

September 30, 2005:

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# **Study and Recommendations To Improve The Construction Of New Multi-Family Residential Buildings**

Prepared for

**Minnesota Department of Commerce  
State Energy Office**

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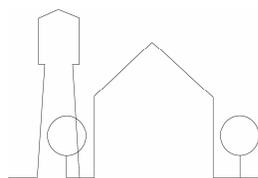
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**Blumentals/Architecture Inc**

## ACKNOWLEDGEMENTS

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A special thank you to the Project Manager, Bruce Nelson, Minnesota Department of Commerce, State Energy Office.

We would further like to acknowledge:

- Chris Gilchrist, State Energy Office.
- Don Sivigny and Nirmal Jain, Building Codes and Standards Division.
- Han Lee, Minnesota Housing Finance Agency.
- Don Hynek, Wisconsin Focus Energy.

In addition, we would like to acknowledge the forty-seven (47) multi-residential industry members who participated in the twelve (12) focus group meetings:

- **Architects:** Mina Adsit, AIA - Adsit Architecture & Planning; Michelle Baltus - Cermak Rhoades Architects; Roger Johnson, AIA - JSSH Architects; John Rova, AIA - Miller Hanson Partners
- **Building Officials:** Gene Abbott - City of Lakeville; Janine Atchison - City of Minneapolis; John Griebler - City of St. Cloud; Clayton Larson - City of Coon Rapids; Larry Martin - City of Brooklyn Center
- **Contractors:** Mike Benedict - Frana & Sons; Dick Benedict - Weis Builders; David Forsberg - Watson-Forsberg; Marv Kotek - Frerichs Construction; Jim Kuechle - KUE Contractors; Mike Monson - Benson-Orth Associates
- **Developers:** Jeffrey Huggett - Dominion Development; Randy Schold - Metro Plains Development
- **Energy Consultants:** William Bloemendal, PE - GME Consultants; Jay Johnson, AIA - The Weidt Group; Russ Landry, PE - Center for Energy & Environment; Keith Pashina, PE - Building Consulting Group; Gary Patrick, AIA - Inspec, Inc.
- **Engineers / Mechanical & Electrical:** Michael Dolejs, PE - Dolejs Associates; James Giefer, PE - Gausman & Moore Associates; William Karges, PE - Karges-Falconbridge; Wally Ouse, PE - Cain Ouse Associates; Linda Johnson - LKPB Consulting Engineers
- **Government Agencies:** Dave Lang - St. Paul Public Housing Agency; Han Lee - Minnesota Housing & Finance Agency; Kathy O'Brien - Central MN Housing Partnership; Greg Peterson - Dakota County Community Development Agency; Gerald Welf - Minneapolis Public Housing Authority
- **Management:** Thomas Etienne - Brutger Equities; Ellen Hart - Hart-Shegos & Associates; Jeff Lanffo - Ebenezer Foundation; Kenneth Perusek - Great Lakes Management; Harold Teasdale - Minnesota Brokerage Group

- **Manufacturers / Distributors:** Bill Enright - Pro Product and Pella Windows; Steve Johnson - Andersen Windows; Steve Pedracine - MN Lathing & Plastering Bureau; Scott Vandenbark - CertainTeed
- **Non-Profits:** Sabina Beg - Project for Pride in Living; Ken Isaacson - Twin Cities Housing Development Corp.
- **Subcontractors / Mechanical & Electrical:** Robert Barriger - Hunt Electric; Rawley Brodeen - Harris Mechanical; Victor Pipars - Northland Mechanical
- **Tenants:** Alice Finley - Lake Shore Drive Condominiums

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March 11, 2005

The Minnesota Department of Commerce, State Energy Office is conducting a project to improve the energy performance and living environment of new multi-family residential buildings. We want to identify what resources could be provided to assist those designing, constructing and operating to help realize these improvements.

We have contracted with Blumentals Architecture to contact industry members to gather information and develop recommendations. This research is very important to improving multifamily home construction for the benefit of all Minnesotans.

Feel free to contact me if you have any questions about this project. Thank you for your consideration.

Bruce Nelson  
SENIOR ENGINEER  
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## EXECUTIVE SUMMARY

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The Minnesota Department of Commerce, State Energy Office commissioned **Blumentals/Architecture Inc** to provide recommendations to the department on actions that could be undertaken by the State to improve the construction of new multi-family residential buildings.

Recommendations are needed for improving the training of those involved with development, design and construction of multi-family residential buildings as well as those involved with energy code enforcement.

To this end, we organized small focus groups for informal discussions about:

- Construction Documents
- Shop Drawings
- Pre-construction Meetings
- Installation
- Inspections
- Field Testing
- Maintenance
- Performance
- Operation
- Training
- Costs
- Incentives
- Other Motivations
- Other Recommendation

We contacted over 100 multi-residential industry members, and 82 agreed to participate. 47 industry members participated in 12 focus groups:

- Architects
- Building Officials
- Contractors
- Developers
- Energy Consultants
- Engineers / Mechanical & Electrical
- Government Agencies
- Management
- Manufacturers / Distributors
- Non-Profits
- Subcontractors / Mechanical & Electrical
- Tenants

Informal discussions were the basis of 19 recommendations, and these recommendations can be classified in 6 groups:

- TRAINING - Training for everybody from architects, building officials, to contractors, construction superintends, etc.
- MORE PROFESSIONAL TIME – Insistence of more complete construction documents and more professional involvement during construction.
- MORE INSPECTIONS – Elevate the energy code to a status as important as life/safety matters in the Code. Energy performance should be framed as an integral part of building performance.
- PERFORMANCE TESTING – Special inspections. Acceptance testing for HVAC and lighting systems. Random testing of units early enough so that problems can be identified and corrected.
- CONSERVATION DOLLAR INVESTMENT – Utilities could encourage conservation in multi-family buildings. Tax rebates are possible. The Energy Star program for multi-family residential housing should be developed.
- OTHER RECOMMENDATIONS – Continuous ventilation. Individual metering. Multiple paths to code compliance, and coordination of all trades.

## PURPOSE

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**Blumentals/Architecture Inc** has a contract with the Minnesota Department of Commerce, State Energy Office to provide recommendations to the department on action that could be undertaken by the State and/or others to improve the construction of new multi-family residential buildings.

Code improvements are important, but for energy code enforcement the quality of construction in the field is even more important. Proper installation of insulation, windows, siding, roofing, mechanical systems and other important details are all important, and any omissions or erroneous construction can create a problem.

Recommendations are needed for improving training and motivation of those involved with development, design and construction and those involved with energy code development and enforcement.

Energy-conscious construction is important. Everybody involved in the multi-family residential industry should be trained and motivated to understand that the Energy Code is part of the Building Code and as important as the life and safety portions of the Code. Energy-conscious construction is a matter of life and safety.

## METHODOLOGY

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Recommendations are needed for improving training and motivation of those involved with development, design and construction and those involved with energy code enforcement.

To this end, we organized focus groups for informal discussions. To get as varied opinions as possible, we selected as varied participants as possible. We contacted over 100 potential participants from which 82 multi-family residential industry members were scheduled to participate in 12 focus groups:

- Architects
- Building Officials
- Contractors
- Developers
- Energy Consultants
- Engineers / Mechanical & Electrical
- Government Agencies
- Management
- Manufacturers / Distributors
- Non-Profits
- Subcontractors / Mechanical & Electrical
- Tenants

To keep discussions informal, focus groups were kept small, each with 4 to 9 participants. Due to scheduling, the actual number of participants was reduced to 47, and the number of participants in each group was reduced down to 2 to 6. And, in one case, there was only one participant, but to this one participant's credit, this particular discussion was a good one.

## SELECTION

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The purpose for this study is to improve the construction of multi-family residential buildings. Thus, the selection of participants for focus groups was limited to industrial members and professionals who are involved with the construction of multi-family residential buildings.

Janis and Su Blumentals had 15 years of experience in multi-family residential architecture before they established **Blumentals/Architecture Inc** 30 years ago. This 45 year practice has created a very extensive group of contacts, including: Clients, agencies, contractors, manufacturers, professionals and others who are involved with the construction of multi-family residential projects.

This network, together with additional random selections from industrial and professional circles, was used as the basis for the selection of participants for these groups. Over 100 multi-residential industry members were contacted and 82 agreed to participate. 47 industry members actually participated in the 12 focus groups.

Each focus group was formed to represent one particular industrial group or one professional discipline, thus all discussions and recommendations for each group were somewhat limited to certain points of views. This assured that all points of view were included in the study, and it also proved that all members of the different focus groups share the same concerns – in fact, several recommendations were unanimous, or almost unanimous, by all focus groups.

## LIST OF PARTICIPANTS

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<u>FOCUS GROUP</u>	<u>ABBREVIATIONS</u>	<u>PRESENT</u>	<u>NOT PRESENT</u>	<u>TOTAL</u>
ARCHITECTS	ARCH	4	5	9
BUILDING OFFICIALS	B.O.	5	3	8
CONTRACTORS	CONTR	6	2	8
DEVELOPERS	DEV	2	4	6
ENERGY CONSULTANTS	ERGY	5	1	6
ENGINEERS / M&E	ENGR	5	2	7
GOVERNMENT AGENCIES	GOV	5	0	5
MANAGEMENT	MGMT	5	3	8
MANUFACTURERS / DISTRIBUTORS	MFR	4	3	7
NON-PROFITS	N-P	2	6	8
SUBCONTRACTORS / M&E	SUB	3	3	6
TENANTS	TEN	1	3	4
		<hr/> 47	35	82

## PROCESS

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Twelve small focus groups were conducted with informal discussions using the same agenda for all of the groups. A copy of that agenda is enclosed.

Each meeting lasted approximately 1½ to 2 hours. The purpose and limitations of this study was reviewed, as well as the status and possible changes to the Minnesota Energy Code application to multi-family residential buildings.

Discussions covered problems and challenges during the entire development / design / approval / construction period. This included “horror stories” from the field. Common practices as to how to avoid the problems were reviewed. Comments from other focus groups were also reviewed. Lists of identified problems were recorded.

After one hour or so, the discussion groups transcriber summarized the discussions and list of identified problems so far, and in further discussions a list of recommendations was recorded.

In most cases, the discussions were very spirited. It was somewhat surprising that all focus groups agreed that there are problems and a lack of training and motivation during the entire multi-family residential building process, starting with development / design and ending with construction.

In most cases, everyone is trying to do a good job, but they do not know how to do any better and there are not enough detailed drawings, pre-construction meetings and supervision and/or inspections in the field to control the quality.

All agreed that there should be a level playing field so that everyone in the industry is following the same ground rules.

Copies of summaries for each focus group are enclosed at the end of this report.



## **Energy Code Study**

### **Agenda for the Meeting –**

- Introductions
- Review of the Purpose of the Code Study
- Review of Possible Changes to the Minnesota Energy Code Applications to Multi-Family Residential Buildings (Copy Attached)
- Informal Discussion and Possible Recommendations
  - Construction Documents
  - Shop Drawings
  - Pre-Construction Meetings
  - Installation
  - Inspections
  - Field Testing
  - Maintenance
  - Performance
  - Operation
  - Training
  - Costs
  - Incentives
  - Other Motivations
  - Other Recommendations
- Conclusions
- Enclosure – Possible Changes to Minnesota energy Code Applications to Multi-Family Residential Buildings

## RECOMMENDATIONS

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### A. CONSTRUCTION DOCUMENTS (CD)

CD Require more complete construction documents:

1 Ask Building Departments to require more complete construction documents, including items such as:

- Energy Data
- Energy Calculations
- 3d/Isometric diagrams to better explain system assembly, such as flashing, air barrier, vapor barrier, etc.
- Provide index plan
- Make plans more detailed and more descriptive
- Improve clarity of plans and details

CD Provide standard detail manual:

2 State should provide or assist/coordinate preparation of standard details for energy efficient construction that Architects and Engineers can use/modify for construction documents and Contractors can use as reference.

CD Specify quality of products:

3 Specify quality of products

- To improve quality of bids
- To improve understanding of what/how to install

## RECOMMENDATIONS

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### B. SHOP DRAWINGS (SHP)

#### SHP Require Shop Drawings

- 1 As part of building permit process, require shop-drawings for major items such as floor/roof trusses, windows, sprinkler systems, etc. Shop-drawings should be complete, showing related installation details and written installation procedures if necessary.

## RECOMMENDATIONS

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### C. PRE-CONSTRUCTION MEETINGS (PC)

#### PC Require Pre-Construction Meeting:

- 1 Require that construction documents specify one or more Pre-construction meetings for different (all) subcontracts such as installation of windows, roofing, insulation, air barrier, vapor barrier, etc.

This is the time to set expectations:

- Time to go over special details and how to properly install specific building systems
- Have everyone agree on a system before installing certain materials
- Have manufacturer's representative on-site to oversee installation of the first unit, or portion, of a building material or system.
- Provide performance standards up front.
- Let it be known that testing or inspections will be done.
- Provide a mock-up or sample installation of certain building material/system wherever possible.

## RECOMMENDATIONS

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### D. INSTALLATION (INST)

INST Certify construction superintendents:

- 1 Certify construction superintendents as proof of certain training and experience. Specify that certain size construction projects require certified construction superintendents. See Recommendations for Training.

INST License general contractors:

- 2 License general contractors as proof of certain knowledge, training and experience. See Recommendations for Training.

## RECOMMENDATIONS

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### E. INSPECTIONS (INSP)

INSP Require/train Building Departments:

1 Require/train Building Officials and Inspectors by stressing:

- Energy Code is as important as Life Safety requirements.
- Provide more consistency of interpretation and enforcement across the state.
- Allow more flexibility in ASTM/VL testing to accommodate modern building methods.
- Review construction documents more closely, including energy code details etc. Do not approve documents if they are not complete.
- Require contractors to contact Architect with any discrepancies to details on plans.
- Require Architects/Engineers to be on site more often (should be there as a State requirement.)
- Charge Contractors for repeat inspections, thus providing incentive to contractor to do the work correctly the first time.

## RECOMMENDATIONS

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### F. FIELD TESTING (FT)

FT Require Special Inspections for Testing Units

1 Require Special Inspections by 3<sup>rd</sup> party random testing (i.e. for compaction, concrete, welding, etc.) to test:

- Infiltration of exterior walls, including wall assembly, floor assembly, window and door installations, etc.
- Sound transmission of party walls and party floor assemblies.

FT Require Special Inspections by 3<sup>rd</sup> party detailed inspections for mechanical systems.

2 Provide report or checklist for City/County. Provide guidelines for what should be inspected.

## RECOMMENDATIONS

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### G. MAINTENANCE, PERFORMANCE & OPERATIONS (ME&O)

ME&O 1 Specify requirement to provide operations manual, labeling controls and posting energy data:

- Specify that Contractor(s) shall provide building operation manual for building owners/residents for all general construction, mechanical and electrical materials, appliances, equipment and fixtures to provide proper maintenance and operation of all materials and systems.
- Specify that all system controls etc. shall be labeled clearly.
- Specify that energy data for walls, windows, roof/attic, mechanical and electrical systems, etc. be posted on wall next to mechanical equipment or some other permanent location.

ME&O 2 Train and certify maintenance staff.  
Require annual inspections:

- Provide training for maintenance staff.
- Certify maintenance staff.
- Require annual inspections of mechanical systems.

## RECOMMENDATIONS

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### H. TRAINING (T)

T Provide Training

1 Provide training:

- The State should provide or assist/coordinate training for:
  - Architects and Engineers
  - Building Officials and Inspectors
  - Contractors
  - Construction Superintendents
  - Subcontractors
  - Foremen and Others
  
- Require Continuing Education Credits for
  - Contractors
  - Construction Superintendents

## RECOMMENDATIONS

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### I. INCENTIVES/REBATES (\$)

\$ Provide Financial Incentives/Rebates

1 Provide Financial Incentives/Rebates:

- Work with utility companies to provide financial incentives for using energy efficient equipment, fixtures and materials and provide proper promotion for these programs.
- Provide tax rebates (capital gain taxes, etc.) for exceeding energy code requirements.

\$ Establish Energy Star Program for Apartments:

2 Establish and promote program to certify apartment buildings that exceed energy code requirement. Program would be similar to the Energy Star Program for single family residences requiring 3<sup>rd</sup> party inspections, etc.

## RECOMMENDATIONS

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### J. OTHER MOTIVATIONS (OTH)

OTH Recommend (Require?)continuous ventilation:

1 Recommend continuous ventilation systems in units:

- Eliminates variability in bathrooms by residential use
- Eliminates need for residents to open windows during cold months
- There is a possibility of providing penalties to residents who modify systems.

OTH Recommend individual metering:

2 Individual meters for all units wherever possible.

Individual electronic metering on each plumbing fixture:

- Allows management to monitor usage within a unit
- Allows management to determine if water is leaking or running at each fixture
- Allows management to bill residents for water they use

OTH Provide multiple paths to code compliance:

3 Codes establish the minimum requirements and provide basic, standard minimum requirements. Stress and educate Architects, Engineers, Owners, etc. that alternate materials, design and methods of construction may be used, provided that any such alternative is at least the equivalent of that prescribed in the Code and has been approved.

OTH Require/Provide coordination of all trades on job site:

4 Have job site meeting(s) of different trades and/or provide checklists on-site to list steps of what to do for all trades to improve understanding of:

- That the building is a complete system.
- That everyone can see what needs to be completed.
- Required coordination between all trades to meet the goals of the project.
- How all of the building materials interface/integrate.

## SUMMARY

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Informal discussions by all focus groups are the basis of 19 recommendations. Tabulations of these recommendations can be classified in six (6) basic groups:

- 1. TRAINING.** Training should be provided, and even required, for everyone in the multi-family residential industry: Architects, engineers, building plan reviewers, building inspectors, contractors, project managers, construction superintendents, maintenance staff, and others involved in development, design and construction.

Licensing or certification should be considered for contractors, subcontractors, construction superintendents, foremen and others.

- 2. MORE PROFESSIONAL TIME.** Building Departments, Government Agencies, Finance Institutions, Licensing Boards and Insurance Providers should insist that architects and engineers produce more complete construction documents and have more professional involvement during the construction process, such as more observation and pre-construction meetings for different trades, etc.

Professionals are generally busy and efficient by nature, so more detailed drawings and more construction observation will require more time. Therefore, professional fees will likely have to be increased. However, as long as everyone will have to follow the same rules it will be a very worthwhile investment.

Consider standard details – i.e. how to install windows, how to install flashing and other critical items. Insist on isometric details, which are more easily understood. Require reasonable detailed energy calculations, schedules, etc.

- 3. MORE INSPECTIONS.** The Energy Code is a part of the Building Code and thus should be elevated to an equally important status as life/safety matters in the Code. More inspections should occur and special inspections should be considered for windows, roofing, sealant, duct work, etc. similar to those done for soils, concrete, welding and other critical work.

If something is not clear, or is not complete on the construction plans, insist that the architect or engineers meets the inspector on the site.

These items may take more time and increase expenses, including inspection fees as there may be a greater need for more third party inspections. Again, as long as everyone expends this extra time and effort during Design and Construction, this also will be a very worthwhile investment in the life of the building.

- 4. PERFORMANCE TESTING.** Require acceptance and other testing, such as balancing, etc. for HVAC, lighting systems and sprinkler systems for life/safety systems.

Require energy testing for infiltration, sound, etc. Testing each unit would be prohibitively costly, but a random procedure, such as a minimum 3% of units, would be reasonable. Tests should be performed just as soon as possible after sealing all openings etc., but before finish painting, so any problems can be identified and corrected.

There are enough testing agencies in the Metro area that the costs should be reasonable. Across the state, however, there may be a need for more testing agencies that can perform energy testing in a timely manner.

- 5. CONSERVATION DOLLAR INVESTMENT.** Utility companies should encourage energy conservation in multi-family residential buildings by subsidizing testing, offering rebates for exceeding energy code requirements and/or an energy saving system.

The State should consider providing tax incentives for exceeding energy code requirements. Insist on testing and /or exceeding energy code requirements when any government financing is involved.

An Energy Star Program for multi-family residential buildings should be developed, and could be used for marketing energy efficient units with minimal utility bills.

**6. OTHER RECOMMENDATIONS.**

- Continuous Ventilation. Prevents residents from not turning systems on. Provides constant air flow through units, which controls the moisture level in each unit and eliminates the need for residents to open windows to control the temperature.
- Individual Metering. Residents will be more concerned with the amount of utilities used. Consider using electronic metering on plumbing lines – monitor water usage and help to determine if water is leaking at certain fixtures, etc.
- Multiple Paths to Code Compliance. Provide trade-offs for choosing specific materials or systems, such as allowing a certain window versus an upgraded mechanical system.
- Coordination of all Trades. Look at the building as a complete system. Provide a checklist on-site to provide steps for all trades. Allows everyone to see what needs to be completed and provides coordination between all the trades to meet the goals of the project and interface/integrate all building materials and systems.



## TABULATION OF RECOMMENDATIONS

RECOMMENDATION		BY FOCUS GROUP											
NO.	KEY TEXT	ARCH	B.O.	CONTR	DEV	ERGY	ENGR	GOV	MGMT	MFR	N-P	SUB	TEN
FT 1	Require Special Inspections for Testing Units <b>TEST</b>	●	●	●		●		●		●			●
FT 2	Require Special Inspections for Mechanical & Electrical Systems <b>TEST</b>				●		●						
ME&O 1	Specify requirement to Provide Operations Manual, Labeling Controls and Posting Energy Data <b>PROF</b>	●			●	●	●	●	●		●	●	●
ME&O 2	Train & Certify Maintenance Staff. Require Annual Inspections <b>TRAIN'G</b>				●			●	●		●	●	●
T 1	Provide Training <b>TRAIN'G</b>		●			●		●		●	●		●
\$ 1	Provide Financial Incentives/ Rebates <b>\$</b>	●	●	●	●	●	●	●	●	●	●	●	●
\$ 2	Establish Energy Star Program for Apartments <b>\$</b>	●	●			●	●		●	●	●	●	●

## TABULATION OF RECOMMENDATIONS

RECOMMENDATION		BY FOCUS GROUP											
NO.	KEY TEXT	ARCH	B.O.	CONTR	DEV	ERGY	ENGR	GOV	MGMT	MFR	N-P	SUB	TEN
OTH 1	Recommend Continuous Ventilation <b>REC'D</b>				●				●		●		
OTH 2	Recommend Individual Metering <b>REC'D</b>				●				●		●		
OTH 3	Provide Multiple Paths to Code Compliance <b>REC'D</b>							●		●			
OTH 4	Require / Provide Coordination of all Trades On Job Site <b>REC'D / TRAIN'G</b>									●			

### CLASSIFICATION OF RECOMMENDATIONS / 6 BASIC GROUPS

1. TRAINING (TRAIN'G) / INST1 / INST2 / INSP1 / ME&O2 / T1
2. MORE PROFESSIONAL TIME (PROF) / CD1 / CD2 / CD3 / SHP1 / PC1 / ME&O1
3. MORE INSPECTIONS (INSP) / CD1 / CD2 / CD3 / SHP1 / PC1
4. PERFORMANCE TESTING (TEST) / FT1 / FT2
5. CONSERVATION DOLLAR INVESTMENT (\$) / \$1 / \$2
6. OTHER RECOMMENDATIONS (REC'D) / OTH1 / OTH2 / OTH3 / OTH4

## **ARCHITECTS (ARCH) FOCUS GROUP SUMMARY**

Meeting 4/22/05

MODERATOR	Janis Blumentals
ASSOC. MODERATOR	James Moy
TRANSCRIBER	Jeffrey Hanson

### PRESENT:

1.	Mina Adsit	Adsit Architecture & Planning
2.	Michelle Baltus	Cermak Rhoades Architects
3.	Roger Johnson	JSSH Architects
4.	John Rova	Miller Hanson Partners

### NOT PRESENT:

1.	Rick Carter	LHB Engineers & Architects
2.	John Knowland	Architectural Forensic Specialties
3.	Rosemary McMonigal	McMonigal Architects
4.	Scott Nelson	DJR Architecture
5.	Peter Pfister	Pfister Associates

### Identified problems

- Construction documents are not typically followed in the field.
  - Either spec or drawing is missing/not looked at.
  - End installers never see the drawings. Just installer the standard way.
- Inspectors look for different things in the building process.
  - Moving target for contractors.
  - Contractors need to maintain a good relationship.
- Architect not on site for installation of critical components.
  - Architect may miss a critical component being installed because there are not there daily.
  - Once problem is noticed it is too late, cost a lot of money to correct.
- Daily jobsite supervision is a must by the job supervisor.
  - Key player in success of a job.
  - Must know and use both specs and drawings.
  - Be able to communicate to end installer workforce.
- First cost of building drives too many decisions.
  - No money for energy efficient systems.
  - No money for additional testing/jobsite visits.

- Systems in place must respond to the users of the building.
  - Not all users are the same
  - Systems required for different user groups in order to make building work.
  - Installed components must be seen as an entire system
  - Users/Maintenance staff not aware of how the system works.

## Recommendations

- Make sure all information on quality system is supplied on construction documents.
  - Spec/Drawings does not matter as long as info is there
  - 3d/Isometric diagrams better to explain system assembly
  - Check with manufacturers to see if they have or can create installation diagrams.
- Entire system should be tested to determine if it is functioning as designed.
  - Random testing thought construction process.
  - 3<sup>rd</sup> party testing agency.
  - Who has to pay?
  - Written into the construction documents like special inspections.
  - Testing standards hold installers to a required minimum installation.
- Hold pre-construction meeting with all subs involved.
  - Expectations set
  - Mileposts along the way are set for architect to be notified when critical systems are installed and can be inspected for compliance with drawings.
  - Consistent installers
- Daily jobsite supervisors most important part of quality construction.
  - Certify job site supervisors.
  - Provide training program focused at job site supervisors.
- Provide financial incentives for owner to pay for and want to include energy conscious decisions.
  - Tax incentives
  - Energy star rating program
  - Understand the market.
- Provide building operation manual for building owners and residents so systems can stay in a working order.

## **BUILDING OFFICIALS (B.O.) FOCUS GROUP SUMMARY**

Meeting 5/31/05

MODERATOR	Janis Blumentals
ASSOC. MODERATOR	James Moy
TRANSCRIBER	Erick Wockenfuss

### PRESENT:

1.	Gene Abbott	City of Lakeville
2.	Janine Atchison	City of Minneapolis
3.	John Griebler	City of St. Cloud
4.	Clayton Larson	City of Coon Rapids
5.	Larry Martin	City of Brooklyn Center

### NOT PRESENT:

1.	Rick Davidson	City of Hopkins
2.	John Edberg	City of Chaska
3.	Fred Patch	City of Monticello

### Identified problems

- Quality of work by contractor varies from project to project.
  - Quality of products has improved but competency level is low for those who are installing the products.
  - Inexperienced laborers are those who are installing important systems on buildings (insulation, vapor barrier, etc.)
  - Knowledge and lack of training techniques is not provided for those who are installing energy efficient building materials.
  
- Architect not visiting site frequently and not on site for installation of critical components.
  - Architect may miss a critical component being installed because there are not there daily.
  - When a problem is found it is too late. It will cost a lot of money for corrections to be made.
  - Cost for project may increase if the architect is required to be on site more often.
  
- Details are missing from final documents when drawings are sent out for construction.
  - Job Supervisors have to design/invent in the field due to details that are not complete.
  - Details change from project to project. There is no consistency.

- Details are not complete / not very descriptive.
- Contractor not looking at drawings and installer as detailed/specified.
  - Either spec or drawing is missing/not looked at.
  - Installer of product does not get drawings from contractor and therefore misses important details to how it should be constructed.
- Building Department approving drawings that are not complete.
  - Drawings are commonly done for contractors to get them past the building departments.

## Recommendations

- Make contractor/job supervisors more responsible
  - Provide certification for job supervisors
  - Require job supervisors to contact architect w/ any discrepancies to details on plans.
  - Require contractors to attend Continuing Education Classes/Training.
  - Provide incentives for contractors – Incentives will make contractors do the job correct the 1<sup>st</sup> time.
  - Provide education/training for everyone on the crew. All crews should be knowledgeable.
- Require Architects / Engineers to be on site more often.
  - Tie architect to final product. Architect needs to inspect/visit jobsite more frequently during project construction.
- Provide standard details and construction techniques for energy efficiency materials.
  - Some details should not change from building to building.
  - Providing standard details will allow everyone to know where they need to be w/ the building envelope.
  - Provide standardized energy efficiency sheet w/ detail by Architect.
  - Provide book with standard details.
  - Get plans more detailed and more descriptive.
- Hold pre-construction meeting with all subs involved.
  - Expectations set
  - Time to go over special details and how to properly install specific building systems.
- Require building department to review drawings more closely.

- Do not approve drawings if they are not complete. Send the drawings back to the Architect.
- Provide financial incentives for owner to pay for and want to include energy conscious decisions.
  - Tax incentives
  - Energy star rating program
  - Understand the market.
  - Require testing on energy efficient buildings to show that these buildings pass.
- Require Special Inspections
  - If properly qualified it will work.
  - Call it Energy Code inspections. Look at multiple systems during inspection.

## **CONTRACTORS (CONTR) FOCUS GROUP SUMMARY**

Meeting 4/21/05

MODERATOR	Janis Blumentals
ASSOC. MODERATOR	James Moy
TRANSCRIBER	Jeffrey Hanson

### PRESENT:

1.	Mike Benedict	Frana & Sons
2.	Dick Benedict	Weis Builders
3.	David Forsberg	Watson-Forsberg
4.	Marv Kotek	Frerichs Construction
5.	Jim Kuechle	KUE Contractors
6.	Mike Monson	Benson-Orth Associates

### NOT PRESENT:

1.	Gerry Flannery	Flannery Construction
2.	Preston Euerle	RA Morton & Associates

### Identified problems

- Installing workforce not motivated to do quality work.
  - Job site supervisors know how it is supposed to be done but can't communicate that info to the installer.
  - Low experience and fast turnover at the installer level.
  - Same mistakes are consistently made on a job site.
- Quality building process, supervision, material, etc...costs the owner money. Only willing to pay for code required minimum.
  - All costs of additional requirements will be passed along to the owners.
  - No incentive to do better than minimum compliance with energy code.
  - Who will pay for additional testing?
- Building inspectors/city officials do not interpret/apply the codes consistently.
  - Too many different entities and interpretations, makes working harder than it has to be.
  - Inspection and testing is the key to code compliance.
  - Building inspectors are not accountable for an approved drawing. They just stamp the drawing and collect the fees.
- Building maintenance and owners do not know how to operate equipment once the contractors have left.

- Building maintenance people are un-educated on what needs to be kept up on building.
- Residents will defeat systems in place.

- Assemblies and test numbers do not match current building practices.
  - Tests are specified but can't be built because of common building practices.
  - Very expensive to build exactly as specified.
- Design build Mech./Elec. for an open bid project is not really effective way to be efficient. Too many items missed.
  - Never coordinated correctly.
  - Costly and in-efficient

## Recommendations

- Require testing for compliance throughout building process.
  - Random testing of units to insure compliance
  - Test once all systems are in place but before finishes
  - 3<sup>rd</sup> party to run tests.
  - Energy tests as special inspections.
  - Mandate tests by code or they will not be done.
- Educate/Certify/Supervise end installers.
  - End installer ultimately responsible for quality of work.
  - Certify End installer sub contractor NOT labor (turn over too high)
  - Job site supervisors need to communicate with labor.
  - Provide more training to sub contractors.
- Clean up permitting/inspection process; apply more consistency of code interpretation and enforcement across the state.
  - State run training for interpretation of code issues
  - More accountability for Building inspectors.
  - Expand permitting process to a larger body, city to city to inconsistent.
  - Allow more flexibility in ASTM/UL testing to accommodate modern building methods.
- Create financial incentives so any addition testing, training, etc... Does not affect bottom line cost to the owner.
  - Provide tax/energy incentives to offset the cost of additional testing and going above and beyond the code requirements.
- Evaluate the current energy code to determine if it is really effective.

## **DEVELOPERS (DEV) FOCUS GROUP SUMMARY**

Meeting 6/6/05

MODERATOR	Janis Blumentals
ASSOC. MODERATOR	James Moy
TRANSCRIBER	Erick Wockenfuss

### PRESENT:

- |    |                 |                          |
|----|-----------------|--------------------------|
| 1. | Jeffrey Huggett | Dominium Development     |
| 2. | Randy Schold    | Metro Plains Development |

### NOT PRESENT:

- |    |                |   |
|----|----------------|---|
| 1. | John Bergstad  | Bergstad Properties                     |
| 2. | Wally Johnson  | Stone Bridge Development & Acquisitions |
| 3. | Steve Kotchman | Hansen Builders                         |
| 4. | Mike Podawiltz | Podawiltz Development                   |

### Identified problems

- Architect not visiting site frequently and not on site for installation of critical components.
  - Architect may miss installation of critical details if they are not on the jobsite more frequently
  - Cost for project may increase if the architect is required to be on site more often.
  - We are relying on contractors to install materials / products correctly.
- Plans are too complicated so contractors don't understand them
  - Contractors are not spending time to look at the drawings. They are missing critical information from the details.
  - Customers want more windows than wall space which are creating complicated designs.
  - Details are lacking on final document drawings.
  - Details are not complete / not very descriptive.
- Keeping a job supervisor on site at all times.
  - Can't afford to keep a job supervisor on smaller jobs and not having him working in the field.
  - Job supervisors travel between multiple smaller projects.

- Systems installed into buildings need to be better operated & maintained.
  - Systems installed are complicated and may not be understood by staff
  - Tenants not responsible for bills so they don't take care in operation of system.
  - Currently maintenance staff is used to do turned costs of units and do not have time to do preventive maintenance on units
  
- Building inspectors are not concerned with energy codes for buildings.
  - Inspectors are more concern with life safety issues and commonly overlook energy efficient requirements within buildings.
  - Inspectors are only looking at items that they want to look at.
  - It's difficult to schedule city inspectors to visit site to inspect multiple systems.
  
- Tenants in buildings are not concerned with energy efficiency.
  - If tenants don't pay for utilities they often abuse usage
  - Tenants don't use systems to full potential.
  - Tenants modify systems if they are too loud.

## Recommendations

- Require Architects / Engineers to be on site more often.
  
- Require more complete documentation of details / shop drawings.
  - Provide 3-D drawings or isometric drawings instead of some 2-D drawings to show installation steps
  - Layout plan/design so people understand complete project.
  - Provide book with standard details.
  - Get plans more detailed and more descriptive.
  - Improve clarity of plans and details
  
- Hold pre-construction meeting with all subs involved.
  - Expectations set
  - Time to go over special details and how to properly install specific building systems.
  - Have everyone agree on a system before installing certain materials.
  - Have manufacturer's rep on jobsite to oversee installation of building systems.
  - Provide performance standards up front. Developer, Architect, and contractor will know what to meet and know what will be looked at
  - Let it be known that testing will be done on units.

- Provide end users (building maintenance & tenants) with operational manuals for mechanical systems.
  - Clearly label mechanical systems controls.
  - Keep systems as simple as possible.
  - Provide maintenance certification classes for staff.
  - Require minimum training requirements for all staff.
  - Provide annual inspections on mechanical systems.
  
- Testing certain percentage of units for energy efficiency
  - Test unit as a system (not only the windows)
  - When there is a problem or when a unit fails get the contractors attention.
  - If standards are in place contractors will know what to do to get the units to pass
  
- Have 3<sup>rd</sup> party inspectors instead of city doing inspections
  - City inspectors have trouble verifying everything on site due to schedules.
  - 3<sup>rd</sup> party inspectors will look at only things that they are req'd to look at.
  - Have city set up guidelines for inspections. Provide checklists for city to verify systems have been checked.
  - Determine what the inspection is for and what needs to be looked at.
  
- Provide financial incentives for owner to pay for and want to include energy conscious decisions.
  - Tax incentives
  - Energy star rating program
  - Understand the market.
  - Require testing on energy efficient buildings to show that these buildings pass.

- Upgrade current systems used in buildings can reduce cost of managing properties.
  - Install continuous ventilation systems in units.
    - Eliminates variability in bathrooms by tenant use.
    - Eliminates need for residents to open windows during cold months due to warm units.
    - Provide penalties to tenants who modify systems.
  - Install individual electronic metering on plumbing systems.
    - Allows management staff to monitor water usage within a unit
    - Determine if water is leaking or toilets are running in units.
    - Allows the management staff to have residents pay for the water they use. Residents will be more concern with the amount of water they use.

# ENERGY CONSULTANTS (ERGY) FOCUS GROUP SUMMARY

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Meeting 4/28/05

MODERATOR	Janis Blumentals
ASSOC. MODERATOR	James Moy
TRANSCRIBER	Jeffrey Hanson

## PRESENT:

- |    |                    |                                 |
|----|--------------------|---------------------------------|
| 1. | William Bloemendal | GME Consultants                 |
| 2. | Jay Johnson        | The Weidt Group                 |
| 3. | Russ Landry        | Center for Energy & Environment |
| 4. | Keith Pashina      | Building Consulting Group       |
| 5. | Gary Patrick       | Inspec, Inc.                    |

## NOT PRESENT:

- |    |              |                            |
|----|--------------|----------------------------|
| 1. | Jay Jacobson | Commercial Energy Services |
|----|--------------|----------------------------|

## Identified problems

- Critical details are often not specified or drawn with enough detail to be useful.
  - Unclear details leave it up to the contractor in the field to figure out.
  - Details do not show enough on them for good comparison and field checking.
  - Only take a small deviation from a detail to become a critical failure.
  - HVAC controls are something typically left off drawings.
  - Details not required for building permit and inspector do not know how to look/verify these details in the field.
  - In design build HVAC situations there are often not details until the very end or are constantly changing along the process.
- Building inspectors are not focused on details related to energy code.
  - Inspectors only looking for life safety.
  - Plan review and field inspection do not communicate in many cases
  - Drawings not specific enough on details to provide checking against for compliance.
  - Inspectors need to understand how all components work together as a system.
- Workforce training level very low. Installation of systems suffers.

- Often times very hard to communicate intent and specifics of installation to the installer.
  - Need to be made aware they will be accountable for quality of work.
- No testing to verify compliance with energy code.
  - Testing during construction can identify problems so they can be corrected before completion.
- Level of standards needs to be raised in energy code.
  - Buildings typically designed to minimum code level.
  - First cost of building is the most critical for energy related choices.
  - Code should require more specific/descriptive details and specs related to energy code.
  - Opportunities exist for great improvements in energy code. i.e. Garage ventilation system requirements.
- Systems installed into buildings need to be better operated & maintained.
  - Systems not fully understood by operation staff.
  - Too complicated.
  - Tenants not responsible for bills so they don't take care in operation of system.

## Recommendations

- Better details need to be provided/required.
  - Building permit process provided with details clear enough for an inspector to be able to verify in the field.
  - Required details for building permit.
  - Details for energy code compliance (like ADA details.)
- Building inspectors need to be better trained to look for energy code items.
  - Understand the different components of possible complete system failure.
  - Inspectors need drawings detailed enough that they can check against.
- Pre-Construction meetings and pre installation meetings can clarify the expectations of all parties involved.
  - Communicate expectations.
  - Make installer aware they will be tested for quality during the construction process.
  - Establish a time lime for site visits and further pre-installation meetings for vital systems.
- Daily job site supervisors need to be trained insure day to day quality of the construction process.
- Random testing of units for energy code compliance during the testing process.
  - Small percentage of units tested.

- Required as special inspections in construction documents.
- Testing just becomes part of the cost of construction.
- Protection for all parties, contractor, architect, owner, and tenant.
- Creates quantifiable accountability for construction process.
- Incentives for energy conservation should be provided to owners.
  - Tax breaks
  - “Energy Star” rating for buildings.
  - Encourage owners to go above the minimum code requirements.
  - Use proven energy savings systems.
- Provide end users (building maintenance & tenants) with operational manuals for mechanical systems.
  - Clearly label mechanical systems controls.
  - Keep systems as simple as possible.

## **ENGINEERS/M&E (ENGR) FOCUS GROUP SUMMARY**

Meeting 4/20/05

MODERATOR	Janis Blumentals
ASSOC. MODERATOR	James Moy
TRANSCRIBER	Jeffrey Hanson

### PRESENT:

1.	Michael Dolejs	Dolejs Associates
2.	James Giefer	Gausman & Moore Associates
3.	William Karges	Karges-Faulconbridge
4.	Wally Ouse	Cain Ouse Associates
5.	Linda Johnson	LKPB Consulting Engineers

### NOT PRESENT:

1.	Mike Richards	Erickson Ellison & Associates
2.	Eugene Striefel	Steen Engineering

### Identified problems

- Quality control in the field.
  - No time in project budget for field inspections
  - Schedule too tight on project completion. System enclosed before Engineer visits.
  - Need to be able to inspect BEFORE system is enclosed.
  - Construction typically good on Mech/Elec systems but many other parts of the building affect the performance of the system.
- Projects driven and designed with first cost in mind.
  - Projects built to minimum standards.
  - No incentive to do any more than required.
  - Target market for the housing can affect the desire for higher quality systems.
  - No money or perceived need for additional inspections to insure code compliance.
- Systems fail to operate as designed.
  - System has to overcome other failures in other building systems.

- Components of the system are installed incorrectly or are not functioning
- Inspectors do not know what to look for.
- Proper ventilation of buildings becoming harder and harder.

- On going maintenance not done causing system to fail.
  - Residents/Building maintainance does not do the proper upkeep of systems causing them to not function.
  - Systems can't cope with alternate living styles.
  - Components have expected life cycle, items need to be replaced on a schedule.
- No reason for developers or residents to want to save energy.
  - Minimum quality components used.
  - No time/money for additional inspections
  - Cost of energy passed along to the resident who does not see a one to one relationship between efficiency and money saved.
  - Quality of all building components affects the efficiency of mechanical systems.

## Recommendations

- Field inspections during construction.
  - COM shining of system with checkpoints along the way during construction.
  - Multiple site visits required by design engineer during construction process.
- Entire system should be tested to determine if it is functioning as designed.
  - 3<sup>rd</sup> party or design engineer to test system after all components are installed to verify all components are working "as designed".
- Provide owners/residents with owners manual to operate and maintain systems properly.
  - Maintenance checklist
  - Expected life of components within system
- Offer financial incentives to owners/residents to encourage energy conservation/compliance.
  - Tax incentives to building owners to include better systems provide more testing
  - "Energy Star" rating for owners to use as marketing tool in owner occupied units.
  - Provide individual metering to units that can impact the owner's bottom line. (Able to fix item right away, Can bill residents themselves)

# GOVERNMENT AGENCIES (GOV) FOCUS GROUP SUMMARY

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Meeting 4/27/05

MODERATOR	Janis Blumentals
ASSOC. MODERATOR	James Moy
TRANSCRIBER	Jeffrey Hanson

## PRESENT:

1.	Dave Lang	St. Paul Public Housing Agency
2.	Han Lee	MHFA
3.	Kathy O'Brien	Central MN Housing Partnership
4.	Greg Peterson	Dakota County CDA
5.	Gerald Welf	Minneapolis PHA

## Identified problems

- Construction documents do not thoroughly cover all of the areas needed for energy efficient buildings.
  - Critical details left out.
  - Old/Out of date systems. Make sure current products and standards are used.
  - Documents need to comply with manufacturer's installation recommendations.
  - Documents not followed in the field.
- Day to day job site supervision quality is critical.
  - Job site supervisor need to enforce/understand the construction documents and make sure they are followed.
  - Installation contractors' turnover rate high training/experience of crew is very low.
  - Job site supervisors can have trouble communicating to the installation crew.
- Architect not on site often enough to insure compliance with construction documents.
  - Architects need to be there for quality control.
  - The beginning of the project is more important in order to set expectations.

- No way to quantify if components have been installed correctly after items are installed.
  - Special inspection testing can be costly.
  - Testing does give a way to verify compliance and function of the system.
  - Testing standards need to be verified and established.
- Building departments are not focused on energy code compliance.
  - Plan review to quick and changes in the field once item are being installed.
  - Plan reviews do not look for the details pertaining to energy code.
  - Building code/energy code needs to be more concrete when it comes to energy issues.
  - Need better enforcement on energy issues.
  - Plan review and building inspection need to communicate better with one another so there are not surprises during the construction process.
- Systems operation never a concern after building is occupied.
  - Systems are not maintained or operated correctly.
  - Individual metering can give some control to the tenants but not good for all types of development.
  - Systems only inspected for life safety issues after occupancy.

## Recommendations

- Critical details related to energy code should be required for building permit.
  - Details need to be up to date with current standards.
- Architect should be required to be on site more often in order to insure proper installation of systems.
  - Pre-Construction/Installation meetings as well as regularly scheduled visits to jobsite.
- Random testing of units during the construction to insure code compliance.
  - Standardize tests so they are a know quantity.
  - Minimum percentage of units tested.
- Daily jobsite supervisors' most important part of quality construction.
  - Provide training to jobsite supervisors so they better understand their role in compliance with the energy code.
  - Better communication to end installers.
- Building inspections departments better trained to look for issues related to the energy code.
  - Details required for building permit.
  - Uniform enforcement from plan review to building inspection.

- Better operational standards for building systems.
  - Provide operational manuals for tenants and building maintenance crews.
  - Periodic inspection for more than just life safety issues.
- Provide incentives for building owners to do more than code minimum.
  - Energy company energy auditors to reduce operational costs.
  - Energy Star rating for certain type of housing.
  - Tax incentives to give owners a break on first cost of construction and make them interested in energy conservation.
- Allow for multiple paths to code compliance.
  - What makes sense for one developer/owner may not make sense for another.

## **MANAGEMENT (MGMT) FOCUS GROUP SUMMARY**

Meeting 5/23/05

MODERATOR	Janis Blumentals
ASSOC. MODERATOR	James Moy
TRANSCRIBER	Erick Wockenfuss

### PRESENT:

1.	Thomas Etienne	Brutger Equities
2.	Ellen Hart	Hart-Shegos & Associates
3.	Jeff Lanffo	Ebenezer Foundation
4.	Kenneth Perusek	Great Lakes Management
5.	Harold Teasdale	Minnesota Brokerage Group

### NOT PRESENT:

1.	Ralph Nutzman	Thies & Talle Management, Inc.
2.	Janet Putnam	Thies & Talle Management, Inc.
3.	Jim Soderberg	Soderberg Apartment Specialists

### Identified problems

- Installation of windows
  - Windows specified as energy efficient are not installed properly.
  - Windows installed not frequently inspected.
  - A limited number of windows that are installed are inspected.
    - Commonly one window will be installed and will be inspected. When window has been approved as installed properly the remaining windows will be installed.  
(How do we know if all windows will be installed properly?)
  - Drawing details or instructions for properly installing windows are missing.
    - Not shown on drawings or in specifications.
  - Cost of project is increased if more inspections are required for verifying installation of products.
  
- Energy codes standards need to be raised to require developers to used energy efficient systems.
  - Developers are more concerned with the speed of construction for buildings than providing energy efficient buildings.
  - What would they lose if developers chose to provide energy efficient buildings?

- Ex. Size of unit, density of site, quality of materials, etc.
- Systems in place currently within properties are causing management staffs the inability to produce cash flowing properties with current energy costs.
  - Properties are provided residents with rebates to live in their apartments
  - Residents don't care about water usage and energy consumption because properties pay certain utilities.
  - Residents are opening windows during winter because units are warm.
  - Ventilation systems are not used properly.
- Systems installed into buildings need to be better operated & maintained.
  - Systems installed are complicated and may not be understood by staff
  - Tenants not responsible for bills so they don't take care in operation of system.
  - Currently maintenance staff is used to do turned costs of units and do not have time to do preventive maintenance on units

## Recommendations

- Pre-Construction meetings and pre installation meetings can clarify the expectations of all parties involved.
  - Communicate expectations.
  - Make installer aware that a certain percentage of windows and random sample of windows will be checked by architects or inspectors
  - Inspect window before walls are enclosed to verify proper installation.
  - Management would rather pay inspector fees up front to guarantee proper installation of energy efficient products instead of paying in energy costs over a period of time.
- Provide better details and instructions for window installation
  - Provide shop drawings and written installation procedures for window installation.
- Building inspectors need to be better trained to look for energy code items.
  - Understand the different components of possible complete system failure.
  - Inspectors need drawings detailed enough that they can check against.
- Upgrade current systems used in buildings can reduce cost of managing properties.
  - Install continuous ventilation systems in units.

- Eliminates residents from not turning systems on. Constant air flow through units
- Eliminates need for residents to open windows during cold months due to warm units.
- Install individual electronic metering on plumbing systems.
  - Allows management staff to monitor water usage within a unit
  - Determine if water is leaking or toilets are running in units.
  - Allows the management staff to have residents pay for the water they use. Residents will be more concern with the amount of water they use.
- Incentives for energy conservation should be provided to owners.
  - Tax breaks
  - “Energy Star” rating for buildings.
  - Encourage owners to go above the minimum code requirements.
  - Use proven energy savings systems.
- Incentives by management for energy conservation should be provided to residents.
  - “Energy Star” rating for units allow residents to market them as energy efficient.
  - In apartment units where electricity is paid by residents, guarantee them that costs will not be more than \$25.
- Provide end users (building maintenance & tenants) with operational manuals for mechanical systems.
  - Clearly label mechanical systems controls.
  - Keep systems as simple as possible.
  - Provide maintenance certification classes for staff.
  - Require minimum training requirements for all staff.

## **MANUFACTURERS/DISTRIBUTORS (MFR) FOCUS GROUP SUMMARY**

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Meeting 5/31/05

MODERATOR	Janis Blumentals
ASSOC. MODERATOR	James Moy
TRANSCRIBER	Erick Wockenfuss

### PRESENT:

- |    |                 |                                |
|----|-----------------|--------------------------------|
| 1. | Bill Enright    | Pro Product and Pella Windows  |
| 2. | Steve Johnson   | Andersen Windows               |
| 3. | Steve Pedracine | MN Lathing & Plastering Bureau |
| 4. | Scott Vandebark | CertainTeed                    |

### NOT PRESENT:

- |    |              |                       |
|----|--------------|-----------------------|
| 1. | Greg Johnson | Brock White           |
| 2. | Nick Knick   | Lindsay Window & Door |
| 3. | Greg Ochs    | Snow-Larson           |

### Identified problems

- Critical Details / shop drawings are missing from final documentation
  - Details are not complete / not very descriptive.
  - Concern with shop drawings is cost of doing them.
  - Documents are not complete. Missing descriptive details to explain how to install certain building systems.
  
- Quality craftsmanship is missing on jobsites.
  - Contractors are not looking at details provided by architect
  - Instructions of materials are not being read by the people who are installing them materials
  - Contractors are not communicating with architects if they find discrepancies in the details that they are providing.
  - Building systems are not being installed as detailed on drawings by the architect.
  
- Building inspectors are not concerned with energy codes for buildings.

- Inspectors are more concern with life safety issues and commonly overlook energy efficient requirements within buildings.
- Architects in college courses are not getting the training that they need.
- Architect not visiting site frequently and not on site for installation of critical components.
  - Architect may miss installation of critical details if they are not on the jobsite more frequently
  - Cost for project may increase if the architect is required to be on site more often.
- Certain materials for buildings are not chosen to provide a longer life expectancy of buildings
  - Developers are often more concerned with the up front costs and not the long term costs when materials are selected.

## Recommendations

- Require more complete documentation of details / shop drawings.
  - Provide 3-D drawings over some 2-D drawings to show installation steps
  - Blow up details to provide step by step process for installation.
  - Architect needs to be responsible to send shop drawings back if they are not complete.
  - Providing standard details will allow everyone to know where they need to be w/ the building envelope.
  - Provide standardized energy efficiency sheet w/ detail by Architect.
  - Provide book with standard details.
  - Get plans more detailed and more descriptive.
- Hold pre-construction meeting with all subs involved.
  - Expectations set
  - Time to go over special details and how to properly install specific building systems.
- Doing a mock up of certain building systems. (ex. Window installation)
  - Architect can verify installation is complete. Contractor will know what expectations there are for installations.
  - Allows everyone to work through any problems that come up during the installation process.

- Provide checklists on sites to provide steps for all trades
  - Look at the building as a complete system
  - Allows everyone to see what needs to be completed.
  - Allow coordination between all trades to meet goals of the project.
  - Interface/integration of all building materials.
  
- Provide training for building inspectors.
  - Train inspectors to look at energy efficiency concerns within a building and not only life safety issues.
  - Make building inspectors more responsible for their inspections.
  
- Recommend special inspections / testing of units (buildings) for energy efficiency.
  - Have a certain number of units within project to be tested to see if it passes.
  
- Architect needs to spec quality of products they want to have installed in buildings.
  - Manufacturers will have better understanding how to bid projects.
  - Shop drawings can be more details.
  - Installers will have better knowledge of what / how to install products.
  
- Make contractor/job supervisors more responsible
  - Provide certification for job supervisors
  - Provide incentives for those who have more training
  - Job supervisors should be licensed
  - Provide education/training for everyone on the crew. All crews should be knowledgeable.
  
- Require Architects / Engineers to be on site more often.
  
- Provide trade-offs for choosing specific building materials in energy efficient buildings. (ex. Allow a certain window package with an upgraded mechanical system.)
  - A minimum standard needs to be met for building materials
  
- Provide financial incentives for owner to pay for and want to include energy conscious decisions.
  - Tax incentives
  - Energy star rating program
  - Understand the market.
  - Require testing on energy efficient buildings to show that these buildings pass.

## **NON-PROFITS (N-P) FOCUS GROUP SUMMARY**

Meeting 6/9/05

MODERATOR	Janis Blumentals
ASSOC. MODERATOR	James Moy
TRANSCRIBER	Erick Wockenfuss

### PRESENT:

- |    |              |                                       |
|----|--------------|---------------------------------------|
| 1. | Sabina Beg   | Project for Pride in Living           |
| 2. | Ken Isaacson | Twin Cities Housing Development Corp. |

### NOT PRESENT:

- |    |                 |                                 |
|----|-----------------|---------------------------------|
| 1. | Eric Carpenter  | East Side Neighborhood Dev. Co. |
| 2. | Kym Dimmerman   | Perspectives Family Center      |
| 3. | Deanna Foster   | Hope Community, Inc.            |
| 4. | Doug Mayo       | Common Bond Communities         |
| 5. | Kirk Moorhead   | Central Community Housing Trust |
| 6. | Bill Vanderwall | Lutheran Social Services        |

### Identified problems

- Quality of work by contractor and quality of construction is driven by budget of project.
  - Inexperienced laborers are those who are installing important systems on buildings (insulation, vapor barrier, etc.)
  - Training and knowledge is lacking for those who are installing certain building systems.
- Details are missing from final documents when drawings are sent out for construction.
  - Details are owner driven. Some owners don't require some details because they don't feel they need to be done because they have work on similar projects in the past
  - Details change from project to project. There is no consistency.
  - Details vary from architect to architect. There is no standard.

- Contractor not looking at drawings and installer as detailed/specified.
  - Either spec or drawing is missing/not looked at.
  - They construct buildings the way they have done it in the past. They miss critical information or specific details that architects supply on drawings.
  - Installer of product does not get drawings from contractor and therefore misses important details to how it should be constructed.
- Having more inspections could cause delays in construction/increase cost of construction.
  - There are not enough building inspectors to do all inspections
  - Difficult to schedule inspectors to visit site to inspect multiple systems.
- Architect not visiting site frequently and not on site for installation of critical components.
  - Architects miss critical details being installed because they are not there daily.
  - Having architect on job site more often may cause an increase in project budget.
  - When a problem is found it is too late. It will cost a lot of money for corrections to be made.

## Recommendations

- Make general contractor/job supervisor more responsible.
  - Review details and construct only per architect's drawings
  - Contractors should discuss details w/ owner & architect for alternate solution before constructing a detail their own way
  - Contractor should contact architect if any discrepancies are found in detail shown.
  - Get architects/engineers on jobsite more frequently.
  - Provide training for job supervisors
  - Make more training opportunities available for contractors
- Provide financial incentives for owner to pay for and want to include energy conscious decisions.
  - Tax incentives
  - Rebates for use of energy efficient materials.
  - Energy star rating program
  - Require testing on energy efficient buildings to show that these buildings pass.
- Hold pre-construction meeting

- Expectations set
  - Allows all parties to go over details and stress importance of installing products properly.
  - Have manufacturer's rep on jobsite to oversee installation of building systems.
  - Provide performance standards up front. Developer, Architect, and contractor will know what to meet and know what will be looked at
  - Let it be known that testing will be done on units.
- Upgrade current systems used in buildings can reduce cost of managing properties.
    - Install continuous ventilation systems in units.
      - Eliminates control from the tenant.
      - Provide penalties to tenants who modify systems.
    - Install individual electronic metering on plumbing systems.
      - Allows management staff to monitor water usage within a unit
      - Determine if water is leaking or toilets are running in units.
      - Allows the management staff to have residents pay for the water they use. Residents will be more concern with the amount of water they use.
- Provide values for wall construction for future use
    - Leave ratings for insulation values on walls to allow people to see what the walls are built to.
    - When renovations are done it eliminates the need to cut openings in the walls to verify components. Everyone will know what the construction is of the wall.
- Recommend having annual inspections on mechanical systems.
    - Provide better labeling of units/systems.
    - Mechanical plans/specs should state the importance of placing tags on systems for verification.
    - Provide manuals for maintenance staff/tenants
    - Supply written explanation to all tenants why building systems are in place and what there intended use is.

## **SUBCONTRACTORS/M&E (SUB) FOCUS GROUP SUMMARY**

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Meeting 5/24/05

MODERATOR	Janis Blumentals
ASSOC. MODERATOR	James Moy
TRANSCRIBER	Erick Wockenfuss

### PRESENT:

1.	Robert Barriger	Hunt Electric
2.	Rawley Brodeen	Harris Mechanical
3.	Victor Pipars	Northland Mechanical

### NOT PRESENT:

1.	William Daugherty	P&D Mechanical
2.	Bill Nicol, Jr.	Doody Mechanical
3.	Wade Sedgwick	Sedgwick Heating & Air Conditioning

### Identified problems

- Lack of energy code enforcement currently.
  - More emphasis on building code (life safety issues) than spent reviewing energy code
  - Inspectors not looking at energy calculations and enforcing the energy code.
    - Energy calculations are often not looked closely.
  - No enforcement with energy code in place now.
    - How will changes to code affect that?
  - Inspectors spending more time reviewing materials and methods and not looking at design of systems.
- Systems installed into buildings need to be better operated & maintained.

- Systems installed are complicated and may not be understood by staff.
- Systems are installed correctly but are not maintained by staff properly
- Manuals and training materials not sufficient to train staff.

- Projects are designed with first cost in mind.
  - Projects built to minimum standards.
  - Energy efficiency for owners not as important w/ energy cost being affordable.
  - No incentive to do any more than required.
  - Target market for the housing can affect the desire for higher quality systems.
  - No money or perceived need for additional inspections to insure code compliance.
  - Individual metering too costly. Technology is designed but usually cut by owners.
  
- Quality control in the field.
  - No time in project budget for field inspections
  - Inspectors only concerned with installation of product and energy efficiency of design
  - Need to be able to inspect BEFORE system is enclosed.

## Recommendations

- Enforce energy code requirements.
  - Someone has to be responsible to enforce energy code and energy calculations.
  - Make energy calculations a requirement.
  - Provide energy data on drawings and issue a permit only if requirements are met.
  
- Required annual inspections of systems.
  - Annually inspect systems to see if units are running properly and if staff is maintaining systems as required.
  - Verify residents have not altered systems which would cause them to not function as designed.
  
- Provide end users (building maintenance & tenants) with operational manuals for mechanical systems.
  - Video taping training classes for staff to verify staff have done training. Make them responsible if system fails due to not maintaining the system properly.
  - Keep systems as simple as possible.
  - Require minimum training requirements for all staff.
  - Improve operating manuals.

- Building inspectors need to know code and make them responsible so they review the design and calculations completely.
- Incentives for energy conservation should be provided to owners.
  - “Energy Star” rating for buildings.
  - Encourage owners to go above the minimum code requirements.
  - Sell idea to owners, management that energy efficient buildings are cost effective.

## **TENANTS (TEN) FOCUS GROUP SUMMARY**

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Meeting 5/31/05

MODERATOR	Janis Blumentals
ASSOC. MODERATOR	James Moy
TRANSCRIBER	Erick Wockenfuss

### PRESENT:

1. Alice Finley Lake Shore Drive Condominiums

### NOT PRESENT:

1. Paul Birnberg Home Line  
2. Ron Elwood Legal Services Advocacy Project  
3. Pam Marshall Energy Cents Coalition

### Identified problems

- Quality craftsmanship is missing on jobsites.
  - Contractors are not looking at details provided by architect
  - Inexperienced laborers are those who are installing important systems on buildings (insulation, vapor barrier, etc.)
  - Quality of building systems are as good as they are installed
  - Instructions of materials are not being read by the people who are installing them materials
  - Contractors are not communicating with architects if they find discrepancies in the details that they are providing.
  - Building systems are not being installed as detailed on drawings by the architect.
- Lack and training/knowledge regarding energy efficiency
  - Inspectors more concerned with life safety issues and overlook energy efficiency requirements.
  - Lack of knowledge about health concerns within buildings today.
  - Developers more concerned with up front costs and not future costs.

- Architect not on site for critical detail installation. Commonly they may be on site once a month for draw request.
  - Architect may miss installation of critical details if they are not on the jobsite more frequently
  - Who will be able to stop job if installation is not complete or installed properly.
  - Contractor builds how he has in the past. Overlooks architects drawings and critical details.
  
- Stop stack effect in buildings and air movement through units.
  - Systems are not sealed properly letting unwanted air movement from unit to unit
  - Lack of quality construction. Holes are being made but not getting filled.

## Recommendations

- Hold pre-construction meeting with all subs involved.
  - Expectations set
  - Time to go over special details and how to properly install specific building systems.
  - Get architect on job site more often to oversee construction of critical details.
  
- Doing a mock up of certain building systems. (ex. Window installation)
  - Architect can verify installation is complete. Contractor will know what expectations there are for installations.
  - Allows everyone to work through any problems that come up during the installation process.
  - Manufacturer's rep should be on site to oversee installation of products.
  
- Provide better training for contractors, job supervisors, and building inspectors.
  - Train inspectors to look at energy efficiency concerns within a building and not only life safety issues.
  - Make building inspectors more responsible for their inspections.
  - Train people about possible health concerns within buildings.
  
- Make contractor/job supervisors accountable/responsible for their work
  - Provide incentives for those who have more training
  - Properly train contractors and job supervisors – State should license and certify them.

- Provide education/training for everyone on the crew. All crews should be knowledgeable.
- Provide financial incentives for owner to pay for and want to include energy conscious decisions.
  - Tax incentives and rebates.
  - Energy star rating program
- Recommend special inspections / testing of units (buildings) for energy efficiency.
  - Have a certain number of units within project to be tested to see if it passes.
  - Prove building does what it was designed to do.
- Provide training & manuals for maintenance staff and tenants
  - Require having manuals for all systems within the building
  - State should prepare guidelines for manuals for tenants.
  - State should recommend tenant handbook – Educate tenants about energy efficiency.

## Possible changes to Minnesota energy code application to multifamily residential buildings.

Changes are expected to be effective January 1, 2006.

Prepared by Bruce Nelson, Minnesota Department of Commerce, State Energy Office  
3/31/05

Requirement	IRC (1)	IBC (2)
1. Foundation insulation	new residential requirements*	R-5
2. Air barrier	Similar to Ch. 7672*	Substantially more stringent*
3. Make-up air	Yes - as in Ch. 7672	Yes - as in Ch. 7672
4. Mechanical ventilation	Yes - as in Ch. 7672	Yes - as in Ch. 7672
5. Envelope thermal performance	REScheck calculation will NOT be required (but may be used if poorer than spec. R & U are desired*	Not substantially changed.*
6. HVAC acceptance testing	Limited*	Yes*
7. Lighting system acceptance testing	No	Yes, for common spaces*

\* indicates details appear below

### **Possible division between IRC and IBC applicability**

(1) IRC (Int'l Residential Code) applies to buildings with residential occupancies, 3 stories and less, with fully independent plumbing, electrical and mechanical systems and with no common areas (corridor, etc.).

(2) IBC (Int'l Building Code) applies to buildings with residential occupancies that include common plumbing, electrical, mechanical systems or common area (corridor, etc.), as well as to all residential buildings greater than 3 stories.

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### **1. IRC Foundation insulation requirements.**

R-10 baseline, R-5 with improved efficiency heating system. See below web site for alternative requirements, depending upon interior, integral or exterior insulation location and full basement, crawl space or slab-on-grade.

<http://www.buildingfoundation.umn.edu/FoundRuleWWW/rule.htm>

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### **2. Air barrier**

#### **IRC**

**Interior air barrier.** The building thermal envelope shall be continuously sealed to limit the leakage of air through the thermal envelope. The air barrier shall be installed on the warm-in-winter side of the thermal insulation. Areas of potential air leakage in the building thermal envelope shall be caulked, gasketed, weatherstripped or otherwise sealed with an air barrier material, suitable film or solid material to form an effective barrier between conditioned and unconditioned spaces. The integrity of all air barriers shall be maintained. The sealing methods between dissimilar materials shall allow for differential expansion and contraction. An air barrier shall be provided in the following locations:

1. Walls, floors, ceilings, overhangs, knee walls, and floor rim joist areas separating conditioned from unconditioned spaces.
2. At all joints, seems, and penetrations of the building thermal envelope.
3. At all electrical, plumbing, mechanical and other penetrations of the interior air barrier.

4. At all interconnections in the thermal envelope between concealed vertical and horizontal spaces such as occur at soffits, drop ceiling, cove ceilings and similar locations.
5. In concealed spaces between stairs, fireplace framing, partition walls, chases, tubs and showers that are directly adjacent to the building envelope.
6. At the top of interior partition walls and walls separating dwelling units where they join insulated ceilings.
7. At openings between framing members and window, skylight and door frames and jambs.

**Exceptions:**

1. Areas that do not separate conditioned from unconditioned space.
2. Where the insulation material or insulated assembly prevents the leakage of air through the thermal envelope.

**IBC**

**Air Barrier Material.** “Air barrier material” means an material installed to provide a barrier to the movement of air. Air barrier materials shall have an air permeability not to exceed 0.004 cfm/ft<sup>2</sup> under a pressure differential of 0.3 in. water column (1.57psf) (0.02 L/s.m2 @ 75 Pa) when tested in accordance with ASTM E 2178.

**Building Envelope Air Sealing.**

Where a building component or assembly separates interior conditioned space from exterior space, interior space from ground, or environmentally dissimilar spaces, the component or assembly shall contain a continuous air barrier system to control air leakage into or out of the conditioned space. The air barrier system shall consist of air barrier materials sealed to be continuous:

- a. across construction, control and expansion joints,
- b. across junctions between different building assemblies, and
- c. around penetrations through the building assembly.

Drawings shall indicate the location of the air barrier system.

**Exceptions:** Where it can be shown that uncontrolled air leakage will not adversely affect any of:

- (a) the building envelope components,
- (b) the intended use of the building, or
- (c) the operation of building services.

**5. Envelope thermal performance**

**IRC**

Default values: Roof/ceiling R-38, walls R-19, windows U-0.35, foundations R-10 (or R-5 with an improved efficiency furnace or HRV/ERV)

**IBC**

Default values: Roof/ceiling R-23, Walls R-19, windows U-0.49 & SHGC-0.49, foundations R-5

**6. HVAC acceptance testing**

**IRC**

**Certificate.** A permanent certificate shall be posted inside the building on or adjacent to the electrical distribution panel. The certificate shall list the values of components listed in the table below:

<b>Component</b>	<b>Certificate requirement</b>
Insulation installed in or on ceiling/roof, walls, slab-on-grade and floor	Installed R-value
Rim joist and foundation wall insulation	Installed R-value and whether the insulation is exterior, integral or interior
Fenestration	Average U-factor and solar heat gain coefficient
Ducts outside conditioned spaces	Installed R-value
Mechanical ventilation system	Type, location and design continuous & total ventilation rates
Make-up air & combustion air systems (if installed)	Type, location and size
Heating system	Input rating and AFUE
Domestic water heater	Type, size and energy factor
Cooling system (if installed)	Output rating and SEER

## **IBC**

**HVAC System Acceptance Testing.** HVAC control systems shall be tested and adjusted for function and performance to ensure that control elements are calibrated, and in proper working condition and that components, equipment, systems and interfaces between systems conform to the construction documents. Acceptance testing shall be documented and submitted to the building official upon request.

**Exceptions:**

- (a) Buildings under 50,000 square feet conditioned floor area.
- (b) Semiheated spaces within buildings.
- (c) Buildings complying with the HVAC acceptance requirements in Appendix A of Acceptance Requirements from Advanced Buildings: Energy Benchmark for High Performance Buildings, 2004, New Buildings Institute and documented and submitted to the building official.

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## **7. Lighting system acceptance testing (IBC only)**

**Lighting Control System Acceptance Testing.** The lighting control systems shall be tested and adjusted for function and performance and to ensure that control elements are calibrated, and in proper working condition and that components, equipment, systems and interfaces between systems and controls conform to the construction documents. Acceptance testing shall be documented and submitted to the building official upon request. Construction documents shall include a statement of intended operational performance, a description of the sequence of operation and functional test requirements for lighting control elements.

**Exceptions:**

- (a) Buildings under 50,000 square feet conditioned floor area.
- (b) Buildings complying with the Lighting Control Systems acceptance requirements of Appendix A of Acceptance Requirements from Advanced Buildings: Energy Benchmark for High Performance Buildings, 2004, New Buildings Institute and documented.