAME
[1.4]All-refrigerator: may include a compartment of 0.5 cu. ft (14.2 liters) or less for the freezing or storage of food p. 128; 1.4	same as DOE (p.5) Also defines: Basic refrigerator; classes I&II Compact Refrigerator	[9.7] freezer volume less than 14.2 liters
[1.5] Cycle - 24 hours	same	same
[1.6] Cycle type - set of test conditions		
[1.7] Standard Cycle - the anti-sweat heater control is in highest energy consuming position		
[1.8] Automatic defrost - automatically initiated and terminated	same [2. Definitions] Also defines: manual defrost partial automatic defrost semi-automatic defrost (these are all tested the same way) May be slightly different than AHAM def'n but those def'n are not referenced in the DOE std. anyway	**?**
[1.9] Long time automatic defrost - successive defrost cycles are separated by 14 hours or more of compressor-operating time	same [2. Definitions]	**?**
1.10 Stabilization period - steady state conditions are maintained		

1.11 Variable defrost control - long-time automatic defrost system where successive defrost cycles are determined by an operating conditions other than solely compressor operating time.. Excludes electrical or mechanical device.	same [2. Definitions]	**?**
1.12 Externally vented refrigerator or refrigerator-freezer - has enclosed condenser and air ducts (see std. for detail)	**Not part of standard**	**Not part of standard**
Test Conditions		
[2.1] Ambient Temperature 90.0±1□F (32.3 9±0.6□C) Optional for variable defrost control - 80±2F dry bulb & 67F web bulb	[5.1.2] same as DOE also specifies ±1□F for the wet bulb (wb) ±0.5□C (±1□F) **a weighted thermocouple may be used (e.g., attach a 200 gram brass weight)**	same **but does not discuss optional test conditions for variable defrost control**
[2.2] Operational conditions refrigerator refrigerator-freezer HRF-1-1979 section 7.2 - 7.4.3.3 except: vertical ambient temp. gradient at 10 in. out from the centers of the two sides of the unit is to be maintained during the test. Gradient is to be maintained from 2 inches to 1 foot above the unit under test. test with anti-sweat on and off	same	[9.2.1] measure at 10 in. out from centers of two sides of the unit; from 2 in. from floor or platform to 1 foot (30.5 cm above top of cabinet – 0.9 □C/meter (0.5 □F per foot) [Same as U.S.]

[2.3] Conditions for auto-defrost refrig-freezers cylindrical metallic masses 1.12±0.25 inches (2.9±0.6 cm) 1 inch air space	same	same [9.5.1]
[2.4] all-refrigerator no load in freezer compartment	[3.2.3] Same as DOE	<u>Simulated Load Not Used:</u> [9.8.1] In tests of *all-refrigerator, refrigerator-freezers with* ***automatic defrost***
[2.5] Steady state condition A B		
[2.6] Exterior air of externally vented refrigerator or refrigerator-freezer 2.6.1 Air duct 2.6.2 Air temperature measurement 2.6.3 Exterior air static pressure	**not mentioned**	**not mentioned**
Test Control Settings		
[3.1] If no user control – a) measure compartment temp. and energy use b) run compressor continuously and measure energy use		

[3.2] with operator temp. controls – All-refrigerator 3.3C (38□F) fresh food compart. Refrigerator -9.4C (15□F) freezer compartment Refrigerator-freezer -15C (5□F) freezer compart. Variable defrost control models: -15C (5□F) freezer compartment 38□F ±2□F fresh food comp. w/o door openings If both settings cannot be obtained then test with fresh food at 38□F ±2		
[3.2.1] first test – median position second test - either highest or lowest temp. If can't achieve upper bound. temp. at coldest setting, then run test at CC and WW (coldest and warmest temps. (for refrig. & refrig.-freezer)		
[3.2.2] Alternately: test 1: WW and if temp.<45F (for refrig. & refrig.- freezer) than can use results for this test.		
[3.2.3] Alternately: test 1: CC and if comp. temp. is above standard temp. then test 2 can be tested at WW		
[3.3] Variable defrost control optional test: requires door openings 80F db and 67 F wb temperatures	[5.2.7.4]	

Test Period		
[4.1] Test period - see sections 2&3		
[4.1.1] Nonautomatic defrost - >3hrs, min. 2 compressor cycles, -if no off cycling will occur then run for 3 hours - if < 2 cycles run for 24 hours		
[4.1.2] Automatic defrost -		
[4.1.2.1] Long-time automatic defrost		
[4.1.2.2] Variable defrost control		
[4.1.2.3] Variable defrost control optional includes door openings	[5.2.7.4]	**not part of standard**
[4.1.2.4] Dual compressor systems	[5.1.8.7]Dual compressor systems - Same as DOE	**not part of standard**
Test Measurements		
[5.1] **Temperature measurements** - HRF-1-1979, Figures 7.1 & 7.2 ±0.5□F (0.3C) of true value		
[5.1.1] Measured temp. - Compartment temp = avg of all temps in that compartment, time intervals □4 minutes		
[5.1.2] Compartment Temperature - -take over 1 complete cycle -for long time defrost; first part of test period -for variable defrost: first part of test period		
[5.1.2.1] Number of compressor motor cycles -		

[5.1.2.2] If no compressor motor cycling -		
[5.1.2.3] If incomplete cycling -		
[5.2] **Energy Measurements**		
[5.2.1] Per-day Energy Consumption		
[5.2.1.1] Nonautomatic and automatic defrost models		
[5.2.1.2] Long-time Automatic Defrost		
[5.2.1.3] Variable defrost control		
[5.2.1.4] Optional test method for variable defrost controls		
[5.2.1.5] Dual compressor systems		
[5.3] **Volume Measurements**		
[5.4] Externally vented refrigerator or refrigerator-freezer units		
[5.4.1] Operability of thermostatic and mixing of air controls		
[5.4.2] Energy consumption tests		
[5.4.2.1] Correction factor test		
[5.4.2.2] Energy consumption at 90□F		
[5.4.2.3] Energy consumption at 60□F		
[5.4.2.4] Energy consumption if mixing controls do not operate properly		

Calculation of Derived Results from Test Measurements

[6.1] Adjusted Total Volume		

[6.1.1] Electric refrigerators		
[6.1.2] Electric refrigerator - freezers		
[6.2] Average Per-Cycle Energy consumption		
[6.2.1] All-refrigerator Models		
[6.2.1.1] If fresh food compartment always < 38□F		
[6.2.1.2] If one fresh food compartment is > 38□F		
[6.2.2] Refrigerators & refrigerator-freezers		
[6.2.2.1] If fresh food compartment □45□F		
[6.2.3] Energy consumption corrections		
[6.3.4] Energy profile equation	**not part of standard**	**not part of standard**
[6.3.5] Energy consumption at 80□F	**not part of standard**	**not part of standard**
[6.3.6] National average per cycle energy consumption	**not part of standard**	**not part of standard**
[6.3.7] Regional average per cycle energy consumption	**not part of standard**	**not part of standard**
Appendix B1 to subpart B of part 430 - Uniform Test Method for Measuring the Energy Consumption of Freezers		

Notes:

Test Loads: Mexican test procedure doesn't require a test load for refrigerator-freezers with automatic defrost. Also states to use a metal mass in the freezer. US & Canada use a test load.

Definitions: Definitions not apparent in the Mexican standard.

Testing: US & Canada have an optional procedure for variable defrost control, Mexico does not. US has a procedure for externally vented refrigerators or refrigerator-freezers, Canada and Mexico do not. US has additional calculations but are not required for

minimum standards.

2) Integral Horsepower 3-phase Electric Motor Standards

This test procedure comparison is in process.

3) Room Air Conditioners

4) Central Air Conditioners