# *City of Auburn Hills* **Memo**

To: Building Permit Applicants

From: Building Department

Date: Wednesday, April 14, 1999

Subject: Michigan Uniform Energy Code

As of March 31 1999, the new Michigan Uniform Energy Code became effective.

All new residential structures built after this date will require compliance. Please note the code does not include additions and alterations to existing buildings. Commercial structures shall comply with ASHRAE 90A-1980 and 90B-1975.

The following enclosed information will assist you in preparing the required documentation.

Michigan Energy Code worksheet
Energy analysis worksheet for Systems Approach
Codes and Standards Order Form
Understanding the Michigan Uniform Energy Code (MUEC)

If you have any questions or for further clarification of this package, please contact the Department of Building Services at 248-391-8180.

Fax

# WORKSHEET FOR MICHIGAN UNIFORM ENERGY CODE
# CITY OF AUBURN HILLS BUILDING SERVICES

Job Address _____

Applicant _____ Phone _____

Check Method of Compliance: Prescriptive _____ Systems Approach (MUEC Rule 1084) ____

**Note:** Systems Approach method requires an energy analysis comparison report (enclosed).

1. Gross area of exterior walls in square feet. _____

2. Square feet of fenestration/openings (windows & doors). _____

3. Percent of fenestration/openings in exterior walls. _____%

4. If fenestration/openings exceed 20% of gross exterior wall area, indicate the specific trade-off option that will be used for compliance. _____

5. Indicate the percentage of exposed basement wall area (sq. ft. of exposed basement wall divided by sq. ft. of gross area of exterior wall)

6. Indicate the "R" value and type of insulation proposed for use on basement walls exposed more than 7% of the gross area of exterior walls. _____

7. Submit documentation for certified or labeled "R" values of all fenestration products including windows, doors and skylights. In addition, submit manufacturer's verification that fenestration products do not exceed .37 cfm of air leakage per lineal feet of sash crack perimeter at air pressure of 1.56 p.s.f. (25 mph) using ASTM-E283 Procedures.

8. Indicate the proposed insulation (include "R" value and thickness) See attached Table 1074 for minimum "R" values used for prescriptive compliance in Zone 1

| | | | |
|---|---|---|---|
| Walls | _____ | Heated Slabs | _____ |
| Ceiling | _____ | Unheated Slabs | _____ |
| Floors | _____ | | |

9. At time of inspection, the insulation installer shall provide a certificate for blown-in or sprayed insulation that lists the following information:

   a. The initial thickness
   b. The settled thickness
   c. The coverage area
   d. The number of bags used

# Abbreviated Report Form 1086.3
## Energy Analysis Comparison Report Continued

| FOUNDATION/FLOOR | SUBTOTALS |
|---|---|
| **rs Over Unconditioned Spaces**<br>A _____ /R _____ = A/R _____ = | _____ Line 8 |
| **Slab on Grade Floors (Area = Perimeter x 2')**<br>A _____ /R _____ = A/R _____ = | _____ Line 9 |
| **Crawl Space Walls** (Area: Top foundation wall to average finished grade)<br>A _____ /R _____ = A/R _____ = | _____ Line 10 |
| **Basement Walls** (Area: Top foundation wall to average finished grade)<br>$A_1$ _____ /$R_1$ _____ = $A_1/R_1$ _____<br>^ _____ /$R_2$ _____ = $A_2/R_2$ _____<br>$A_1/R_1 + A_2/R_2$ =<br>**Basement Windows**<br>A _____ /R _____ = A/R _____ =<br>_____<br>Total Gross Basement Wall Area | _____ Line 11<br>_____ Line 12 |
| **FOUNDATION/FLOOR SUBTOTAL A/R**<br>(Lines: 8+9+10+11+12) | _____ Line 13 |
| **PROPOSED ALTERNATIVE HOUSE SUB-TOTAL A/R**<br>(Lines: 1+7+13) | _____ Line 14 |
| **HEATING EQUIPMENT EFFICIENCY**<br>(If the same as Standard House, go to line 16 or 17)<br>(Oil or Gas Fired) AFUE: _____%<br>Line 14: _____ = Adjusted A/R =<br>AFUE: 0.___ | _____ Line 15 |
| **AIR LEAKAGE RATE**<br>(If the same as Standard House, go to line 17)<br>_____ ACH x _____ $ft^3$ x 0.018 =<br>Air Changes per Hour Volume of House | _____ Line 16 |
| **PROPOSED ALTERNATIVE HOUSE TOTAL**<br>(Lines: 15+16)<br>Equal to or less than line L to pass | _____ Line 17 |

| FOUNDATION/FLOOR | SUBTOTA |
|---|---|
| **Floors Over Unconditioned Spaces**<br>_____ x $Z_1$0.05 $Z_2$0.05 = $Z_3$0.033<br>Total Floor Area | _____ Line C |
| **Slab on Grade (Unheated)**<br>_____ x $Z_1$0.17 $Z_2$0.15 = $Z_3$0.13<br>Total Slab Edge Area<br>**Slab on Grade (Heated)**<br>_____ x $Z_1$0.12 $Z_2$0.11 = $Z_3$0.10<br>Total Slab Edge Area | _____ Line D<br>_____ Line E |
| **Crawl Space**<br>_____ x $Z_1$0.16 $Z_2$0.15 = $Z_3$0.13<br>Total Crawl Space Wall Area | _____ Line F |
| **Basement Walls**<br>_____ x $Z_1$0.16 $Z_2$0.15 = $Z_3$0.13<br>Total Gross Basement Wall Area | _____ Line G |
| **FOUNDATION/FLOOR SUBTOTAL A/R**<br>(Lines: C+D+E+F+G) | _____ Line H |
| **STANDARD DESIGN HOUSE SUB-TOTAL A/R**<br>(Lines: A+B+H) | _____ Line I |
| **HEATING EQUIPMENT EFFICIENCY**<br>(Oil or Gas Fired) AFUE: 78%<br>Line I: _____ = Adjusted A/R =<br>AFUE: 0.78 | _____ Line J |
| **AIR LEAKAGE RATE**<br>0.8 ACH x _____ $ft^3$ x 0.018 =<br>Volume of House | _____ Line K |
| **STANDARD DESIGN LIMIT TOTAL**<br>(Lines: J+K) | _____ Line L |

# Energy Analysis Comparison Report

Builder's Name:

Project Address:

.y/Township/County:

| PROPOSED ALTERNATIVE HOUSE | | STANDARD DESIGN HOUSE | |
|---|---|---|---|
| ROOF/CEILING (INC. SKYLIGHTS) | SUBTOTALS | ROOF/CEILING (INC. SKYLIGHTS) | SUBTOTALS |
| $A_1$ _____ /$R_1$ _____ = $A_1/R_1$ _____<br>$A_2$ _____ /$R_2$ _____ = $A_2/R_2$ _____<br>$A_3$ _____ /$R_3$ _____ = $A_3/R_3$ _____<br>_____ $A_1/R_1 + A_2/R_2 + A_3/R =$<br>Total Roof/Ceiling Area | _____<br>Line 1 | _____ x $Z_1$0.036<br>$Z_2$0.032 =<br>$Z_3$0.030<br>Total Roof/Ceiling Area | _____<br>Line A |
| GROSS WALL | | GROSS WALL | |
| **Opaque Wall** (Does not include band joist, windows, doors, etc.)<br>$A_1$ _____ /$R_1$ _____ = $A_1/R_1$ _____<br>$A_2$ _____ /$R_2$ _____ = $A_2/R_2$ _____<br>$A_1/R_1 + A_2/R_2 =$ | _____<br>Line 2 | | |
| **Band Joist**<br>A _____ /R _____ = A/R _____ = | _____<br>Line 3 | | |
| **Penetration and Doors, Windows**<br>$A_1$ _____ /$R_1$ _____ = $A_1/R_1$ _____<br>$A_2$ _____ /$R_2$ _____ = $A_2/R_2$ _____<br>$A_3$ _____ /$R_3$ _____ = $A_3/R_3$ _____<br>$A_1/R_1 + A_2/R_2 + A_3/R_3 =$ | _____<br>Line 4 | | |
| **Doors**<br>$A_1$ _____ /$R_1$ _____ = $A_1/R_1$ _____<br>$A_2$ _____ /$R_2$ _____ = $A_2/R_2$ _____<br>$A_1/R_1 + A_2/R_2 =$ | _____<br>Line 5 | | |
| **Other**<br>A _____ /R _____ = A/R _____ =<br>_____<br>Total Gross Wall Area | _____<br>Line 6 | | |
| GROSS WALL SUBTOTAL A/R<br>(Lines: 2+3+4+5+6) | _____<br>Line 7 | _____ x $Z_1$0.16<br>$Z_2$0.15 =<br>$Z_3$0.13<br>Total Gross Wall Area | _____<br>Line B |

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# CODES & STANDARDS ORDER FORM

Michigan Department of Consumer and Industry Services
Bureau of Construction Codes
P.O. Box 30255
Lansing, MI 48909
(517) 241-9313

| | | |
|---|---|---|
| AUTHORITY: | P.A. 230 OF 1972, AS AMENDED | THE DEPARTMENT OF CONSUMER AND INDUSTRY SERVICES WILL NOT DISCRIMINATE AGAINST ANY INDIVIDUAL OR GROUP BECAUSE OF RACE, SEX, RELIGION, AGE, NATIONAL ORIGIN, COLOR, MARITAL STATUS, HANDICAP OR POLITICAL BELIEFS. |
| COMPLETION: | MUST BE COMPLETED TO PROCESS ORDER | |
| PENALTY: | ORDER CAN NOT BE FILLED | |

| | | | |
|---|---|---|---|
| Date | | | |
| Name | | | Social Security Number |
| Street Address (CODE BOOKS ARE DELIVERED UPS-CANNOT BE DELIVERED TO POST OFFICE BOXES) | | | Phone Number |
| City | | State | Zip Code |

## CODE BOOKS

| | Price | Quantity | Total |
|---|---|---|---|
| The **BOCA** National Building Code / 1996 | $42.00 * | | |
| **International** Plumbing Code / 1997 | $35.00 * | | |
| **International** Mechanical Code / 1996 | $36.00 * | | |
| **National** Electrical Code / 1996 | $40.00 * | | |

*Includes one copy of applicable State Construction Code Rules.

## CONSTRUCTION CODE RULES

| | Price | Quantity | Total |
|---|---|---|---|
| Parts 1,2,3,4 - Building Code Rules / 1996 (includes Barrier Free Design requirements) | $ 2.50 | | |
| Part 7 - Plumbing Code Rules / 1997 | $ 2.50 | | |
| Part 8 - Electrical Code Rules / 1996 | $ 2.50 | | |
| Part 9a - Mechanical Code Rules / 1996 | $ 2.50 | | |
| Part 10 - Michigan Uniform Energy Code Rules | $ 2.50 | | |

MAKE CHECKS PAYABLE TO STATE OF MICHIGAN

TOTAL

The New

# Michigan Uniform Energy Code (MUEC)

*by Lee Schwartz*

Later this month, Michigan will become the first, but most certainly not the last, state in the nation to adopt a simple, inexpensive, energy-efficient, environmentally-friendly, cost-effective energy code, which assures that new home owners won't spend more for energy saving measures than they will save in their energy bills. In this issue we will try to answer some basic questions about the new Michigan Uniform Energy Code (MUEC).

## When does the new energy code go into effect?

The Michigan Uniform Energy Code takes effect on March 31, 1999. Residential buildings which have undergone a plan review or have a permit application filed before March 31 may be built under the ASHRAE 90A/90B standards. Residential buildings that undergo a plan review or have a permit application filed after March 31 must be built under the new Michigan Uniform Energy Code (MUEC).

## What are considered residential buildings under the code?

Residential buildings are detached one and two family dwellings, other residential buildings that are three stories or less in height and buildings or structures which are incidental to the use of the main residential building and which are located within the apartment complex or a subdivision. An example would be a club house in an apartment complex.

## What about commercial buildings?

Commercial buildings will continue to be built under the ASHRAE 90A/90B standards currently in use.

## What happens if I have a building that is part residential and part commercial?

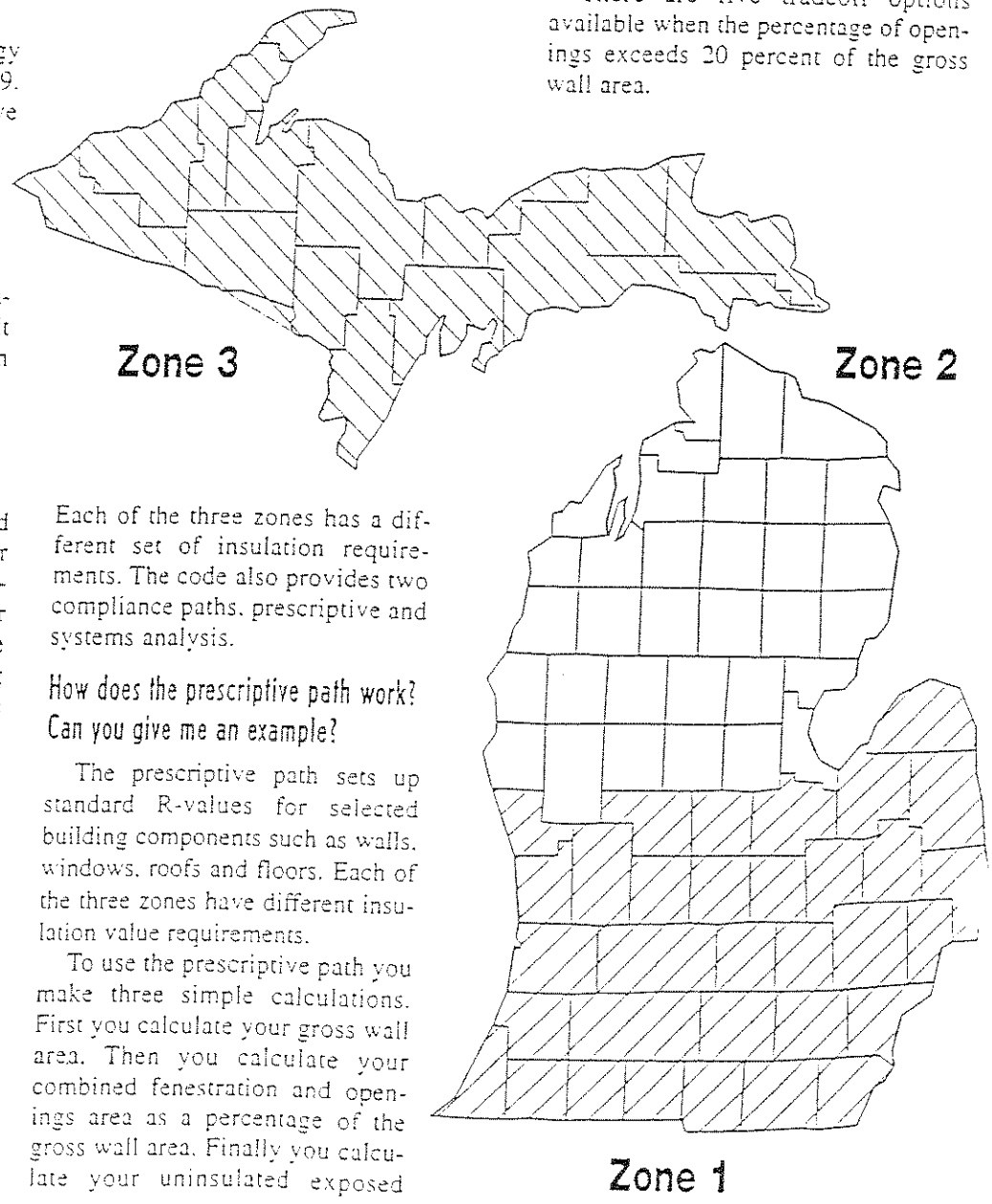
Buildings that have more than one occupancy must be built with each portion of the building meeting the requirements of occupancy for that portion. If the "minor accessory uses" do not occupy more than 10 percent of the area of any floor of a building, then the major use shall be considered the building occupancy.

## Do additions or renovations come under this new code?

Additions and renovations of residential buildings are exempt from the requirements of the MUEC.

## How does the MUEC work?

The MUEC divides the state up into three zones (See the map below).




Each of the three zones has a different set of insulation requirements. The code also provides two compliance paths, prescriptive and systems analysis.

## How does the prescriptive path work? Can you give me an example?

The prescriptive path sets up standard R-values for selected building components such as walls, windows, roofs and floors. Each of the three zones have different insulation value requirements.

To use the prescriptive path you make three simple calculations. First you calculate your gross wall area. Then you calculate your combined fenestration and openings area as a percentage of the gross wall area. Finally you calculate your uninsulated exposed basement wall area above finished grade as a percentage of the gross wall area (assuming there is a basement).

Once you've made these calculations you go to Table 1074 in the code (reproduced on page 11). This table lists all the building component R-value requirements by zone.

The fenestration and openings percentage you calculated earlier controls the R-value requirements for openings. It also establishes when a builder must use a tradeoff.

## How do the trade offs work?

There are five tradeoff options available when the percentage of openings exceeds 20 percent of the gross wall area.

You could install high-efficiency HVAC equipment. Gas and oil-fired warm air furnaces would need to have a 90 percent or better Annual Fuel Utilization Efficiency (AFUE) rating. Air conditioning systems would need to have a Heating Seasonal Performance Factor (HSPF) of not less than 7.8 and a Seasonal Energy Efficiency Rating (SEER) of not less than 12. Gas and oil-fired hot water boilers would need to have at least an 83 percent AFUE rating. Ground source heat pumps would have to have a Coefficient of Performance (COP) of not less than 3.0.

You could install high-efficiency windows & doors with an R-value of not less than 3.5 as measured from the center of unit. You could increase the roof/ceiling R-value to R-38 and the R-value for exterior walls to R-15 for zone 1, R-19 for zone two and R-24 for zone 3. You could insulate the exterior basement walls from the top of the foundation wall to the level of the basement floor with R-5 insulation. You could install a variety of specific air-leakage controls listed in the code. You would only need to do one of the above tradeoff options.

## Will it be up to the building official to decide which trade off I use?

No. The decision of which option to use is your choice and must be accepted by the building official. The same is generally true regarding which path to use, prescriptive or systems analysis. If you meet the requirements to be able to use the prescriptive path, the building official can't force you to use the systems analysis path.

## Do I have to insulate the basement?

As a general rule, the MUEC does not require basements to be insulated. However, there are two exceptions to this rule.

1. If the percentage of exposed uninsulated basement wall above ground is greater than 7 percent of the gross wall area, the exposed basement walls must be insulated with R-5 insulation until the exposed uninsulated area has been reduced to 7 percent or less.
2. The exterior walls of heated finished lower levels have to be insulated to at least R-5. Finished lower levels are basements, or portions of a basement, that are enclosed areas, which are suitable for year-round use, including walls, floors, and ceilings, and which meet the requirements of the applicable building code for their intended use.

Table 1074
PRESCRIPTIVE COMPLIANCE APPROACH
BUILDING ENVELOPE INSULATION CRITERIA

| Building Component | Zone 1 | Zone 2 | Zone 3 |
|---|---|---|---|
| R 408.31074 Walls | R13 | R15 | R19 |
| R 480.31075 Fenestration/Openings<br>Up to and including 15% gross exterior wall area. | R1.9 | R1.9 | R1.9 |
| Over 15% and including 20% gross exterior wall area. | R2.5 | R2.5 | R2.5 |
| Over 20% gross exterior wall area. | Refer to building envelope opening allowance trade-off options (R408.31083) | | |
| R 408.31076 Roof/Ceiling<br>Skylights follow fenestration requirements for R values and are limited to 10% of gross roof/ceiling area. | R30 | R38 | R38 |
| R 408.31077 Floors over unconditioned spaces (including outdoor overhangs) | R21 | R30 | R30 |
| R 408.31078 Slab-on-grade Floors<br>Unheated slabs<br>Heated slabs | R5<br>R10 | R5<br>R10 | R5<br>R10 |
| R 408.31079 Crawl Space Walls | R5 | R5 | R5 |
| R 408.31080 Finished Lower Level Walls | R5 | R5 | R5 |
| R 408.31081 Exposed Basement Walls<br>(More than 7% of the gross exterior wall area) | R5 | R5 | R5 |

## Is there any limit to the size and number of windows and doors I can have in a house?

There is no limitation on how many windows and doors a house can have or what size they can be. However, the number and size of windows and doors does affect their required R-values. Also, when using the prescriptive path, skylights are limited to 10 percent of the gross roof/ceiling area.

## When do I have to use the systems analysis path?

The prescriptive path is a "cookie cutter" approach that doesn't allow you to have less insulation in one building component and more in another. If you had a design that didn't allow you to put the required amount of insulation for your zone in one of the listed building components, you'd have to use the systems analysis path. The same would be true if you had enough skylights to exceed the 10 percent of the gross roof/ceiling area limitation.

If a building uses renewable energy sources for part or all of its energy needs, it may also make sense to use the systems analysis path to take advantage of reduced insulation requirements.

## How does the systems analysis approach work?

The systems analysis approach is designed to allow builders to show that a house built to different insulation standards (proposed alternative design) than are found in the prescriptive path (standard design) would not use any more energy to heat than if it had been in accordance with the prescriptive path.

The proposed alternative design must be the same as the standard design in floor area, thermal envelope area, exterior design conditions, occupancy, climate data, and usage operational schedule.

The standard building design is considered to use 78 percent AFUE gas and oil-fired comfort equipment and, for purposes of calculation only, have an air changes per hour (ACH) rate of 0.80.

You can use either a simplified heating degree day (HDD) approach or the typical meteorological year (TMY) for the closest available location in your comparison.

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## ENERGY CODE

*continued from page 11*

You have to use the same methodology or calculation tool for both designs.

The MUEC provides a one-page Abbreviated Report Form (ARF) 1086.3 to compare a proposed alternative design with a standard design. You simply need to fill in the blanks (the alternative design is on one side of the form, the standard design on the other) and do some simple math. You do not need a computer program to do these calculations. If the bottom line figure for the alternative design is less than or equal to the bottom line figure for the standard design, the house is considered to be in compliance with the code. If not, you will need to tinker with your alternative design.

### What kind of paperwork does the code require?

We won't be sacrificing a half-acre of forest on forms to show you've complied with the MUEC. Paperwork has been kept to a minimum.

Insulation installers will have to provide building officials with a signed and dated statement for the insulation installed in each element of the building envelope.

The R-value of premanufactured doors, windows and skylights needs to be labeled or certified by the manufacturer or fabricator.

Premanufactured windows, doors and skylights separating outdoor ambient conditions or exempted portions of the building from interior spaces that are heated or mechanically cooled have to be labeled or certified by the manufacturer to have an air-leakage rate of not more than .37 cubic feet per minute per lineal foot of sash crack perimeter at an air pressure of 1.56 pounds per square foot using ASTM-E283 procedures.

Custom-installed windows and doors that are not premanufactured are exempt from the product rating requirements for air leakage but have to comply with the general air leakage requirements of the code.

If you want to take advantage of the air leakage options found in the code you have to provide the building official with documentation showing the air-leakage treatments in the code have been followed or provide the results of a post-construction blower door test.

If you use the systems analysis report, you'll need to provide the building official with an energy analysis as outlined in the code. This can be done with the one page ARF 1086.3.

You'll also need to provide the building official with a comparison report that includes a basic description of the proposed alternative building design that identifies any exceptions to the standard design criteria.

If you are claiming credit for using a renewable energy source you have to provide the building official with supporting documentation on the basis of the performance estimates for the energy source.

If you are claiming credit for reduced ACH levels you have to provide the building official with documentation showing the air-leakage treatments in the code have been followed or provide the results of a post-construction blower door test.

### Do I need to have an architect, professional engineer or other consultant prepare these documents?

No. The code stipulates that documentation submitted by a properly licensed homebuilder or remodeler is not required to be prepared, sealed or submitted by an architect, professional engineer or other consultant.

### How can I get a copy of the new Michigan Uniform Energy Code?

Copies of the new code should be available from the Michigan Department of Consumer and Industry Services, Bureau of Construction Codes, Office of Management Services, P.O. Box 30255, Lansing, Michigan 48909. Copies of the code are also available from the Michigan Association of Home Builders, either in a printed booklet or in Word Perfect format on disk. Both Macintosh and IBM disks are available. The price is $5.00 for members, $15 for non-members.

## Thank you...

No great accomplishment occurs in a vacuum. The Michigan Uniform Energy Code did not spring forth full-blown from Zeus' brow. It exists today because of the hard work of many individuals who deserve our gratitude.

It begins with the members of the MAHB's Combined Energy Code Committee: *David Zilke*, David Z & Company, Bridgeman who chaired the committee; *Eric Brakke*, Four Season Sunrooms, Southfield ; *Tom Comfort*, Temex, Belaire; *David Kellett, Sr.* Kellett Construction Company, Bloomfield Hills; *Mark Klad*, Zeeland Lumber & Supply, Allendale; *Mark LeVasseur*, Mark LeVasseur Builder, Midland; *Dan MacLeish*, MacLeish Building, Inc. Troy; *Roger Papineau*, Papineau Builder, Beulah; *Charlie Pullum*, Pullum Windows, Detroit; *Rodney Rajala*, Rajala Homes, Inc., Flint; *Jim Reichard*, Campbell & Reichard Builders, Bay City; *Jack Saylor*, Saylor Building Company, Troy; *Loren Swanson*, Southern Michigan Heating Company, Jackson; and *Mike Toon* Mike Building Company, Farmington Hills; all of whom, in the words of Winston Churchill, offered their "blood, toil, tears and sweat" to this project.

Special thanks are due *Mike Tobin* and *Dave Zilke* who pulled double duty as the MAHB's representatives to the State Construction Code Commission's Energy Code Ad Hoc Committee.

Joining Tobin and Zilke on the SCCC Ad Hoc Committee were *Ted Yklmoff*, Consumers Energy, Jackson; *Fred Galbraith*, Livingston County Building Department, Howell; *Lance Bickel*, Three Rivers Construction, Midland; *Tim Miller*, Applegate Heating & Insulation, Lansing; *Doug Sibee*, Dow Chemical, Midland; *Don Saven*, Novi Building Department, Novi; *James Velthoven*, Giffels Associates, Southfield; *John Gross*, West Bloomfield; and *Ron Kohler*, Daimler-Chrysler Corporation, Auburn Hills. Every individual who served on this committee did so with honesty, integrity and a goal of producing the best energy code possible for Michigan's citizens.

Numerous MAHB members who were not officially committee members also made important contributions to the development of the code. *Sam Kreis*, Countrywide Home Loans, Southfield, spent many hours working on assessment practices and making sure the MUEC met the mortgage qualification provisions of the code. *Mike Hofer*, Welcome Homes, Inc., Clarkston, took to the airwaves with Glenn Haage to debate the need for a new energy code. *Don Pratt*, Wake-Pratt Construction, Auburn Hills provided sage counsel throughout the process while *Don Nelson*, D. R. Nelson & Associates, Lake Orion contributed his knowledge regarding air infiltration.

The assistance of the National Association of Home Builders was a key element in the creation of this code. We appreciate the help rendered by NAHB staff members Ron Burton, Dick Morris, Mary DiCrescenzo, Brett Diggs and Eric Anderson.

Finally many thanks are due to the MAHB members who participated in the March 2, 1998 public hearing on the proposed energy code either through direct or written testimony. With more than 900 of you lending a helping hand to name everyone would take almost an entire issue of the Michigan Builder. But, each of you know who you are and your involvement provided the final push needed to make the new code a reality.