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ENERGY CONSUMPTION IN COMMERCIAL BUILDINGS: A COMPARISON WITH BEPS BUDGETS

Final Report

September 22, 1980

Work Performed Under Contract No. AC01-79CS20184

Hagler, Bailly & Company
Washington, D. C.

U. S. DEPARTMENT OF ENERGY

Division of Buildings and Community Systems

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**Energy Consumption in Commercial Buildings:
A Comparison with BEPS Budgets**

Final Report

HBC Reference No.: R-80-407

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September 22, 1980

Introduction

At present, the U.S. Department of Energy is proposing to establish Building Energy Performance Standards (BEPS)* to reduce the energy requirements of new buildings. In recent public debate, the standards have been criticized, on the one hand, for being too stringent and thus impossible to meet in a cost-effective manner, and on the other hand, for being too lenient and thus allowing a significant waste of scarce energy resources.

Although this controversy cannot be readily resolved, data can be collected on the energy consumption of existing buildings that will help to put the proposed standards in perspective and indicate the difficulty or ease with which they can be met. To contribute to the evaluation of BEPS, we sought metered energy consumption data on existing commercial buildings. This search has thus far identified 84 buildings whose metered energy consumption is equal to or less than that proposed for their BEPS budgets, and another 7 buildings whose metered consumption is less than 20 percent above their BEPS budgets (Exhibits 1a and b, Appendix A). The group of 91 includes buildings that are both publicly and privately owned, that represent 10 of the 14 BEPS building types, and that are located in various climatic regions across the United States. These data are a strong indicator that the proposed BEPS are already being met by many different building types using existing (i.e., pre-BEPS) construction practices.

In the following sections, we describe the methodology used to identify the buildings and to collect their metered energy consumption data. Then we analyze and summarize the data, and finally we develop conclusions.

*Energy Performance Standards for New Buildings,
44 FR 68120 (November 28, 1979)

The search for low-energy buildings started with individuals and organizations that have been active in building energy conservation. We contacted professional organizations such as the American Institute of Architects, government agencies such as state energy offices and the General Services Administration, and various private companies to identify low-energy buildings. These organizations either had data of their own or were able to refer us to other organizations or individuals that had metered data. In addition, we learned of several large data banks that contain metered energy consumption of buildings.

Our effort was not a scientifically designed, random sample. We did not set out to collect data on a predetermined number of buildings by either type or location. We simply sought to collect metered data on as many buildings as we could identify and that would cooperate in providing the data. Initially, we sought to obtain the data by telephone. On occasion, the building operator wanted the request in writing. In some cases, the operator required time to gather the requested information. As long as the data could be obtained conveniently, the people contacted were most cooperative.

The largest single group of buildings that meet their BEPS budgets was identified for the Minnesota Energy Agency as part of the DOE schools and hospitals grants program. We received metered energy consumption data on 158 buildings that participated in this program. In addition, the Energy Technology Center of the American Hotel/Motel Association provided metered data from their annual survey on 327 properties, and the General Services Administration provided data on ten federal buildings. From these sources we found 80 of the 84 buildings whose energy consumption met their BEPS budgets: 72 were Minnesota buildings, 4 were hotels, and 3 were federal office buildings. The remaining four buildings that met BEPS came from individual sources.

Of the 84 buildings that meet BEPS, 62 or 74 percent are public schools and hospitals in Minnesota. Of all the buildings meeting BEPS, 4 percent (3 buildings) are privately owned and 6 percent (5 buildings) are federally owned (Exhibit 2). Appendix A provides a complete list of the 84 buildings that meet their BEPS budgets and the 7 buildings that are within 20 percent of their BEPS budgets.

Our study identified buildings that meet, or are within 20 percent of their BEPS budgets in eight of the

ten federal regions (Exhibit 3). While it is possible to conclude that there are existing buildings that meet the proposed BEPS budgets, our sampling is too small to develop any meaningful correlation between climate or degree days and the achieving of BEPS budgets.

Other large collections of metered energy consumption data -- covering more than 5,000 commercial buildings -- are in the process of development (Exhibit 4). In addition, Oak Ridge National Laboratory will soon have analyzed the data submitted by ten states for the DOE schools and hospitals grants program. The Tennessee Valley Authority has data on 1,100 buildings in its service area and will expand this to 2,000 buildings by 1981. The Electric Power Research Institute is completing the development of a data base of metered data on 2,800 buildings. Additional data, which may be confidential and therefore not available, are contained in a DOE/EIA national survey, a 20-city survey by the Building Owners and Managers Association, and the energy audits on 200 buildings conducted by a private company in Seattle, Washington.

Our chronological progress is indicated in Exhibit 5, which shows that the rate of discovery of buildings has steadily risen. However, as we have met the objective of the study -- to determine whether there are any existing buildings that meet BEPS -- we have stopped gathering metered data. We have reason to believe that the more metered data we collect, the more BEPS-complying buildings we will find.

Through our research we collected metered data on more than 200 buildings that were identified as low-energy commercial buildings, but we found that the designation was not always appropriate when compared with BEPS budgets. The term "low-energy" was frequently applied to buildings that had recently incorporated energy conservation measures. A 20-percent saving was considered noteworthy, even if the building still consumed many times what is allowed by BEPS. An absolute performance index would certainly help people to assess their buildings and to know when further improvement is necessary.

The performance data are presented in the tables in Appendix A; data are given in terms of the weighted total energy consumption, which is given in Btu per year per gross square feet* of floor space. The weighting factors, which were obtained from the published BEPS regulations, correct the building energy consumption to source energy consumption. A Btu of natural gas is multiplied by 1.0; a Btu of oil, by 1.2; and a Btu of electricity, by 3.08. The 1.2 corrects for the transportation energy and the 3.08 corrects for the efficiency of the power plant, assuming that it uses fossil energy.

Among the Minnesota buildings, which include hospitals for which BEPS allows over 320,000 Btu per year per square foot, we observed some metered values that fell well below what BEPS allows. However, many buildings in these and other classes exceeded BEPS, some by as much as 300 percent. Therefore, substantial energy savings would apparently be realized by the implementation of the BEPS.

Exhibit 1b indicates that there are no trends with respect to building size. We might have expected smaller buildings to consume more energy per square foot of floor space, but the differences between sizes are small compared with the differences between buildings.

We found that the weighted source energy consumption of the metered buildings did not appear to depend significantly on the total degree days** (Exhibit 6); at most there is perhaps a slight upward trend for a given building type.

*Gross square feet is "the sum of all floor areas except ... parking areas, enclosed in a building design... measured from the exterior face of exterior walls at the floor line," 44 FR 66167.

**Total degree days are the sum of heating degree days based on 60° F and cooling degree days based on 50° F. Because heating load is approximately proportional to heating degree days, cooling load is approximately proportional to cooling degree days, and the source energy consumed is proportional to heating and cooling loads, we can expect the total energy consumption to increase nearly linearly with the sum of heating and cooling degree days.

BEPS appear to be achievable, for any building size in any U.S. climate. Many private and public buildings built before BEPS already meet the standard.* Many others, thought to be energy conserving, consume far more energy than permitted by BEPS. Owners of such buildings obviously need BEPS as an absolute reference point.

*While this report was on its way to press, we received the metered data from the Hittman study on buildings in the Baltimore Central Business District. Of the 383 buildings for which data are given, over one-third appear to meet BEPS.

EXHIBITS

- 1a BEPS Budgets vs Weighted Total by Building Type
- 1b BEPS Budgets vs Weighted Total by Building Size
- 2 Building Ownership
- 3 Geographical Distribution by Federal Regions
- 4 Potential Sources of Metered Energy Consumption Data
- 5 Chronological Progress of Data Collection
- 6 Total Degree Days vs Weighted Total by Building Type

EXHIBITS**NOTE**

For Exhibits 1a, 1b, and 6, all 91 buildings were plotted but when more than one building had the same plotted points the computer only printed the last entered building.

KEY**Building Types**

C	Community Center
G	Gymnasium
H	Hospital
M	Hotel/Motel
O	Office Large - Federal and Other Public
Ø	Office Large - Private
S	Office Small - Federal and Other Public
E	School Elementary
U	School Secondary
T	Theatre/Auditorium
W	Warehouse

Building Size

S	Small, under 20,000 square feet
M	Medium, 20,001 to 50,000 square feet
L	Large, over 50,001 square feet

BEPS BUDGETS VS. WEIGHTED
TOTAL BY BUILDING TYPE

Exhibit 2

BUILDING OWNERSHIP

	PRIVATE		FEDERAL		MINNESOTA		OTHER PUBLIC	
	<u>Meets</u> <u>BEPS</u>	<u>Within</u> <u>20%</u>	<u>Meets</u> <u>BEPS</u>	<u>Within</u> <u>20%</u>	<u>Meets</u> <u>BEPS</u>	<u>Within</u> <u>20%</u>	<u>Meets</u> <u>BEPS</u>	<u>Within</u> <u>20%</u>
Community Center					2			
Gymnasium								1
Hospital					15		1	1
Hotel/Motel	3	1						
Office Large- Federal and Other Public			4	1				1
Office Large Private		1						
Office Small Federal and Other Public			1		5			1
School Elementary					34		2	
School Secondary					13			
Theatre/Auditorium							1	
Warehouse	—	—	—	—	3		—	—
Total	3	2	5	1	72		4	4

Exhibit 3

GEOGRAPHICAL DISTRIBUTION BY FEDERAL REGIONS.

	<u>I</u>	<u>II</u>	<u>III</u>	<u>IV</u>	<u>V</u>	<u>VI</u>	<u>VII</u>	<u>VIII</u>	<u>IX</u>	<u>X</u>
Community Center					2					
Gymnasium	1									
Hospital					16				1	
Hotel/Motel						1			2	1
Office Large - Federal and Other Public	1			3			1	1		
Office Large - Private					1					
Office Small - Federal and Other Public	1				6					
School Elementary					35					1
School Secondary					13					
Theatre/Auditorium	1									
Warehouse	-			-	3	-	-	-	-	-
Total	4			3	76	1	1	1	3	2

Exhibit 4

POTENTIAL SOURCES OF
METERED ENERGY CONSUMPTION DATA

Source	Number of Buildings	Selection Criteria	Availability	Status
Tennessee Valley Authority	1,000 (2,000- 5,000)	TVA service area	Public	Available on request
Electric Power Research Institute	2,800	New England, Philadelphia, Baltimore, Denver, Others	Public	Awaiting EPRI Approval
California Energy Commission	500	California	?	Early 1981
DOE/ERA	100	Midwest	?	Late 1980
Oak Ridge National Laboratory	?	Preliminary Energy Audits from 10 states, DOE schools and hospitals grants program	?	Analysis soon to be completed
Building Owners & Managers Association	?	All buildings over 40,000 square feet in 20 cities	?	BOMA is now receiving return questionnaires
DOE/EIA	?	?	?	Metered data available in 1981

Exhibit 5

CHRONOLOGICAL PROGRESS OF
DATA COLLECTION

	<u>5/28/80</u>	<u>6/3/80</u>	<u>3/13/80</u>	<u>7/31/80</u>
Total Buildings Identified for Which Data can be Obtained	27	75	1,700	5,000+
Number of Buildings for Which Data Has Been Obtained	18	30	55	227+
Number of Buildings Within 20 percent of BEPS	3	6	9	7*
Number of Buildings Meeting BEPS	2	4	8	84

*The decline occurred when we re-calculated the weighted totals on the basis of gross rather than occupied square feet; two buildings that were within 20 percent fell below the BEPS budgets.

Appendix A

Buildings with metered energy consumption at or 20 percent above the BEPS budget for their location and building type.

BUILDING TYPE: COMMUNITY CENTER

Building Location	Year of Construction	Gross Floor Area (1000 sq ft)	Total Hours of Operation Per Year	Energy Consumption (1000 Btu/GSF/yr)		
				Reported On-Site	Weighted Total ¹	BEPS Standard ²
1. Minnesota		85 ⁶		61	71	109
2. Minnesota		56 ⁶		63	70	109

¹Weighted total = physical units x conversion factor x BEPS weighting factor:

for gas	=	cubic feet	x	1,000	x	1.0
for oil	=	gallons	x	139,000	x	1.2
for electricity	=	kWh	x	3,413	x	3.08

²44 FR 68175 - 68179, November 28, 1979.

BUILDING TYPE: COMMUNITY CENTER

Building Location	Heating Degree Days (60°) ³	Cooling Degree Days (50°) ³	Electricity Consumption	Fuel Consumption				
				Gas	Oil	Coal ⁵	Steam ⁶	Other
1. Minnesota	6842	2575	79,360 kWh	3,506 mcf	9,600 gal	-	-	-
2. Minnesota	6842	2575	11,360 kWh	2,151 mcf	9,350 gal	-	-	-

³44 FR 68180 - 68181, November 28, 1979.

⁴To figure weighted total for coal (which is not addressed by BEPS) we calculated tons of coal x 24.5 million Btu per ton x 1.2 (weighting factor used by Minnesota).

⁵To figure weighted total for steam (which is not addressed by BEPS) we calculated lbs. of steam x 1,390 Btu per lb. (which includes boiler efficiency) x 1.2 (weighting factor used by Minnesota).

⁶Gross square footage - occupiable square footage (as reported) ÷ 0.8.

BUILDING TYPE: GYMNASIUM

Building Location	Year of Construction	Gross Floor Area (1000 sq ft)	Total Hours of Operation Per Year	Energy Consumption (1000 Btu/GSF/yr)		
				Reported On-Site	Weighted Total ¹	BEPS Standard ²
1. Worcester, Mass.		83		102	153	126

¹Weighted total = physical units x conversion factor x BEPS weighting factor:

for gas	=	cubic feet	x	1,000	x	1.0
for oil	=	gallons	x	139,000	x	1.2
for electricity	=	kWh	x	3,413	x	3.08

²44 FR 68175 - 68179, November 28, 1979.

BUILDING TYPE: GYMNASIUM

Building Location	Heating Degree Days (60°) ³	Cooling Degree Days (50°) ³	Electricity Consumption	Fuel Consumption				
				Gas	Oil	Coal ⁵	Steam ⁶	Other
1. Worcester, 4383 Mass.	2383	2920	395,000 kWh	-	51,446 gal	-	-	-

³44 FR 68180 - 68181, November 28, 1979.

⁴To figure weighted total for coal (which is not addressed by BEPS) we calculated tons of coal x 24.5 million Btu per ton x 1.2 (weighting factor used by Minnesota).

⁵To figure weighted total for steam (which is not addressed by BEPS) we calculated lbs. of steam x 1,390 Btu per lb. (which includes boiler efficiency) x 1.2 (weighting factor used by Minnesota).

⁶Gross square footage - occupiable square footage (as reported) ÷ 0.8.

BUILDING TYPE: HOSPITAL

Building Location	Year of Construction	Gross Floor Area (1000 sq ft)	Total Hours of Operation Per Year	Energy Consumption (1000 Btu/GSF/yr)		
				Reported On-Site	Weighted Total ¹	BEPS Standard ²
1. Long Beach California	1930/1975	640		196	329	364
2. Minnesota		589 ⁶		182	313	335
3. Minnesota		179 ⁶		151	208	335
4. Minnesota		166 ⁶		208	282	335
5. Minnesota		115 ⁶		160	250	335
6. Minnesota		89 ⁶		150	202	335
7. Minnesota		76 ⁶		191	277	335

¹Weighted total = physical units x conversion factor x BEPS weighting factor:
 for gas = cubic feet x 1,000 x 1.0
 for oil = gallons x 139,000 x 1.2
 for electricity = kWh x 3,413 x 3.08

²44 FR 68175 - 68179, November 28, 1979.

BUILDING TYPE: HOSPITAL

Building Location	Heating Degree Days (60°) ³	Cooling Degree Days (50°) ³	Electricity Consumption	Fuel Consumption				
				Gas	Oil	Coal ⁴	Steam ⁵	Other
1. Long Beach California	522	5,442	11,600,640 kWh	70,660 mcf	93,471 gal	-	-	-
2. Minnesota	6,842	2,575	7,391,100 kWh	28,883 ccf	-	-	56,635 PUS lbs.	-
3. Minnesota	6,842	2,575	1,325,700 kWh	18,042 ccf	28,854 gal	-	-	-
4. Minnesota	6,842	2,575	1,727,040 kWh	27,288 mcf	4,000 gal	-	-	-
5. Minnesota	6,842	2,575	1,278,400 kWh	7,616, 693 cf	44,800 gal	-	-	-
6. Minnesota	6,842	2,575	638,640 kWh	10,783 mcf	1,000 gal	-	-	-
7. Minnesota	6,842	2,575	557,600 kWh	-	90,848 gal	-	-	-

³44 FR 68180 - 68181, November 28, 1979.

⁴To figure weighted total for coal (which is not addressed by BEPS) we calculated tons of coal x 24.5 million Btu per ton x 1.2 (weighting factor used by Minnesota).

⁵To figure weighted total for steam (which is not addressed by BEPS) we calculated lbs. of steam x 1,390 Btu per lb. (which includes boiler efficiency) x 1.2 (weighting factor used by Minnesota).

⁶Gross square footage - occupiable square footage (as reported) ÷ 0.8.

BUILDING TYPE: HOSPITAL

Building Location	Year of Construction	Gross Floor Area (1000 sq ft)	Total Hours of Operation Per Year	Energy Consumption (1000 Btu/GSF/yr)		
				Reported On-Site	Weighted Total ¹	BEPS Standard ²
8. Minnesota		66 ⁶		176	269	335
9. Minnesota		58 ⁶		139	214	335
10. Minnesota		53 ⁶		179	262	335
11. Minnesota		51 ⁶		157	261	335
12. Minnesota		44 ⁶		61	186	335
13. Minnesota		36 ⁶		202	273	335
14. Minnesota		33 ⁶		153	248	335

¹Weighted total = physical units x conversion factor x BEPS weighting factor:
 for gas = cubic feet x 1,000 x 1.0
 for oil = gallons x 139,000 x 1.2
 for electricity = kWh x 3,413 x 3.08

²44 FR 68175 - 68179, November 28, 1979.

BUILDING TYPE: HOSPITAL

Building Location	Heating Degree Days (60°) ³	Cooling Degree Days (50°) ³	Electricity Consumption	Fuel Consumption				
				Gas	Oil	Coal ⁴	Steam ⁵	Other
8. Minnesota	6,842	2,575	600,680 kWh	757 PR gal	68,244 gal	-	-	-
9. Minnesota	6,842	2,575	547,520 kWh	3,713 mcf	16,909 gal	-	-	-
10. Minnesota	6,842	2,575	527,840 kWh	46,323 ccf	21,235 gal	-	-	-
11. Minnesota	6,842	2,575	703,500 kWh	40,555 ccf	10,424 gal	-	-	-
12. Minnesota	6,842	2,575	778,800 kWh	113 ccf	-	-	-	-
13. Minnesota	6,842	2,575	309,280 kWh	4,186 mcf	13,650 gal	-	-	-
14. Minnesota	6,842	2,575	333,790 kWh	2,195 PR gal	26,700 gal	-	-	-

³44 FR 68180 - 68181, November 28, 1979.

⁴To figure weighted total for coal (which is not addressed by BEPS) we calculated tons of coal x 24.5 million Btu per ton x 1.2 (weighting factor used by Minnesota).

⁵To figure weighted total for steam (which is not addressed by BEPS) we calculated lbs. of steam x 1,390 Btu per lb. (which includes boiler efficiency) x 1.2 (weighting factor used by Minnesota).

⁶Gross square footage - occupiable square footage (as reported) ÷ 0.8.

BUILDING TYPE: HOSPITAL

Building Location	Year of Construction	Gross Floor Area (1000 sq ft)	Total Hours of Operation Per Year	Energy Consumption (1000 Btu/GSF/yr)		
				Reported On-Site	Weighted Total ¹	BEPS Standard ²
15. Minnesota		33 ⁶		86	130	335
16. Starbuck, Minnesota	1977	23		274	385	335
17. Minnesota		21 ⁶		160	229	335

¹Weighted total = physical units x conversion factor x BEPS weighting factor:

for gas	=	cubic feet	x	1,000	x	1.0
for oil	=	gallons	x	139,000	x	1.2
for electricity	=	kWh	x	3,413	x	3.08

²44 FR 68175 - 68179, November 28, 1979.

BUILDING TYPE: HOSPITAL

Building Location	Heating Degree Days (60°) ³	Cooling Degree Days (50°) ³	Electricity Consumption	Fuel Consumption				
				Gas	Oil	Coal ⁴	Steam ⁵	Other
15. Minnesota	6,842	2,575	134,240 kWh	55 ccf	17,164 gal	-	-	-
16. Starbuck Minnesota	6,842	2,575	358,560 kWh	48,861 ccf	250 gal	-	-	-
17. Minnesota	6,842	2,575	194,400 kWh	22,840 ccf	2,500 gal	-	-	-

³44 FR 68180 - 68181, November 28, 1979.

⁴To figure weighted total for coal (which is not addressed by BEPS) we calculated tons of coal x 24.5 million Btu per ton x 1.2 (weighting factor used by Minnesota).

⁵To figure weighted total for steam (which is not addressed by BEPS) we calculated lbs. of steam x 1,390 Btu per lb. (which includes boiler efficiency) x 1.2 (weighting factor used by Minnesota).

⁶Gross square footage - occupiable square footage (as reported) ÷ 0.8.

BUILDING TYPE: HOTEL/MOTEL

Building Location	Year of Construction	Gross Floor Area (1000 sq ft)	Total Hours of Operation Per Year	Energy Consumption (1000 Btu/GSF/yr)		
				Reported On-Site	Weighted Total ¹	BEPS Standard ²
1. Little Rock, Arkansas		255		68	146	169
2. Boise, Idaho		61		71	150	163
3. San Jose, California		46		71	143	150
4. Santa Maria, California		30		69	168	157

¹Weighted total = physical units x conversion factor x BEPS weighting factor:
 for gas = cubic feet x 1,000 x 1.0
 for oil = gallons x 139,000 x 1.2
 for electricity = kWh x 3,413 x 3.08

²44 FR 68175 - 68179, November 28, 1979.

BUILDING TYPE: HOTEL/MOTEL

Building Location	Heating Degree Days (60°) ³	Cooling Degree Days (50°) ³	Electricity Consumption	Fuel Consumption				
				Gas	Oil	Coal ⁴	Steam ⁵	Other
1. Little Rock Arkansas	2,352	5,339	37,327 Btu/sq.ft.	30,580 - Btu/sq.ft.	-	-	-	-
2. Boise, Idaho	4,533	2,793	37,844 Btu/sq.ft.	33,377 - Btu/sq.ft.	-	-	-	-
3. San Jose California	1,668	2,832	34,217 Btu/sq.ft.	37,154 - Btu/sq.ft.	-	-	-	-
4. Santa Maria California	522	5,442	35,397 Btu/sq.ft.	33,345 - Btu/sq.ft.	-	-	-	-

³44 FR 68180 - 68181, November 28, 1979.

⁴To figure weighted total for coal (which is not addressed by BEPS) we calculated tons of coal x 24.5 million Btu per ton x 1.2 (weighting factor used by Minnesota).

⁵To figure weighted total for steam (which is not addressed by BEPS) we calculated lbs. of steam x 1,390 Btu per lb. (which includes boiler efficiency) x 1.2 (weighting factor used by Minnesota).

⁶Gross square footage - occupiable square footage (as reported) ÷ 0.8.

BUILDING TYPE: OFFICE LARGE - FEDERAL GOVERNMENT OR OTHER PUBLIC

Building Location	Year of Construction	Gross Floor Area (1000 sq ft)	Total Hours of Operation Per Year	Energy Consumption (1000 Btu/GSF/yr)		
				Reported On-Site	Weighted Total ¹	BEPS Standard ²
1. Topeka, Kansas	1976	321			90	119
2. Ft. Lauderdale, Florida	1976	253			102	135
3. Jackson, Mississippi	1976	202			121	117
4. Orlando, Florida	1977	164		51	157	135
5. Manchester, New Hampshire	1976	163			101	117
6. Huron, South Dakota	1976	94			106	125

¹Weighted total = physical units x conversion factor x BEPS weighting factor:

for gas	=	cubic feet	x	1,000	x	1.0
for oil	=	gallons	x	139,000	x	1.2
for electricity	=	kWh	x	3,413	x	3.08

²44 FR 68175 - 68179, November 28, 1979.

BUILDING TYPE: OFFICE LARGE - FEDERAL GOVERNMENT OR OTHER PUBLIC

Building Location	Heating Degree Days (60°) ³	Cooling Degree Days (50°) ³	Electricity Consumption	Fuel Consumption				
				Gas	Oil	Coal ⁴	Steam ⁵	Other
1. Topeka Kansas	3,963	4,025	-	-	-	-	-	-
2. Ft. Lauderdale, Florida	54	9,308	-	-	-	-	-	-
3. Jackson, Mississippi	1,548	6,086	-	-	-	-	-	-
4. Orlando, Florida	364	8,172	14.9 kWh/sq.ft./yr.	-	-	-	-	-
5. Manchester, New Hampshire	6,488	2,180	-	-	-	-	-	-
6. Huron, South Dakota	6,842	2,575	-	-	-	-	-	-

³44 FR 68180 - 68181, November 28, 1979.

⁴To figure weighted total for coal (which is not addressed by BEPS) we calculated tons of coal x 24.5 million Btu per ton x 1.2 (weighting factor used by Minnesota).

⁵To figure weighted total for steam (which is not addressed by BEPS) we calculated lbs. of steam x 1,390 Btu per lb. (which includes boiler efficiency) x 1.2 (weighting factor used by Minnesota).

⁶Gross square footage - occupiable square footage (as reported) ÷ 0.8.

BUILDING TYPE: OFFICE LARGE - PRIVATE

Building Location	Year of Construction	Gross Floor Area (1000 sq ft)	Total Hours of Operation Per Year	Energy Consumption (1000 Btu/GSF/yr)		
				Reported On-Site	Weighted Total ¹	BEPS Standard ²
1. Southfield, Michigan	1978	262		42	129	114

¹Weighted total = physical units x conversion factor x BEPS weighting factor:

for gas	=	cubic feet	x	1,000	x	1.0
for oil	=	gallons	x	139,000	x	1.2
for electricity	=	kWh	x	3,413	x	3.08

²44 FR 68175 - 68179, November 28, 1979.

BUILDING TYPE: OFFICE LARGE - PRIVATE

Building Location	Heating Degree Days (60°) ³	Cooling Degree Days (50°) ³	Electricity Consumption	Fuel Consumption				
				Gas	Oil	Coal ⁴	Steam ⁵	Other
1. Southfield, Michigan	5,167	2,823	42,000 Btu/sq.ft./yr.	-	-	-	-	-

³44 FR 68180 - 68181, November 28, 1979.

⁴To figure weighted total for coal (which is not addressed by BEPS) we calculated tons of coal x 24.5 million Btu per ton x 1.2 (weighting factor used by Minnesota).

⁵To figure weighted total for steam (which is not addressed by BEPS) we calculated lbs. of steam x 1,390 Btu per lb. (which includes boiler efficiency) x 1.2 (weighting factor used by Minnesota).

⁶Gross square footage - occupiable square footage (as reported) ÷ 0.8.

BUILDING TYPE: OFFICE SMALL-FEDERAL GOVERNMENT OR OTHER PUBLIC

Building Location	Year of Construction	Gross Floor Area (1000 sq ft)	Total Hours of Operation Per Year	Energy Consumption (1000 Btu/GSF/yr)		
				Reported On-Site	Weighted Total ¹	BEPS Standard ²
1. Saginaw, Michigan	1976	92			89	114
2. Minnesota		55 ⁶			48	117
3. Worcester, Mass.	1968/ 1978	33		59	108	102
4. Minnesota		29 ⁶		56	71	117
5. Minnesota		19 ⁶		33	101	117
6. Minnesota		13 ⁶		74	107	117

¹Weighted total = physical units x conversion factor x BEPS weighting factor:
 for gas = cubic feet x 1,000 x 1.0
 for oil = gallons x 139,000 x 1.2
 for electricity = kWh x 3,413 x 3.08

²44 FR 68175 - 68179, November 28, 1979.

BUILDING TYPE: OFFICE SMALL - FEDERAL GOVERNMENT OR OTHER PUBLIC

Building Location	Heating Degree Days (60°) ³	Cooling Degree Days (50°) ³	Electricity Consumption	Fuel Consumption				
				Gas	Oil	Coal ⁴	Steam ⁵	Other
1. Saginaw, Michigan	5,167	2,823	-	-	-	-	-	-
2. Minnesota	6,842	2,575	113,670 kWh	7,300 PR gal	4,356 gal	-	-	-
3. Worcester, Mass.	4,383	2,920	189,120 kWh	-	9,432 gal	-	-	-
4. Minnesota	6,842	2,575	59,860 kWh	13,828 ccf	-	-	-	-
5. Minnesota	6,842	2,575	183,440 kWh	-	-	-	-	-
6. Minnesota	6,842	2,575	36,620 kWh	-	6,068 gal	-	-	-

³44 FR 68180 - 68181, November 28, 1979.

⁴To figure weighted total for coal (which is not addressed by BEPS) we calculated tons of coal x 24.5 million Btu per ton x 1.2 (weighting factor used by Minnesota).

⁵To figure weighted total for steam (which is not addressed by BEPS) we calculated lbs. of steam x 1,390 Btu per lb. (which includes boiler efficiency) x 1.2 (weighting factor used by Minnesota).

⁶Gross square footage - occupiable square footage (as reported) ÷ 0.8.

BUILDING TYPE: OFFICE SMALL-FEDERAL GOVERNMENT OR OTHER PUBLIC

Building Location	Year of Construction	Gross Floor Area (1000 sq ft)	Total Hours of Operation Per Year	Energy Consumption (1000 Btu/GSF/yr)		
				Reported On-Site	Weighted Total ¹	BEPS Standard ²
7. Minnesota		4 ⁶		72	88	117

¹Weighted total = physical units x conversion factor x BEPS weighting factor:

for gas	=	cubic feet	x	1,000	x	1.0
for oil	=	gallons	x	139,000	x	1.2
for electricity	=	kWh	x	3,413	x	3.08

²44 FR 68175 - 68179, November 28, 1979.

BUILDING TYPE: OFFICE SMALL - FEDERAL GOVERNMENT OR OTHER PUBLIC

Building Location	Heating Degree Days (60°) ³	Cooling Degree Days (50°) ³	Electricity Consumption	Fuel Consumption				
				Gas	Oil	Coal ⁴	Steam ⁵	Other
7. Minnesota	6,842	2,575	8,860 kWh	-	6,068 gal	-	-	-

³44 FR 68180 - 68181, November 28, 1979.

⁴To figure weighted total for coal (which is not addressed by BEPS) we calculated tons of coal x 24.5 million Btu per ton x 1.2 (weighting factor used by Minnesota).

⁵To figure weighted total for steam (which is not addressed by BEPS) we calculated lbs. of steam x 1,390 Btu per lb. (which includes boiler efficiency) x 1.2 (weighting factor used by Minnesota).

⁶Gross square footage - occupiable square footage (as reported) ÷ 0.8.

BUILDING TYPE: SCHOOLS - ELEMENTARY

Building Location	Year of Construction	Gross Floor Area (1000 sq. ft)	Total Hours of Operation Per Year	Energy Consumption (1000 Btu/GSF/yr)		
				Reported On-Site	Weighted Total ¹	BEPS Standard ²
1. Minnesota		180 ⁶		90	115	122
2. Minnesota		145 ⁶		86	103	122
3. Minnesota		115 ⁶		58	95	122
4. Minnesota		105 ⁶		89	102	122
5. Minnesota		99 ⁶		85	101	122
6. Minnesota		99 ⁶		77	91	122

¹Weighted total = physical units x conversion factor x BEPS weighting factor:
 for gas = cubic feet x 1,000 x 1.0
 for oil = gallons x 139,000 x 1.2
 for electricity = kWh x 3,413 x 3.08

²44 FR 68175 - 68179, November 28, 1979.

BUILDING TYPE: SCHOOLS ELEMENTARY

Building Location	Heating Degree Days (60°) ³	Cooling Degree Days (50°) ³	Electricity Consumption	Fuel Consumption				
				Gas	Oil	Coal ⁴	Steam ⁵	Other
1. Minnesota	6,842	2,575	476,460 kWh	9,275 mcf	36,688 gal	-	-	-
2. Minnesota	6,842	2,575	292,400 kWh	9,313 mcf	13,857 gal	-	-	-
3. Minnesota	6,842	2,575	560,850 kWh	3,142 mcf	10,775 gal	-	-	-
4. Minnesota	6,842	2,575	105,750 kWh	5,850.8 mcf	21,261 gal	-	-	-
5. Minnesota	6,842	2,575	145,480 kWh	5,069.6 mcf	19,602 gal	-	-	-
6. Minnesota	6,842	2,575	140,630 kWh	5,029.2 mcf	13,949 gal	-	-	-

³44 FR 68180 - 68181, November 28, 1979.

⁴To figure weighted total for coal (which is not addressed by BEPS) we calculated tons of coal x 24.5 million Btu per ton x 1.2 (weighting factor used by Minnesota).

⁵To figure weighted total for steam (which is not addressed by BEPS) we calculated lbs. of steam x 1,390 Btu per lb. (which includes boiler efficiency) x 1.2 (weighting factor used by Minnesota).

⁶Gross square footage - occupiable square footage (as reported) ÷ 0.8.

BUILDING TYPE: SCHOOLS - ELEMENTARY

Building Location	Year of Construction	Gross Floor Area (1000 sq ft)	Total Hours of Operation Per Year	Energy Consumption (1000 Btu/GSF/yr)		
				Reported On-Site	Weighted Total ¹	BEPS Standard ²
7. Minnesota		94 ⁶		79	116	122
8. Minnesota		93 ⁶		43	59	122
9. Minnesota		91 ⁶		40	63	122
10. Minnesota		79 ⁶		93	113	122
11. Minnesota		78 ⁶		72	108	122
12. Minnesota		75 ⁶		63	83	122

¹Weighted total = physical units x conversion factor x BEPS weighting factor:
 for gas = cubic feet x 1,000 x 1.0
 for oil = gallons x 139,000 x 1.2
 for electricity = kWh x 3,413 x 3.08

²44 FR 68175 - 68179, November 28, 1979.

BUILDING TYPE: SCHOOLS ELEMENTARY

Building Location	Heating Degree Days (60°) ³	Cooling Degree Days (50°) ³	Electricity Consumption	Fuel Consumption				
				Gas	Oil	Coal ⁴	Steam ⁵	Other
7. Minnesota	6,842	2,575	448,340 kWh	4,145 mcf	11,425 gal	-	-	-
8. Minnesota	6,842	2,575	106,720 kWh	-	-	-	2,621 mlbs	-
9. Minnesota	6,842	2,575	264,000 kWh	1,661 mcf	7,650 gal	-	-	-
10. Minnesota	6,842	2,575	170,880 kWh	4,804 mcf	13,300 gal	-	-	-
11. Minnesota	6,842	2,575	352,460 kWh	2,948 mcf	9,900 gal	-	-	-
12. Minnesota	6,842	2,575	168,200 kWh	27,615 ccf	9,502 gal	-	-	-

³44 FR 68180 - 68181, November 28, 1979.

⁴To figure weighted total for coal (which is not addressed by BEPS) we calculated tons of coal x 24.5 million Btu per ton x 1.2 (weighting factor used by Minnesota).

⁵To figure weighted total for steam (which is not addressed by BEPS) we calculated lbs. of steam x 1,390 Btu per lb. (which includes boiler efficiency) x 1.2 (weighting factor used by Minnesota).

⁶Gross square footage - occupiable square footage (as reported) ÷ 0.8.

BUILDING TYPE: SCHOOLS - ELEMENTARY

Building Location	Year of Construction	Gross Floor Area (1000 sq ft)	Total Hours of Operation Per Year	Energy Consumption (1000 Btu/GSF/yr)		
				Reported On-Site	Weighted Total ¹	BEPS Standard ²
13. Minnesota		746		58	78	122
14. Minnesota		746		89	106	122
15. Minnesota		736		75	104	122
16. Minnesota		696		68	87	122
17. Minnesota		656		56	83	122
18. Minnesota		636		91	112	122

¹Weighted total = physical units x conversion factor x BEPS weighting factor:

for gas	=	cubic feet	x	1,000	x	1.0
for oil	=	gallons	x	139,000	x	1.2
for electricity	=	kWh	x	3,413	x	3.08

²44 FR 68175 - 68179, November 28, 1979.

BUILDING TYPE: SCHOOLS ELEMENTARY

Building Location	Heating Degree Days (60°) ³	Cooling Degree Days (50°) ³	Electricity Consumption	Fuel Consumption				
				Gas	Oil	Coal ⁴	Steam ⁵	Other
13. Minnesota	6,842	2,575	109,290 kWh	1,057 LPG gal	27,259 gal	-	-	-
14. Minnesota	6,842	2,575	137,390 kWh	4,459 mcf	11,000 gal	-	-	-
15. Minnesota	6,842	2,575	261,170 kWh	2,981 mcf	10,675 gal	-	-	-
16. Minnesota	6,842	2,575	186,880 kWh	3,904 mcf	-	-	-	-
17. Minnesota	6,842	2,575	219,220 kWh	1,904 mcf	6,625 gal	-	-	-
18. Minnesota	6,842	2,575	142,000 kWh	3,455 mcf	12,000 gal	-	-	-

³44 FR 68180 - 68181, November 28, 1979.

⁴To figure weighted total for coal (which is not addressed by BEPS) we calculated tons of coal x 24.5 million Btu per ton x 1.2 (weighting factor used by Minnesota).

⁵To figure weighted total for steam (which is not addressed by BEPS) we calculated lbs. of steam x 1,390 Btu per lb. (which includes boiler efficiency) x 1.2 (weighting factor used by Minnesota).

⁶Gross square footage - occupiable square footage (as reported) ÷ 0.8.

BUILDING TYPE: SCHOOLS - ELEMENTARY

Building Location	Year of Construction	Gross Floor Area (1000 sq ft)	Total Hours of Operation Per Year	Energy Consumption (1000 Btu/GSF/yr)		
				Reported On-Site	Weighted Total ¹	BEPS Standard ²
19. Minnesota		59 ⁶		86	103	122
20. Minnesota		56 ⁶		84	112	122
21. Minnesota		55 ⁶		82	100	122
22. Minnesota		53 ⁶		87	106	122
23. Minnesota		53 ⁶		78	96	122
24. Minnesota		51 ⁶		74	90	122

¹Weighted total = physical units x conversion factor x BEPS weighting factor:

for gas	=	cubic feet	x	1,000	x	1.0
for oil	=	gallons	x	139,000	x	1.2
for electricity	=	kWh	x	3,413	x	3.08

²44 FR 68175 - 68179, November 28, 1979.

BUILDING TYPE: SCHOOLS - ELEMENTARY

Building Location	Heating Degree Days (60°) ³	Cooling Degree Days (50°) ³	Electricity Consumption	Fuel Consumption				
				Gas	Oil	Coal ⁴	Steam ⁵	Other
19. Minnesota	6,842	2,575	94,240 kWh	2,930 mcf	12,525 gal	-	-	-
20. Minnesota	6,842	2,575	111,100 kWh	3,475 LPG	28,671 gal	-	-	-
21. Minnesota	6,842	2,575	115,000 kWh	32,000 ccf	6,000 gal	-	-	-
22. Minnesota	6,842	2,575	115,800 kWh	32,302 ccf	6,320 gal	-	-	-
23. Minnesota	6,842	2,575	91,250 kWh	2,202 mcf	11,175 gal	-	-	-
24. Minnesota	6,842	2,575	78,440 kWh	2,131 mcf	9,500 gal	-	-	-

³44 FR 68180 - 68181, November 28, 1979.

⁴To figure weighted total for coal (which is not addressed by BEPS) we calculated tons of coal x 24.5 million Btu per ton x 1.2 (weighting factor used by Minnesota).

⁵To figure weighted total for steam (which is not addressed by BEPS) we calculated lbs. of steam x 1,390 Btu per lb. (which includes boiler efficiency) x 1.2 (weighting factor used by Minnesota).

⁶Gross square footage - occupiable square footage (as reported) ÷ 0.8.

BUILDING TYPE: SCHOOLS - ELEMENTARY

Building Location	Year of Construction	Gross Floor Area (1000 sq ft)	Total Hours of Operation Per Year	Energy Consumption (1000 Btu/GSF/yr)		
				Reported On-Site	Weighted Total ¹	BEPS Standard ²
25. Minnesota		51 ⁶		66	88	122
26. Minnesota		51 ⁶		73	102	122
27. Minnesota		50 ⁶		89	102	122
28. Minnesota		48 ⁶		73	92	122
29. Minnesota		48 ⁶		78	112	122
30. Minnesota		44 ⁶		69	85	122

¹Weighted total = physical units x conversion factor x BEPS weighting factor:

for gas	=	cubic feet	x	1,000	x	1.0
for oil	=	gallons	x	139,000	x	1.2
for electricity	=	kWh	x	3,413	x	3.08

²44 FR 68175 - 68179, November 28, 1979.

BUILDING TYPE: SCHOOLS - ELEMENTARY

Building Location	Heating Degree Days (60°) ³	Cooling Degree Days (50°) ³	Electricity Consumption	Fuel Consumption				
				Gas	Oil	Coal ⁴	Steam ⁵	Other
25. Minnesota	6,842	2,575	73,650 kWh	-	22,299 gal	-	-	-
26. Minnesota	6,842	2,575	120,820 kWh	-	23,700 gal	-	-	-
27. Minnesota	6,841	2,575	45,170 kWh	27,880 therms	11,000 gal	-	-	-
28. Minnesota	6,842	2,575	132,210 kWh	2,945.7 mcf	-	-	-	-
29. Minnesota	6,842	2,575	209,860 kWh	21,404 ccf	5,800 gal	-	-	-
30. Minnesota	6,842	2,575	81,860 kWh	2,127 mcf	4,223 gal	-	-	-

³44 FR 68180 - 68181, November 28, 1979.

⁴To figure weighted total for coal (which is not addressed by BEPS) we calculated tons of coal x 24.5 million Btu per ton x 1.2 (weighting factor used by Minnesota).

⁵To figure weighted total for steam (which is not addressed by BEPS) we calculated lbs. of steam x 1,390 Btu per lb. (which includes boiler efficiency) x 1.2 (weighting factor used by Minnesota).

⁶Gross square footage - occupiable square footage (as reported) ÷ 0.8.

BUILDING TYPE: SCHOOLS - ELEMENTARY

Building Location	Year of Construction	Gross Floor Area (1000 sq ft)	Total Hours of Operation Per Year	Energy Consumption (1000 Btu/GSF/yr)		
				Reported On-Site	Weighted Total ¹	BEPS Standard ²
31. Minnesota		446		101	103	122
32. Columbus, Ohio	1957/1975	39		53	61	103
33. Seattle, Washington		38		15	45	91
34. Minnesota		366		55	74	122
35. Minnesota		316		65	75	122
36. Minnesota		236		68	90	122

¹Weighted total = physical units x conversion factor x BEPS weighting factor:

for gas	=	cubic feet	x	1,000	x	1.0
for oil	=	gallons	x	139,000	x	1.2
for electricity	=	kWh	x	3,413	x	3.08

²44 FR 68175 - 68179, November 28, 1979.

BUILDING TYPE: SCHOOLS - ELEMENTARY

Building Location	Heating Degree Days (60°) ³	Cooling Degree Days (50°) ³	Electricity Consumption	Fuel Consumption				
				Gas	Oil	Coal ⁴	Steam ⁵	Other
31. Minnesota	6,842	2,575	3,400 kWh	4,029 mcf	2,047 gal	-	-	-
32. Columbus, Ohio	4,513	3,183	43,489 kWh	1,874 mcf	-	-	-	-
33. Seattle, Washington	3,657	1,832	14,500 BTU/sq. ft./yr	-	-	-	-	-
34. Minnesota	6,842	2,575	68,460 kWh	8,606 ccf	6,302 gal	-	-	-
35. Minnesota	6,842	2,575	38,200 kWh	1,390 mcf	3,224 gal	-	-	-
36. Minnesota	6,842	2,575	71,880 kWh	1,272 mcf	-	-	-	-

³44 FR 68180 - 68181, November 28, 1979.

⁴To figure weighted total for coal (which is not addressed by BEPS) we calculated tons of coal x 24.5 million Btu per ton x 1.2 (weighting factor used by Minnesota).

⁵To figure weighted total for steam (which is not addressed by BEPS) we calculated lbs. of steam x 1,390 Btu per lb. (which includes boiler efficiency) x 1.2 (weighting factor used by Minnesota).

⁶Gross square footage - occupiable square footage (as reported) ÷ 0.8.

BUILDING TYPE: SCHOOLS - SECONDARY

Building Location	Year of Construction	Gross Floor Area (1000 sq ft)	Total Hours of Operation Per Year	Energy Consumption (1000 Btu/GSF/yr)		
				Reported On-Site	Weighted Total ¹	BEPS Standard ²
1. Minnesota		381 ⁶		82	106	138
2. Minnesota		318 ⁶		61	80	138
3. Minnesota		251 ⁶		97	116	138
4. Minnesota		229 ⁶		99	121	138
5. Minnesota		163 ⁶		77	114	138
6. Minnesota		151 ⁶		97	109	138

¹Weighted total = physical units x conversion factor x BEPS weighting factor:
 for gas = cubic feet x 1,000 x 1.0
 for oil = gallons x 139,000 x 1.2
 for electricity = kWh x 3,413 x 3.08

²44 FR 68175 - 68179, November 28, 1979.

BUILDING TYPE: SCHOOLS - SECONDARY

Building Location	Heating Degree Days (60°) ³	Cooling Degree Days (50°) ³	Electricity Consumption	Fuel Consumption				
				Gas	Oil	Coal ⁴	Steam ⁵	Other
1. Minnesota	6,842	2,575	1,075,440 kWh	19,194 mcf	56,100 gal	-	-	-
2. Minnesota	6,842	2,575	764,180 kWh	14,321 mcf	15,805 gal	-	-	-
3. Minnesota	6,842	2,575	455,340 kWh	13,814 mcf	61,450 gal	-	-	-
4. Minnesota	6,842	2,575	565,600 kWh	15,714 mcf	33,325 gal	-	-	-
5. Minnesota	6,842	2,575	540,000 kWh	-	77,600 gal	-	-	-
6. Minnesota	6,842	2,575	357,130 kWh	40,741 LPG gal 8,560 mcf	-	-	-	-

³44 FR 68180 - 68181, November 28, 1979.

⁴To figure weighted total for coal (which is not addressed by BEPS) we calculated tons of coal x 24.5 million Btu per ton x 1.2 (weighting factor used by Minnesota).

⁵To figure weighted total for steam (which is not addressed by BEPS) we calculated lbs. of steam x 1,390 Btu per lb. (which includes boiler efficiency) x 1.2 (weighting factor used by Minnesota).

⁶Gross square footage - occupiable square footage (as reported) ÷ 0.8.

BUILDING TYPE: SCHOOLS - SECONDARY

Building Location	Year of Construction	Gross Floor Area (1000 sq ft)	Total Hours of Operation Per Year	Energy Consumption (1000 Btu/GSF/yr)		
				Reported On-Site	Weighted Total ¹	BEPS Standard ²
7. Minnesota		149 ⁶		50	79	138
8. Minnesota		143 ⁶		69	85	138
9. Minnesota		140 ⁶		61	98	138
10. Minnesota		109 ⁶		104	125	138
11. Minnesota		85 ⁶		80	96	138
12. Minnesota		78 ⁶		82	111	138

¹Weighted total = physical units x conversion factor x BEPS weighting factor:
 for gas = cubic feet x 1,000 x 1.0
 for oil = gallons x 139,000 x 1.2
 for electricity = kWh x 3,413 x 3.08

²44 FR 68175 - 68179, November 28, 1979.

BUILDING TYPE: SCHOOLS - SECONDARY

Building Location	Heating Degree Days (60°) ³	Cooling Degree Days (50°) ³	Electricity Consumption	Fuel Consumption				
				Gas	Oil	Coal ⁴	Steam ⁵	Other
7. Minnesota	6,842	2,575	566,080 kWh	36,410 ccf	12,400 gal	-	-	-
8. Minnesota	6,842	2,575	39,840 kWh	-	70,000 gal	-	-	-
9. Minnesota	6,842	2,575	676,200 kWh	41,152 ccf	14,239 gal	-	-	-
10. Minnesota	6,842	2,575	283,100 kWh	89,645 ccf	8,200 gal	-	-	-
11. Minnesota	6,842	2,575	117,120 kWh	3,720 mcf	18,646 gal	-	-	-
12. Minnesota	6,842	2,575	146,640 kWh	-	42,600 gal	-	-	-

³44 FR 68180 - 68181, November 28, 1979.

⁴To figure weighted total for coal (which is not addressed by BEPS) we calculated tons of coal x 24.5 million Btu per ton x 1.2 (weighting factor used by Minnesota).

⁵To figure weighted total for steam (which is not addressed by BEPS) we calculated lbs. of steam x 1,390 Btu per lb. (which includes boiler efficiency) x 1.2 (weighting factor used by Minnesota).

⁶Gross square footage - occupiable square footage (as reported) ÷ 0.8.

BUILDING TYPE: SCHOOLS - SECONDARY

Building Location	Year of Construction	Gross Floor Area (1000 sq ft)	Total Hours of Operation Per Year	Energy Consumption (1000 Btu/GSF/yr)		
				Reported On-Site	Weighted Total ¹	BEPS Standard ²
13. Minnesota		716		82	101	138

¹Weighted total = physical units x conversion factor x BEPS weighting factor:

for gas	=	cubic feet	x	1,000	x	1.0
for oil	=	gallons	x	139,000	x	1.2
for electricity	=	kWh	x	3,413	x	3.08

²44 FR 68175 - 68179, November 28, 1979.

BUILDING TYPE: SCHOOLS - SECONDARY

Building Location	Heating Degree Days (60°) ³	Cooling Degree Days (50°) ³	Electricity Consumption	Fuel Consumption				
				Gas	Oil	Coal ⁴	Steam ⁵	Other
13. Minnesota	6,842	2,575	152,400 kWh	41,130 ccf	7,850 gal	-	-	-

³44 FR 68180 - 68181, November 28, 1979.

⁴To figure weighted total for coal (which is not addressed by BEPS) we calculated tons of coal x 24.5 million Btu per ton x 1.2 (weighting factor used by Minnesota).

⁵To figure weighted total for steam (which is not addressed by BEPS) we calculated lbs. of steam x 1,390 Btu per lb. (which includes boiler efficiency) x 1.2 (weighting factor used by Minnesota).

⁶Gross square footage - occupiable square footage (as reported) ÷ 0.8.

BUILDING TYPE: THEATRE/AUDITORIUM

Building Location	Year of Construction	Gross Floor Area (1000 sq ft)	Total Hours of Operation Per Year	Energy Consumption (1000 Btu/GSF/yr)		
				Reported On-Site	Weighted Total ¹	BEPS Standard ²
1. Worcester, Massachusetts		32		95	126	139

¹Weighted total = physical units x conversion factor x BEPS weighting factor:

for gas	=	cubic feet	x	1,000	x	1.0
for oil	=	gallons	x	139,000	x	1.2
for electricity	=	kWh	x	3,413	x	3.08

²44 FR 68175 - 68179, November 28, 1979.

BUILDING TYPE: THEATRE/AUDITORIUM

Building Location	Heating Degree Days	Cooling Degree Days	Electricity Consumption	Fuel Consumption				
	(60°) ³	(50°) ³		Gas	Oil	Coal ⁴	Steam ⁵	Other
1. Worcester Massachusetts	4,383	2,920	62,780 kWh	-	20,321 gal	-	-	-

³44 FR 68180 - 68181, November 28, 1979.

⁴To figure weighted total for coal (which is not addressed by BEPS) we calculated tons of coal x 24.5 million Btu per ton x 1.2 (weighting factor used by Minnesota).

⁵To figure weighted total for steam (which is not addressed by BEPS) we calculated lbs. of steam x 1,390 Btu per lb. (which includes boiler efficiency) x 1.2 (weighting factor used by Minnesota).

⁶Gross square footage - occupiable square footage (as reported) ÷ 0.8.

BUILDING TYPE: WAREHOUSE

Building Location	Year of Construction	Gross Floor Area (1000 sq ft)	Total Hours of Operation Per Year	Energy Consumption (1000 Btu/GSF/yr)		
				Reported On-Site	Weighted Total ¹	BEPS Standard ²
1. Minnesota		206		52	81	93
2. Minnesota		116		15	17	93
3. Minnesota		106		63	89	93

¹Weighted total = physical units x conversion factor x BEPS weighting factor:

for gas	=	cubic feet	x	1,000	x	1.0
for oil	=	gallons	x	139,000	x	1.2
for electricity	=	kWh	x	3,413	x	3.08

²44 FR 68175 - 68179, November 28, 1979.

BUILDING TYPE: WAREHOUSE

Building Location	Heating Degree Days (60°) ³	Cooling Degree Days (50°) ³	Electricity Consumption	Fuel Consumption				
				Gas	Oil	Coal ⁴	Steam ⁵	Other
1. Minnesota	6,842	2,575	57,650 kWh	-	6,068 gal	-	-	-
2. Minnesota	6,842	2,575	21,940 kWh	15,767 cf	-	-	-	-
3. Minnesota	6,842	2,575	21,200 kWh	-	4,000 gal	-	-	-

³44 FR 68180 - 68181, November 28, 1979.

⁴To figure weighted total for coal (which is not addressed by BEPS) we calculated tons of coal x 24.5 million Btu per ton x 1.2 (weighting factor used by Minnesota).

⁵To figure weighted total for steam (which is not addressed by BEPS) we calculated lbs. of steam x 1,390 Btu per lb. (which includes boiler efficiency) x 1.2 (weighting factor used by Minnesota).

⁶Gross square footage - occupiable square footage (as reported) ÷ 0.8.