AUTOEVALUACIÓN CON CHECKLIST

- Procedimiento estandarizado y replicable
- Busca determinar los principales factores de consumo de energía y determinar patrones de consumo en áreas específicas.
- Descubrir técnicas replicables para ahorro energético.
- Guía para FM para encontrar modificaciones en los sistemas del edificio y prácticas operacionales que reduzcan los consumos energéticos.
- Identificar áreas que requieren más atención y sugerencias.

AUTOEVALUACIÓN CON CHECKLIST

Áreas de autoevaluación

There are twenty categories or evaluation sections, as follows:

1. Window
2. Door
3. Ceiling
4. Wall
5. Roof
6. Storage Area
7. Shipping and Receiving
8. Illumination
9. Food Area
10. Heat Generation
11. Heat Distribution
12. Cooling Generation
13. Cooling Distribution
14. Electrical Power Distribution
15. Hot Water Service
16. Laundry
17. Compressed Air
18. Water
19. Process Heating
20. Transportation

EJEMPLO

EVALUATOR A. AUD

DATE 5/10/74

UNIT NAME Anywhere

SHEET NO. 1

No.	Location	Rating Value Max. = 10	Storms	Solar Protection	Tight Fit	Minor Infiltration	Major Infiltration	Cannot Be Opened	Can Be Opened	Weather Stripped	TOTAL POINTS
			WINDOW CONDITIONS								
			2	2	2	1	0	3	0	1	
1	Bldg. 4, Room 401		2			1			0	1	4
2	Bldg. 4, Room 402			2	2			3		1	8
3	Bldg. 4, Room 609					1			0	1	2
4	Bldg. 4, Room 102		2	2	2			3	1		10
5	Bldg. 4, Room 104, W1		2			1			0	1	4
6	Bldg. 4, Room 104, W2		2				0	0	1		3
7	Bldd. 4, Room 104, W3		2		2				0	1	5
25	GRAND TOTAL										
											36

RATING SCORE = 100 × 36 / (7) (10) = 51%

Range of Rating Score	*Action Required*
0- 20	Immediate Corrective Action Required
20- 40	Urgent Corrective Action Required
40- 60	Corrective Action Required
60- 80	Evaluation for Potential Improvement Required
80- 100	No Corrective Action Required

AUDITORÍA ENERGÉTICA RESIDENCIAL

- Al igual que una auditoría energética de un edificio, este procedimiento busca determinar cuál es el consumo energético de una casa y evaluar las medidas tendientes a reducirlo.
- La auditoría apunta a identificar problemas que al resolverse ahorran dinero con el tiempo.
- Saber dónde se pierde energía, eficiencia de los sistemas de calefacción y refrigeración ,y qué medidas implementar para conservar electricidad y agua caliente son sus objetivos.
- Puede ser simple (DIY) o más completa (profesional)

AUDITORÍA ENERGÉTICA RESIDENCIAL

DIY (Do-it-yourself)

- Simple, pero atento recorrido por la casa para detectar problemas en cualquier tipo de residencia.
- Hacer una lista de los lugares visitados y problemas encontrados.
- Priorización de los problemas y mejoras propuestas.
- Buscar problemas de:
  - Filtraciones
  - Aislación térmica
  - Equipos de calefacción/refrigeración
  - Iluminación

AUDITORÍA ENERGÉTICA RESIDENCIAL

DIY: Filtraciones

- Listar las filtraciones obvias (corrientes de aire).
- Éstas pueden significar ahorros de entre un 5% y 30%
- Chequear por filtraciones producidas en los encuentros de muros-pisos y muros-cielos.
- Chequear también:
  - Interruptores eléctricos
  - Marcos de ventanas
  - Tableros
  - “Weather strips” de puertas
  - Ductos de chimeneas
  - Accesos al entrepiso
  - AC montado en muros o ventanas

AUDITORÍA ENERGÉTICA RESIDENCIAL

DIY: Filtraciones

- Inspeccionar ventanas y puertas por filtraciones.
  - Remecerlas.
  - Si entra luz exterior por los marcos, hay filtraciones!
  - Fácil de resolver con weather strips o silicona.
  - Pueden reemplazarse también.
- Inspección exterior de todo lugar donde se encuentran dos materiales distintos, incluyendo:
  - Todas las esquinas.
  - Encuentros de recubrimiento (siding) y chimeneas.
  - Encuentro de fundaciones y terminaciones exteriores.
  - Buscar por llaves, instalaciones eléctricas, cables, etc. y chequear sello con silicona.
  - Chequear grietas y perforaciones de revestimientos (mortero, estuco)

AUDITORÍA ENERGÉTICA RESIDENCIAL

DIY: Aislación Térmica

- Chequear niveles mínimos de aislación indicados en normativa.
- Crítico especialmente viviendas antiguas
- En el entretecho inspeccionar las aberturas para ductos, chimeneas y ventilaciones y verificar que estén selladas. Si no lo están, usar espuma proyectada para lograrlo es una buena opción.
- Chequear barreas de vapor (papel kraft), pues su ausencia puede significar concentraciones de vapor que reducen la efectividad de la aislación (y comprometen estabilidad estructural del techo)
- Sellar cajas eléctricas desde el entretecho o interior
- Aislación de muros es más compleja. Una inspección termográfica es la única forma de garantizar homogeneidad de la aislación térmica

AUDITORÍA ENERGÉTICA RESIDENCIAL

DIY: Equipos de calefacción/refrigeración

- Inspeccionar estos equipos anualmente o según indicaciones del fabricante.
- Reemplazar filtros (aire forzado).
- Reemplazar equipos antiguos (>15 años), por nuevos más eficientes.
- Inspeccionar ductos (especialmente cerca de sellos). Si acumulan suciedad, filtran y debieran sellarse.
- Aislar ductos y cañerías cuando circulan por zonas no calefaccionadas.

AUDITORÍA ENERGÉTICA RESIDENCIAL

DIY: Iluminación

- Usualmente, iluminación corresponde al 10% de la cuenta eléctrica.
- Examinar las luminarias y ampolletas. Evaluar el reemplazo de ampolletas incandescentes por CFL de similar luminosidad, especialmente en zonas de mayor uso.
- Evaluar programas o incentivos para reemplazar ampolletas incandescentes.

FORMULARIOS TIPO

Please Print or Type

1. Building Information

1/2

Name of Institution	Address	
Owner, if other than Institution	Address	
Name of Building	Building #	
Address (Street or P.O. Box)	City, State, Zip	
Date of Audit	Type of Institution Public___ Private Non-Profit ____ Other ____	
Building Manager (administrator responsible for bldg.)		Bldg. Mgr.'s Phone
Energy Management Coordinator (EMC) or Monitor		EMC's Phone
Person Completing this Audit (include Cert. #)		Phone

2/2

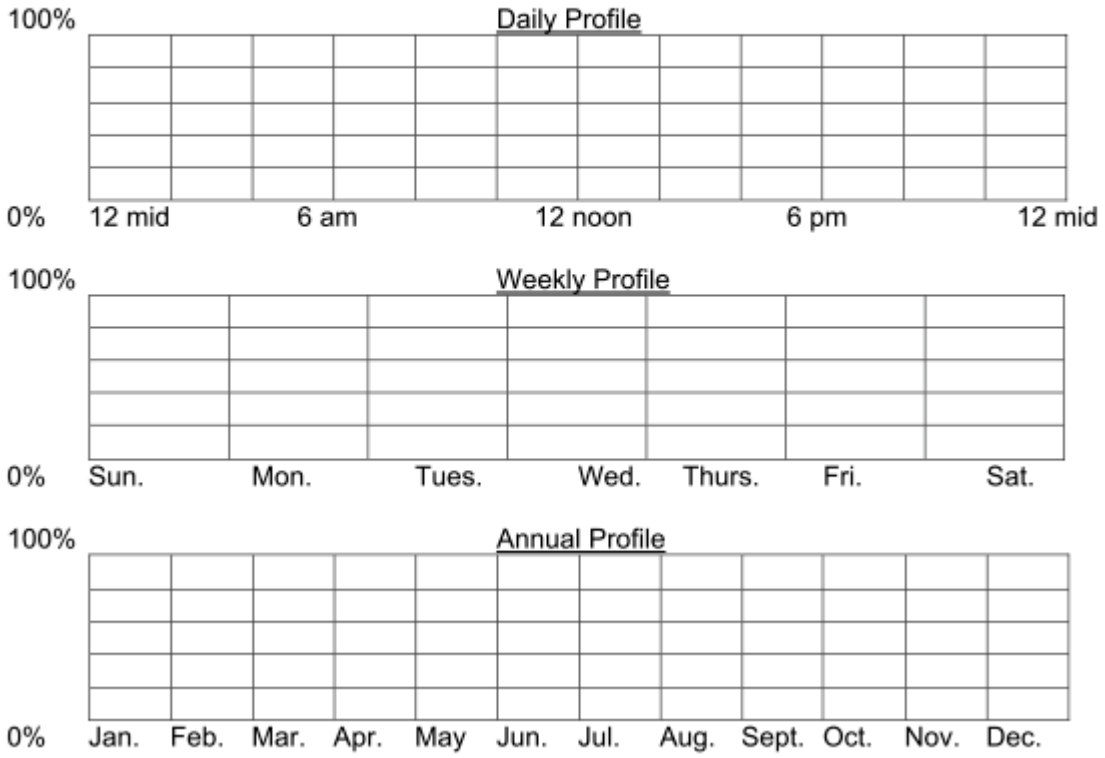
Building Type and Category School: __Element. __Second. __Comm.Coll. __Coll./Univ. __Voc. Tech. Ctr. __Other, Specify _____ Hospital: __General __Psychiatric __Other, Specify _____ Government: __Federal __State __City/County __Special Dist. __Indian Tribe Public Care: __Nurs. Home __Long-term care __Rehab. Center __Orphanage __Public Health __Res. Child Care __ Other, Specify _____ Date of construction, If known _____	Building Use ___Office ___Storage ___Library ___Services ___Police Station ___Fire Station ___Dormitory ___Prisoner Detention ___Other, Specify _____
Original Architects (if known)	Original Engineers (if known)
Building Modifications or Changes In Use Anticipated in the next 15 yrs:	Remaining Useful life of the building: _____Years
Does the Institution Have an ongoing energy management program?	___Yes ___No
Previous Energy Audits Completed? (if yes, give dates) __Yes __No Dates _____ _____ _____ _____	
Previous Architectural/Engineering Studies Undertaken? (if Yes, Specify) ___Yes ___No	
Name of Electric Utility	Is this building on the National Historic Preservation Register? __Yes __No

1. Building Information

Energy Saving Operation and Maintenance Procedures Implemented or Under Consideration Prior to this Audit (specify which). Please include an estimate of implementation cost and energy savings in kWh/yr and Btu/yr.
Conservation Measures (retrofit) Already Implemented or Under Consideration Prior to this Audit (specify which). Pleas Include Estimate of Cost and Savings if Available.

1. BUILDING INFORMATION

Building Occupancy Profile



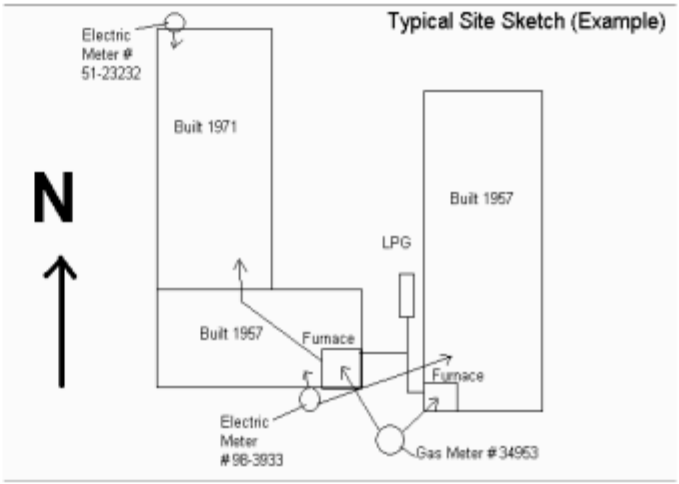
Building Occupancy Schedule

Area/Zone	# of Sq.Ft.	Week Days			Weekends, Holidays		
		hours		# of People	hours		# of People
		from	to		from	to	

BUILDING INFORMATION

On the following page, prepare a site sketch of your building or building complex which shows the following information:

1. Relative location and outline of the building(s).
2. Building Age
3. Building Number (Assign numbers if buildings are not already numbered.)
4. Building Size
5. Fuel Type
6. Location of heating and cooling units
7. Heating plants
8. Central cooling system, etc.
9. North orientation arrow



2. BUILDING CHARACTERISTICS

a. **Gross Floor Area**: _____ Gross Sq.Ft. x Ceiling Height _____ Ft. = volume ____Cu.Ft.
b. **Conditioned Floor Area**: _____ (if different that gross floor area)
c. **Total door Area**: _____ Sq.Ft. Glass doors _____sq.ft. Wood doors _____sq.ft. Metal doors _____ sq.ft. Garage doors _____ sq.ft.
d. **Total Exterior Glass Area**: _____sq.ft. Single Panes _____sq.ft. Double panes ____sq.ft.

	North	**South**	**East**	**West**
Total Area	_____sqft	_____sqft	_____sqft	_____sqft
Single Pane	_____sqft	_____sqft	_____sqft	_____sqft
Double Pane	_____sqft	_____sqft	_____sqft	_____sqft

e. **Total Exterior Wall Area**: _____ sqft Material: [ ]Masonry [ ]Wood [ ]Concrete [ ]Stucco [ ]Other
f. **Total Roof Area**: _____sqft Condition: [ ]Good [ ]Fair [ ]Poor
g. **Insulation Type**: _____Roof _____Wall _____Floor
h. **Insulation Thickness**: _____Roof _____Wall _____Floor
i. **Metering**: Is this building individually metered for electricity? [ ]Yes [ ]No
Is this building individually metered for natural gas? [ ]Yes [ ]No
Is this building on a control boiler system with other buildings? [ ]Yes [ ]No
j. **Describe general building condition**:

2. ANNUAL ELECTRIC USE AND COST
Include Electrical Demand, if applicable

Building	Address	Year of Record From / To
Account Number	Meter Number	Utility
Maximum kW Demand W/O charge	Minimum Power Factor W/O charge	Building size (sqft)

1	2	3	4	5	6	7	8	9	10
Meter Read Date From	To	KWh* Used	KWh/gross sq.ft. **	Annual (EUI) BTU/sqft (000)	Energy Cost	KW-KVA Demand	Fixed Service Cost	P.F. * and Demand Cost***	Total Cost
TOTAL									

Comments:

Conversion: 3413 BTU/kWh
*KW – Kilowatts, KVA – Kilo-Volt-ampere, KWH – Kilowatt hour, P.F. – Power Factor
**Total annual kWh divided by the building's gross sq. ft.
***If demand and/or power factor are metered and billed, energy cost here.

3. ANNUAL NON-ELECTRIC ENERGY USE AND COST

Photo copy this form for additional fuel types

Building	Address	Year of Record From To
Account Number	Meter Number	Utiilty
Building Size (sq ft)	Fuel Type	Specify Units

Billing Period From	To	Fuel consumption	Conversion Factor	MMBTU	Annual (EUI) Btu/sq.ft.	Cost $
TOTAL						

Comments:

***Conversion Factors**

Natural Gas	100,000 Btu/therm
Natural Gas	1,030 Btu/cubic feet
Liquified Petroleum	(LP bottled gas) 95475 Btu/gallon
Kerosene	134,000 Btu/gallon
Distillate Fuel Oil	138,690 Btu/gallon
Residual Fuel Oil	149,690 Btu/gallon
Coal	24.5 million Btu per Standard short ton
Wood	8,680 Btu/pound
Steam	970 Btu/pound
Other	Consult standard Engineering Reference Manual

7. DOMESTIC HOT WATER

Domestic Hot Water Heated by:
[ ]Electricity [ ]Natural Gas [ ]Oil [ ]Steam [ ]Heat pump [ ]Other, specify

Number of Units	General Location(s)of Unit(s)	Is there a re-circulation loop?
Daily Usage (if known) _____gal/day	Hot Water Temp. At point of Use _____ At heater _____	
Temp. of city water	Is tank wrapped? [ ]Y [ ]N	Do obstructions prevent wrapping? [ ]Y [ ]N
Distance form Heater to Point of use _____Nearest _____Farthest	Hot Water Uses for Other than Laveratories	

8. FOOD PREPARATION AND STORAGE AREA EQUIPMENT

Item	Exists	Total load(if known) KW	Item	Exists	Total load (if known) KW
Ranges	Yes No	_____	Ovens	Yes No	_____
Steam Tables	Yes No	_____	Frying Tables	Yes No	_____
Freezers	Yes No	_____	Refrigerators	Yes No	_____
Walk-in Refer	Yes No	_____	Walk-in Freezer	Yes No	_____
Infra-red warmer	Yes No	_____	Dishwashers	Yes No	_____
Microwaves	Yes No	_____	Hoods w/Exhaust fans	Yes No	_____
Mixers	Yes No	_____	Other, Define _____	Yes No	_____

9. LIGHTING

Building Area*	Type Code of fixture	Approximate number of fixtures	Average watts per fixture	Operating hours/day	Average footcandles**

Lighting Type Codes

A. Incandescent
B. Flourescent
C. Mercury Vapor
D. High Pressure Sodium
E. Low Pressure Sodium
F. Metal Halide

*Include indoor and outdoor areas.
** Optional

Comments : (e.g., specially installed energy saving fixtures, bulbs, controls such as wall switchers, timeclocks, dimmers, etc.)

11. ENERGY SAVINGS

INSTRUCTIONS: This section is to be completed by the auditor after the walk-through portions of the audit. First, check the boxes which state the range of the percent of energy consumption which would be saved by implementing the operation and maintenance items recommended in section 2 of this book. Second, calculate the range of energy and cost savings by multiplying the estimated percentages by the annual electrical and fuel consumption date on this audit report.

Check two boxes in each category:

Range of Electrical Savings [ ]0% [ ]5% [ ]10% [ ]15% [ ]20% [ ]25% [ ]Other____

Range of Fuel Savings [ ]0% [ ]5% [ ]10% [ ]15% [ ]20% [ ]25% [ ]Other____

Calculate ranges of energy and cost savings:

Range of Electrical Savings

	% Range		Annual Electrical consumption kWh	=	Range of Electrical savings kWh	% Range		Annual Electrical dollars spent	=	Range of Electrical Dollar savings
Lower Bound	_____	X	_____	=	_____	_____	X	$_____	=	$_____
Upper bound	_____	X	_____	=	_____	_____	X	$_____	=	$_____

Range of Fuel Savings

	% Range		Annual fuel consumption Btu	=	Range of fuel savings Btu	% Range		Annual Fuel dollars spent	=	Range of Fuel Dollar savings
Lower Bound	_____	X	_____	=	_____	_____	X	$_____	=	$_____
Upper bound	_____	X	_____	=	_____	_____	X	$_____	=	$_____

The auditor is not responsible if actual savings resulting from the implementation of the energy conservation opportunities listed in this section do not fall between the roughly estimated ranges which are specified.

Total Range of operation and maintenance energy savings (total all fuels):

From _____ Btu to _____Btu.
(lower bound) (upper bound)

Comments:

COOPERATIVE EXTENSION
WASHINGTON STATE UNIVERSITY
ENERGY PROGRAM

Guidelines for Public Agencies

Energy-Efficiency Measures List

1.0 Envelope

1.1 Reduce Heat Losses-Ceiling/roof
1.11 Additional Ceiling/Roof Insulation
1.12 Exhaust Attics
1.13 Use Light-Colored Roof Surfaces
1.14 Roof Sprinkling/Spray System

1.2 Reduce Heat Losses-Walls/floors
1.21 Additional Wall Insulation
1.22 Additional Floor/Slab Insulation
1.23 Use Light Colored Exterior Surfaces
1.24 Thermal Mass/Passive Solar Heating

1.3 Reduce Heat Losses-Windows/Doors
1.31 Install Additional Glazing Layer
1.32 Install Movable Insulation
Multilayer reflective roller shade device
Operable insulating slats
Quilted insulating draperies
1.33 Use Special Coatings or Gases
Heat mirror
Low-e coatings
Argon gas window fill

1.4 Reduce Heat Gain--Windows/Doors
1.41 Install Exterior Shading
1.42 Install Interior Shading
1.43 Use Tinted or Reflective Coatings or Films
1.44 Optimize Window Sizing and Orientation

1.5 Reduce Infiltration
1.51 Caulk and Weatherstrip Doors and Windows
Dock shelters/seals
Install air curtains
1.52 Install Air-Lock Vestibule System or Revolving Doors

2.0 Lighting

2.1 Reduce Lighting Required
2.11 Utilize Task Lighting
2.12 Lighting Controls
Selective switching
Programmable timing control
Occupancy sensors
Energy management system
2.13 Use Light-Colored Interior Wall Finishes

2.2 Install More Energy-Efficient Lighting System
2.21 Use High-Efficiency Fixtures
HID fixtures in selected locations
Efficient exit signs
Self-ballasted compact fluorescents
2.22 Use Efficient Exterior Fixtures
High-pressure sodium HID fixtures
Metal halide fixtures
2.23 Use High-Efficiency Ballast
Electromagnetic/hybrid.
Electronic

2.3 Use Daylighting
2.31 Install Dimming Controls
2.32 Architectural Modifications

3.0 HVAC Systems

3.1 Air Distribution Systems
3.11 Reduce Energy Losses
Increase duct insulation
Install air-to-air heat recovery
Runaround loop heat recovery