

EFFICIENT BUILDING ADVISORY GROUP

Recommendations on Important and Achievable Efficient Building Practices for Summit County, Colorado September 2006

Prepared by High Country Conservation Center



Background: The Efficient Building Advisory Group (EBAG) was formed to help Town and County building officials determine which efficient building practices were most important to address in Summit County in their efforts to create an efficient building code. The EBAG is a representative group of Summit County building and energy conservation professionals, including builders, architects, landscape architects, and building officials. A list of group members is included at the end of this report in Appendix A.

Process: The EBAG held 9 meetings from April 20 to September 21, 2006. The first few meetings were spent reviewing the need for an efficient building code in Summit County. The group determined that although many building professionals are already employing efficient building practices, many are not.

Subsequent meetings centered largely on code implementation issues. The group felt strongly that additional inspections, paperwork, and other burdens for builders and homeowners would be problematic. However, simplification often negates flexibility, and both are desired qualities of the code.

To help identify important efficient building practices for the Summit County area, the group used the US Green Building Council (USGBC) Leadership in Energy and Environment Design (LEED) outline as a basis for discussion. See Appendix B for the outline used. A rating process (on a scale of 1-5, with 5 as the highest rating) was used to identify both the importance of the concepts for single family and multifamily homes and the achievability of those concepts in Summit County.

Once the group rated the concepts and discussed any additional concepts not included in the outline, this report was prepared to help aid the Town and County code officials in their efforts to draft the code. A flow chart showing an overview of the process is available in Appendix C.

Recommendations: The Efficient Building Advisory Group provided recommendations on both the implementation and content of an efficient building code. In brief, a simple code that focuses on the most important efficient building practices, including energy conservation and efficiency, is desired by the group. The following sections include: a Summary; a detailed rating and discussion of specific concepts; ordered lists of concept ratings; and a variety of supporting documents. Some concepts were combined or omitted through the review process, the outline of the report does not follow the LEED format.

SUMMARY

The Efficient Building Advisory Group identified the following key issues as important for **implementation** of the code:

- Uniformity between jurisdictions
- Simplicity for inspection, paperwork, and certification
- Flexibility for changes in the marketplace and innovation
- Any opt-out condition (i.e., paying a fee instead of complying with certain requirements) should facilitate further resource conservation and efficient building
- Both single family and multi-family homes should be addressed in this code
- The size of a home should be considered (smaller is less resource intensive); baseline home around 3000 square feet (between 2000 and 3500)
- A phase in period is necessary
- A comprehensive Resource Guide must accompany the code
- Educational forums and proactive outreach are necessary

Other implementation issues that need to be considered include:

- Energy codes are not uniform between jurisdictions; baseline energy requirements (examples include roof and wall insulation, windows, etc) likely need to be included in the efficient building code
- Remodels could be tied to size and included in this code (i.e., additions over 2000 square feet)
- All remodels could be required to include efficient building concepts in new materials (i.e., baseline window requirements but not a new furnace)
- All conditioned space (i.e., heated garages) should be included in code
- Mixed-use is not addressed yet, but should be considered over time.

The most important and achievable concepts identified by this group, with an overall rating of 4.5 or greater, are:

- Upgrading Insulation
- Upgrading Windows and Doors
- High Efficiency Heating Equipment
- High Efficiency Appliances
- Water Efficient Landscaping

Secondary important concepts, with an overall rating of 4.0 or greater, are:

- Recycled Content Materials
- Recycling Program (Space) for Operations
- Energy Efficient Controls
- Chemical & Pollutant Control & Monitoring
- Thermal Comfort & User Friendly Controls
- Daylighting

Other important and achievable concepts, with an overall rating of 3.0 or higher, are:

- Rapidly Renewable Materials
- Local and Regional Materials

- OVE Framing
- Construction Waste Management
- Water Use Reduction
- Active Solar Hot Water Systems
- Passive Solar Design
- Off-Site Renewable Energy Credits
- Energy Efficient Lighting
- Healthy Materials
- Effective Ventilation Systems

Concepts that rated **low in both achievability and importance** (2.9 rating or lower) are:

- Resource Reuse
- Wind Power
- Active Shading

Concepts that had a wide disparity between importance and achievability, indicating that they are **important to efficiency building but difficult to achieve** include:

- Deconstruction
- Certified Wood Products
- Solar PV Systems
- Ground Source Heat (Geothermal)
- Construction IAQ Management

Some concepts that were identified as **easy to achieve (high rating) but not very important (low rating)** to efficient building include:

- Passive Shading Devices
- Ozone Protection
- Measurement & Verification

Other issues not addressed in the outline but vocalized as important by the group include:

- Owners manual for home-owner
- Building commissioning (for multi-family, large projects)
- Rough-in for future technologies and affordability
- Restrictions on use of wood burning stoves (with efficiency requirements) should be revisited
- Highly resource intensive materials and designs:
 - Decorative fireplaces (inside and outside)
 - Heated driveways and sidewalks
 - Heated outdoor pools and spas
 - Very large homes (5000 square feet+)

SECTION 1 – SITE & COMMUNITY

1.1 Basis for Program

In the big picture, buildings have a severe impact on our environment; they use one quarter of the world's wood harvest and are responsible for 54% of US energy consumption and 35% of US CO₂ emissions through operation and construction. Locally, approximately 40% of our waste stream comes from construction and deconstruction.

Buildings also present one of the greatest opportunities to move towards sustainability. How we build our buildings today determines how we use our resources in the future.

Local Effort:

Summit County is a place that has been bestowed with many gifts and most residents live in Summit County because of this tremendous natural environment. It is our responsibility to ensure that future generations have the opportunity to enjoy these gifts as present generations do. One significant way to preserve our natural and cultural heritage is to design and build efficient and healthy buildings.

Any efficient building code in Summit County should seek to encourage this effort by considering:

- the entire life cycle of a building,
- reducing its overall resource consumption with a focus on energy,
- eliminating or reducing use of toxic materials, and
- significantly reducing the operating costs of buildings.

1.2 Scope of Program

The EBAG determined that an efficient building code in Summit County should:

- address all residential construction (single and multi-family)
- be a locally uniform code
- not be unnecessarily burdensome to builders
- remain dynamic to technology and markets
- include a comprehensive Resource Guide to accompany the code
- be phased in over time
- include on-going educational forums and proactive outreach to the building community

A Resource Guide that follows an efficient building code should:

- be dynamic and respond to changes in local markets and new technologies.
- be organized by the High Country Conservation Center
- include product listings when possible

The High Country Conservation Center will serve as a central library and resource center for the efficient building effort and will provide pro-active outreach and consistent research on efficient building topics.

1.3 Site Selection, Site Disturbance, and Other Planning Issues

The EBAG determined that while efficient building begins at site selection, the building code should not (and perhaps could not) address these issues. Many issues pertaining to site (slope, disturbance, building orientation, transportation) should be addressed in planning and development codes.

The EBAG recommends that a similar representative group consisting of planning officials from all jurisdictions be convened to address these issues in planning because while uniformity among all jurisdictions may not be totally possible, it should be attempted.

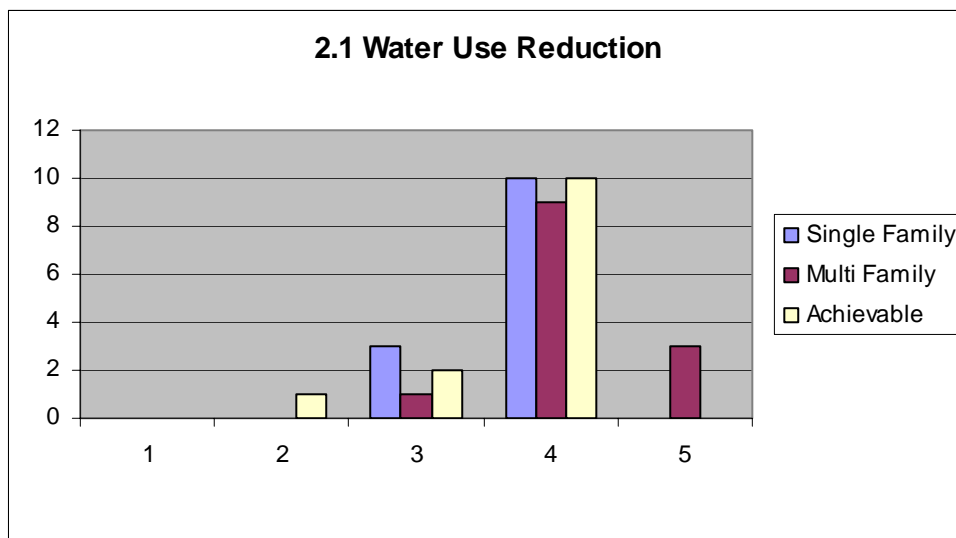
SECTION 2 – WATER EFFICIENCY

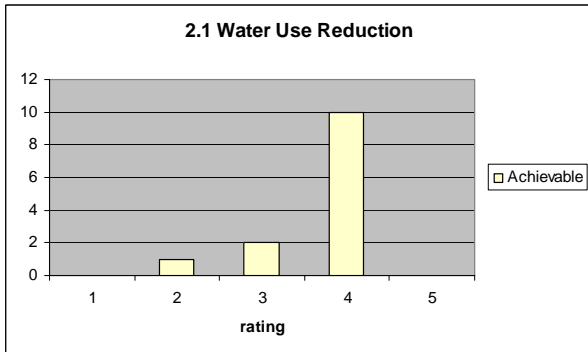
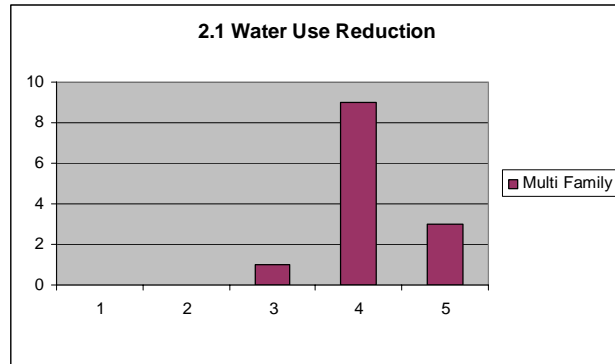
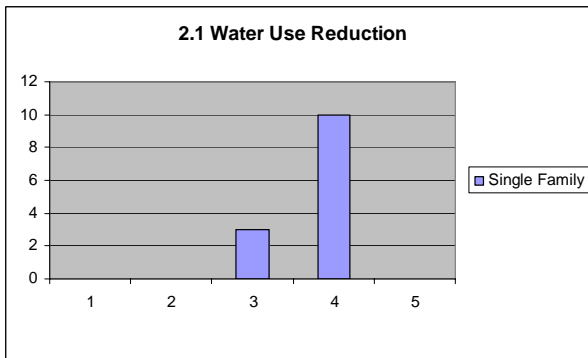
2.1 Water Use Reduction

What: Water Use Reduction refers to the use of **products** that use less water, like low-flow toilets, faucets, and showerheads as well as the use of **practices** conserve water.

2.1 Water Use Reduction

	1	2	3	4	5	total
Single Family			3	10		13
Multi Family			1	9	3	13
Achievable		1	2	10		13





AVERAGE RATING
Single Family: 3.8
Multi Family: 4.2
Achievability: 3.7

Comments & Recommendations:

- There are federal “low-flow” requirements already
- Really low-flow devices can create problems...require more pressure.
- Code or Resource Guide should include info on dual flush systems (what’s that saying? If its yellow, let it mellow...if its brown flush it down)
- Most water use comes from landscaping, not home use
- Is water use such a problem here?
- Is total number of faucets an issue?

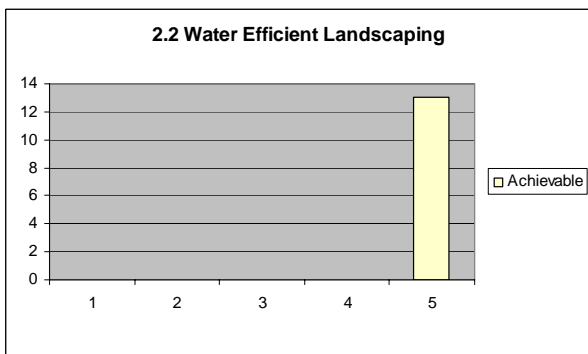
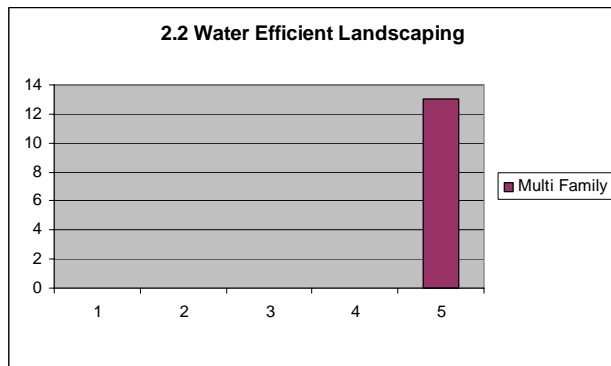
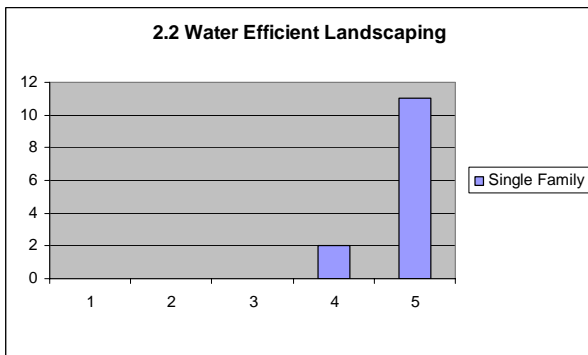
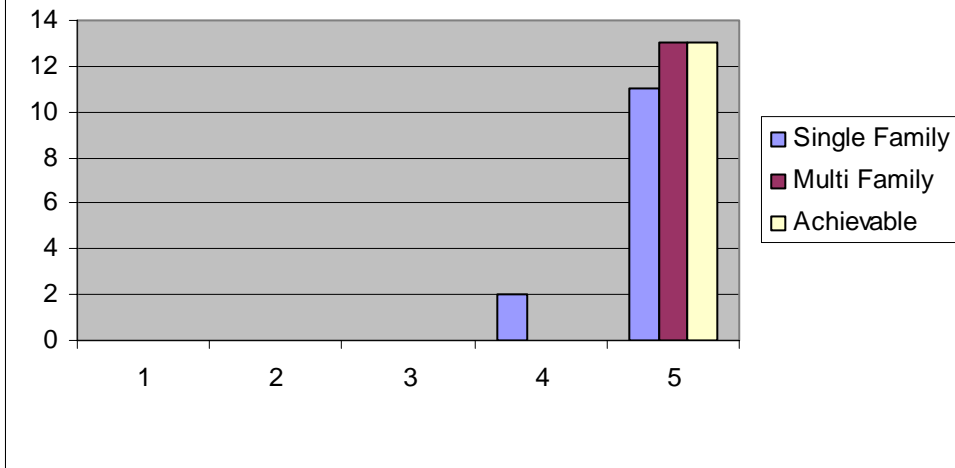
2.2 Water Efficient Landscaping

What: Water Efficient Landscaping refers to the use of products and practices that minimize water use in landscaping, including: low-water, native plants; drip instead of spray irrigation; temporary irrigation for establishing plants only; minimal to no Kentucky bluegrass lawns; etc.

2.2 Water Efficient Landscaping

	1	2	3	4	5	total
Single Family				2	11	13
Multi Family					13	13
Achievable					13	13

2.2 Water Efficient Landscaping



AVERAGE RATING
Single Family: 4.8
Multi Family: 5.0
Achievability: 5.0

Comments & Recommendations:

- Landscaping uses a lot of water; especially lawns
- Limited landscaping should be rewarded
- Fake lawns may become an option; should be rewarded

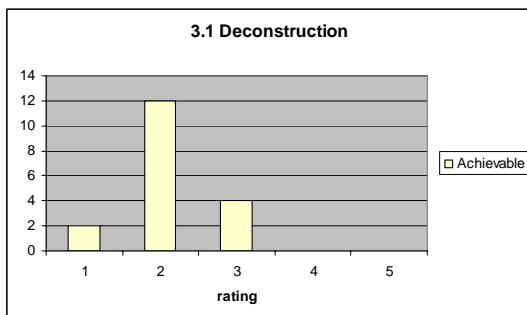
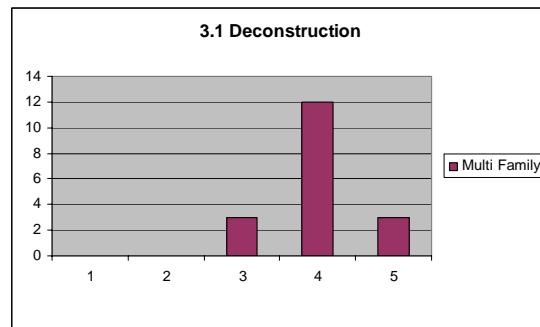
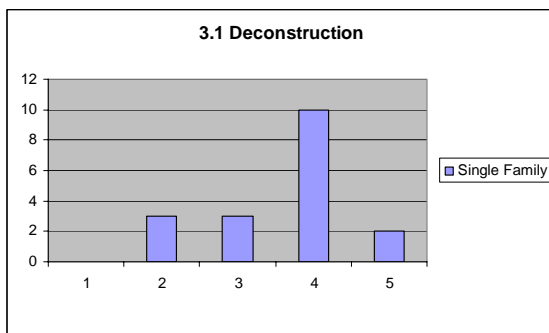
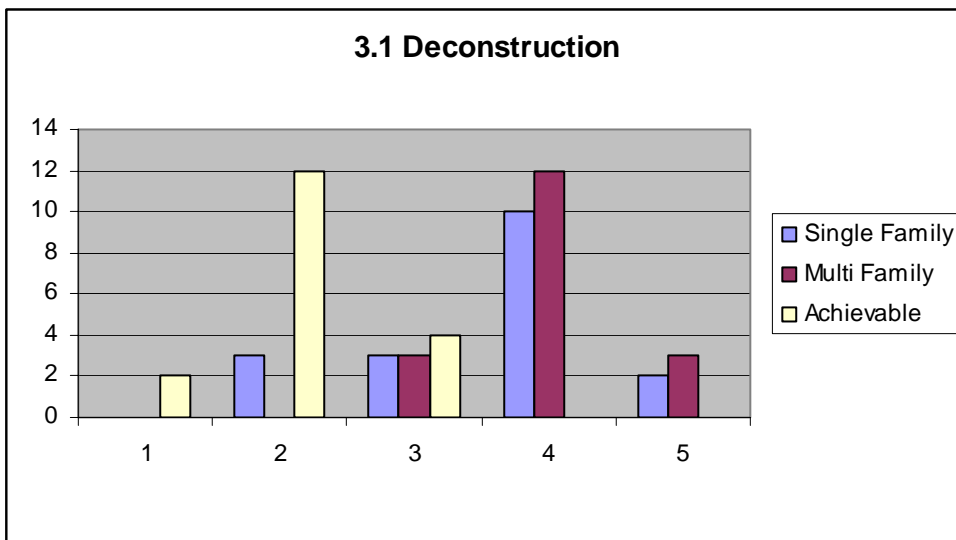
SECTION 3 – MATERIAL & RESOURCE EFFICIENCY

3.1 Deconstruction

What: Deconstruction is the **practice** of methodically disassembling materials and fixtures from a home being demolished in order to salvage materials for reuse and/or recycling.

3.1 Deconstruction

	1	2	3	4	5	total
Single Family		3	3	10	2	18
Multi Family			3	12	3	18
Achievable	2	12	4			18



AVERAGE RATING
Single Family: 3.6
Multi Family: 4.0
Achievability: 2.1

Comments & Recommendations:

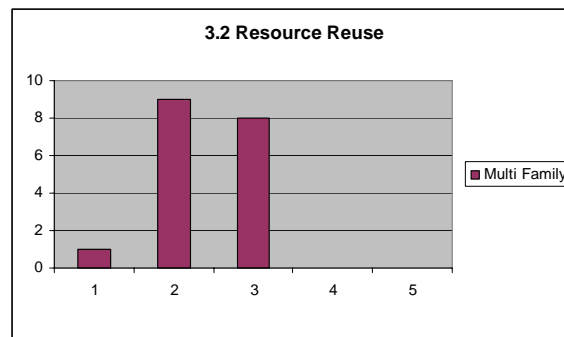
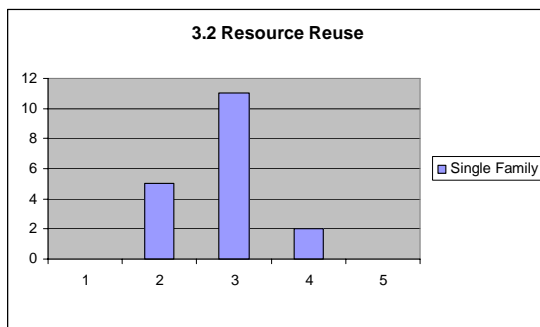
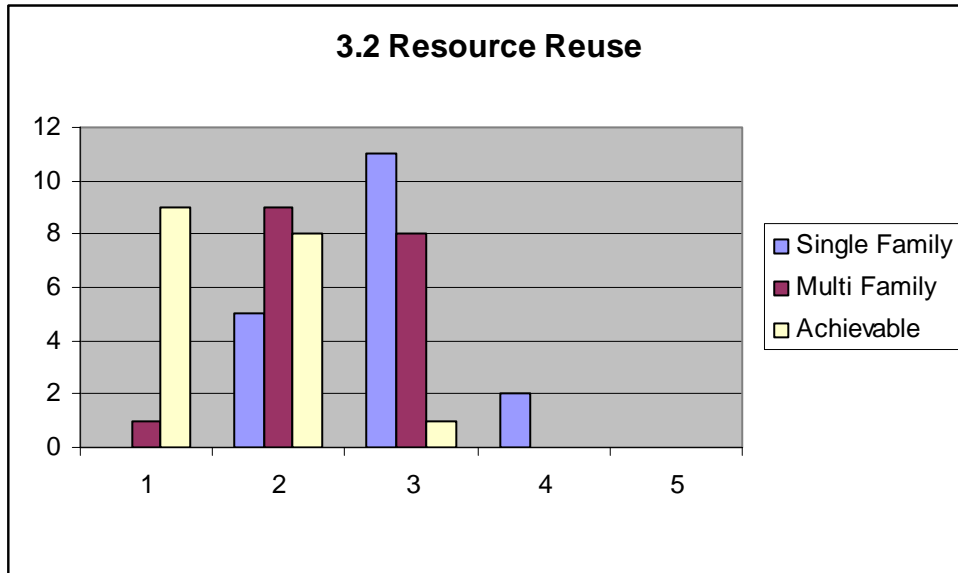
- Is there an affordable housing tie with deconstruction & materials reuse?
- Deconstruction requirements should be included in remodels
- Parts of deconstruction are achievable now (i.e. wood)
- While there is no building materials reuse yard currently available in Summit County, the code should be able to address future changes in local markets (i.e., reused building materials yard)

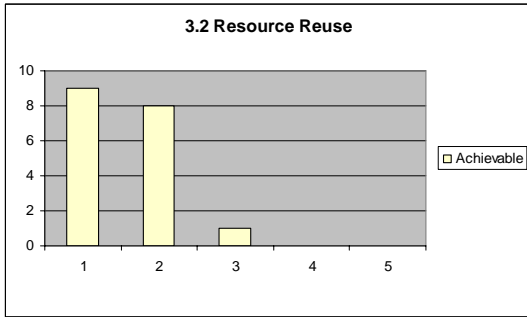
3.2 Resource Reuse

What: Resource Reuse refers to the use of **products** that have been previously owned or used in the construction of a building.

3.2 Resource Reuse

	1	2	3	4	5	total
Single Family		5	11	2		18
Multi Family	1	9	8			18
Achievable	9	8	1			18





AVERAGE RATING
Single Family: 2.8
Multi Family: 2.4
Achievability: 1.6

Comments & Recommendations:

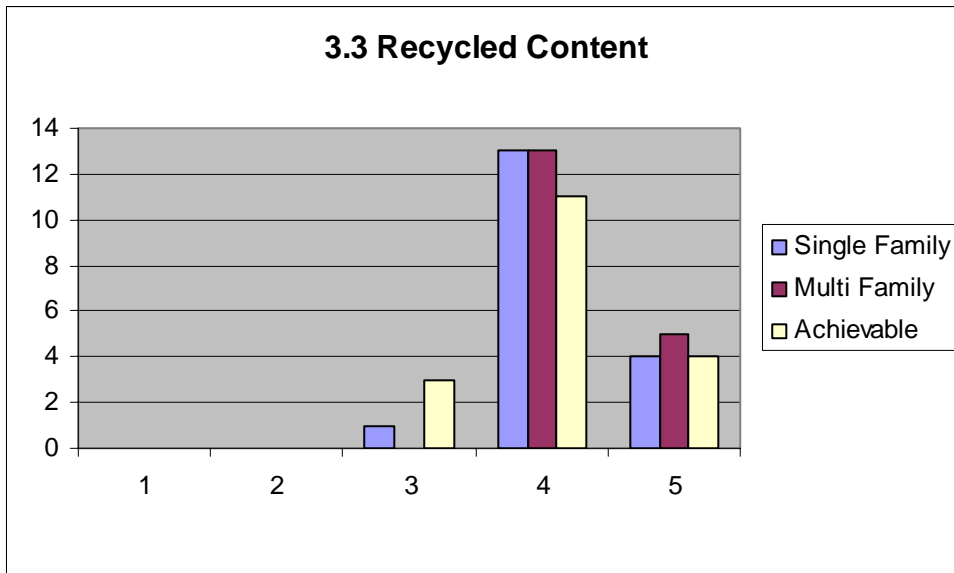
- Code should allow for future cottage industries and new local markets
- There should be a tie with reused materials and affordable housing/community projects.

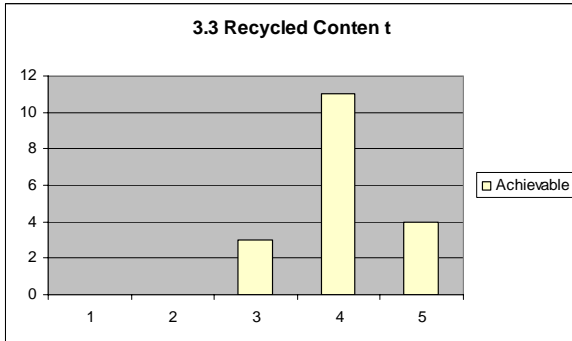
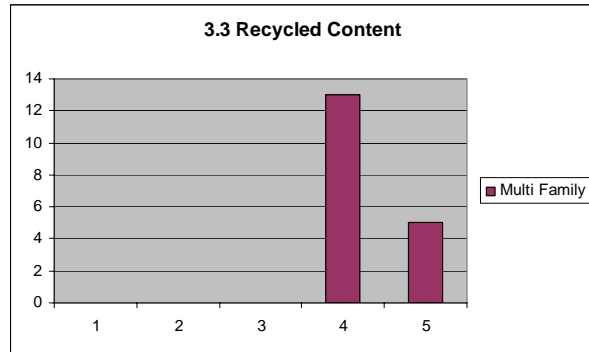
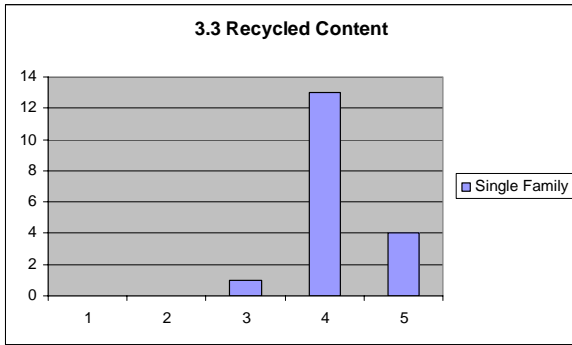
3.3 Recycled Content

What: Recycled Content refers to the use of **products** that contain recycled materials.

3.3 Recycled Content

	1	2	3	4	5	total
Single Family			1	13	4	18
Multi Family				13	5	18
Achievable			3	11	4	18





AVERAGE RATING
Single Family: 4.2
Multi Family: 4.3
Achievability: 4.1

Comments & Recommendations:

- Other waste-related issues should be considered and/or encouraged in code:
 - Panelized materials
 - Engineered Lumber
 - Pre-cut lumber
 - Frost Protected Shallow Foundations
 - Pre-cast foundations

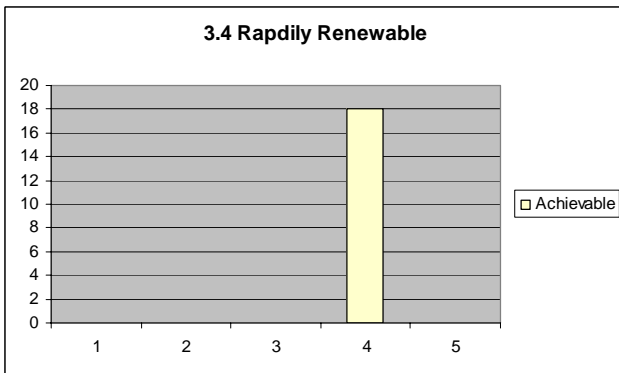
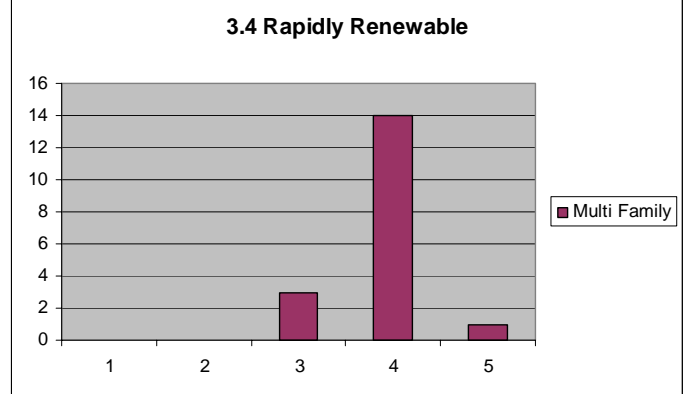
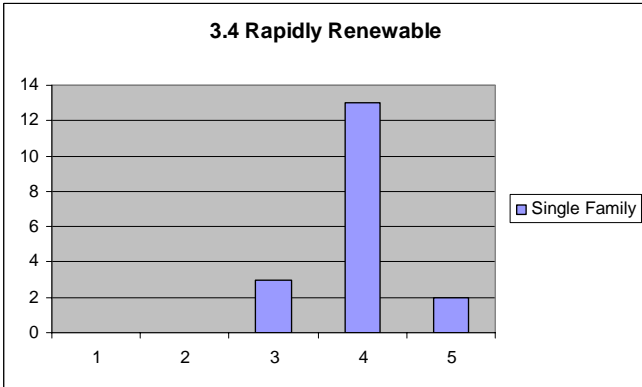
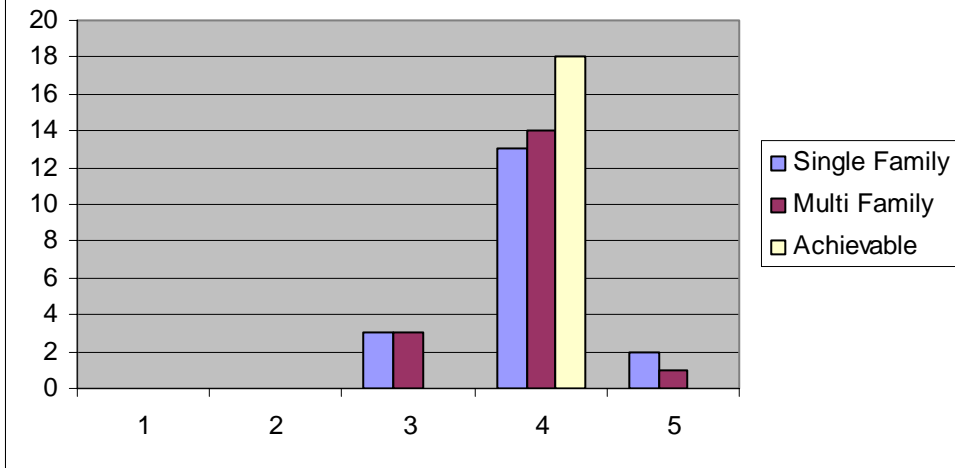
3.4 Rapidly Renewable Materials

What: Rapidly Renewable Materials refers to the use of **products** that contain fibers which grow quickly.

3.4 Rapidly Renewable

	1	2	3	4	5	total
Single Family			3	13	2	18
Multi Family			3	14	1	18
Achievable				18		18

3.4 Rapidly Renewable



AVERAGE RATING

Single Family: 3.9

Multi Family: 3.9

Achievability: 4.0

Comments & Recommendations:

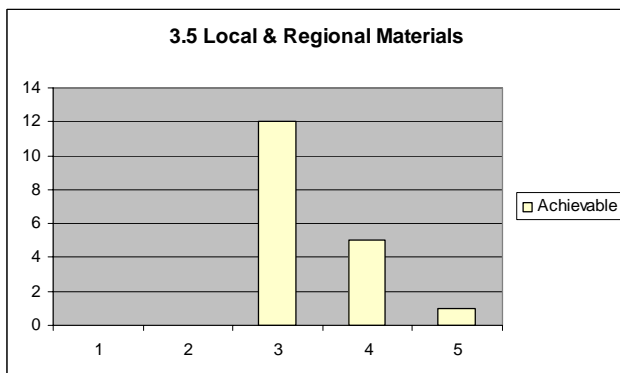
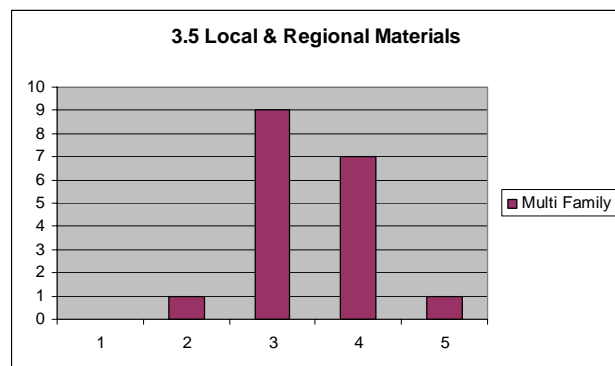
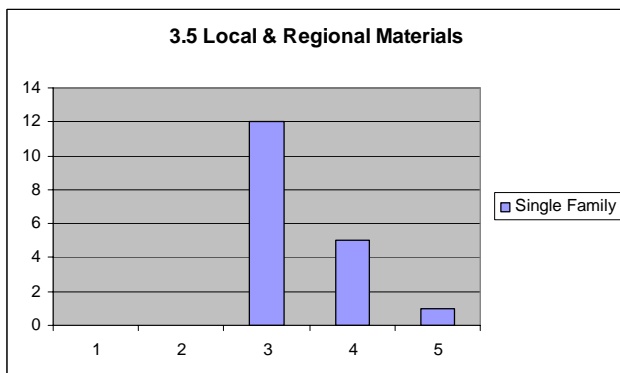
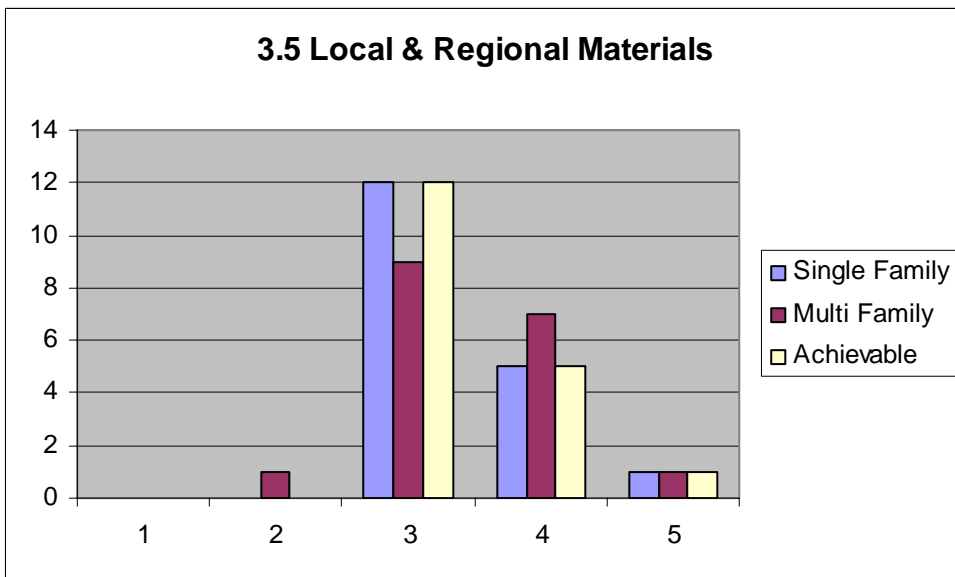
- Should Engineered Lumber be listed under rapidly renewable?
- Products with “Low Embodied Energy” (i.e., products that take a lot of input and energy to create have *high* embodied energy, like concrete or foam insulation) should be included here

3.5 Local & Regional Materials

What: Local & Regional Materials refers to the use of **products** that are indigenous to the Summit County or Colorado Mountain Region.

3.5 Local & Regional Materials

	1	2	3	4	5	total
Single Family			12	5	1	18
Multi Family		1	9	7	1	18
Achievable			12	5	1	18



AVERAGE RATING
Single Family: 3.4
Multi Family: 3.4
Achievability: 3.4

Comments & Recommendations:

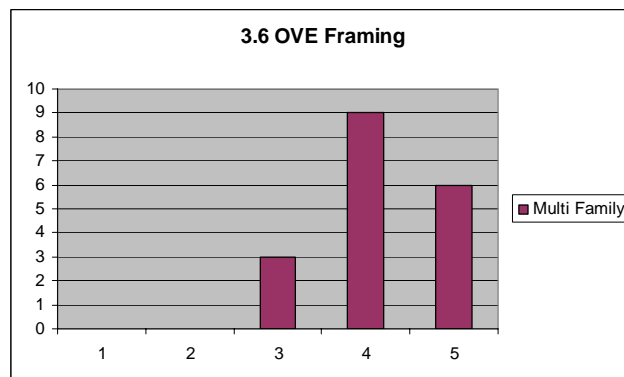
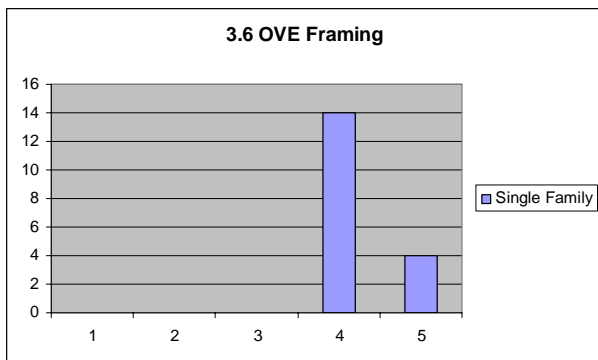
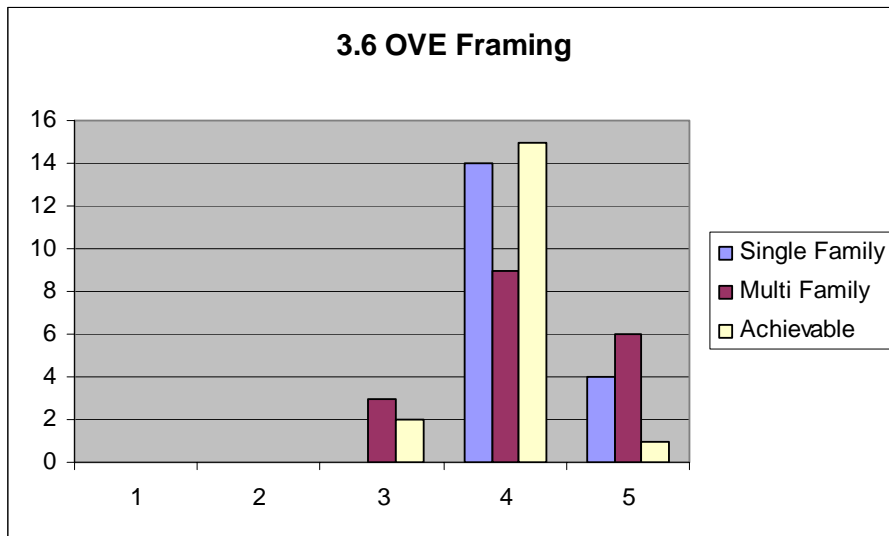
- Narrower definition of “local/regional” is better
- On-site batch plant/crushed rock use should be considered locally produced
- Using materials from building site should be considered locally produced
- Beetle-kill wood (flooring, railing, cabinets, etc) should be included and encouraged in code

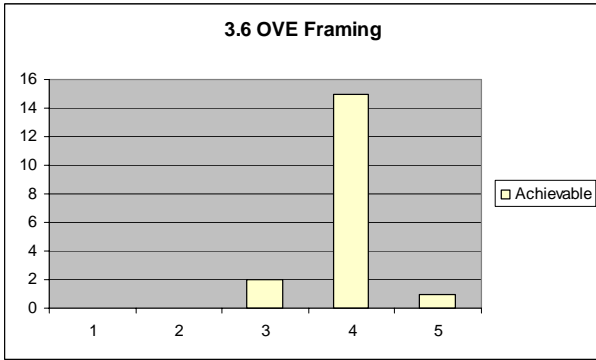
3.6 Optimum Value Engineered (OVE) Framing

What: OVE Framing refers to the **practice** of using “advanced” framing techniques which use less lumber by placing framing members only where they are needed.

3.6 OVE Framing

	1	2	3	4	5	total
Single Family				14	4	18
Multi Family			3	9	6	18
Achievable			2	15	1	18





AVERAGE RATING
Single Family: 4.2
Multi Family: 4.2
Achievability: 3.9

Comments & Recommendations:

- Should Engineered Lumber & pre-cut lumber be in the OVE section?
- Would OVE Framing practices be acceptable to the building departments?
- Some OVE Framing practices may not be applicable here (i.e., snow loads dictate some framing), but many practices are would be accepted.

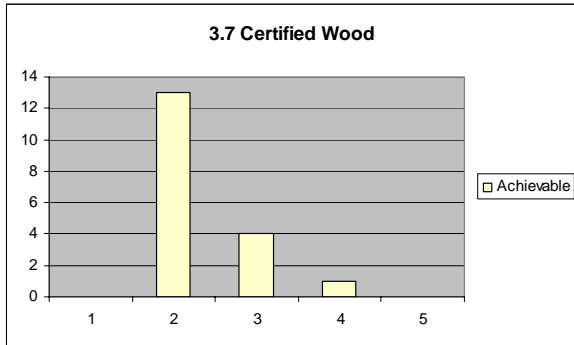
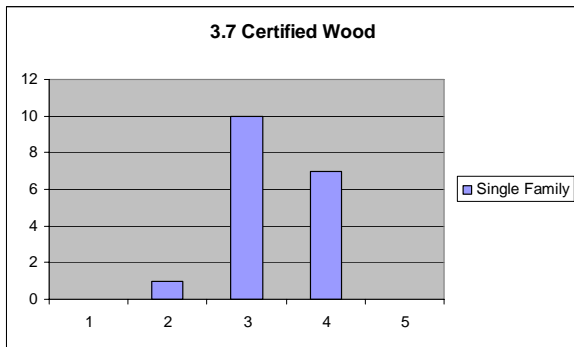
3.7 Certified Wood Products

What: Certified Wood Products refers to the use of wood **products** which have been certified as sustainable by a 3rd Party organization.

3.7 Certified Wood

	1	2	3	4	5	total
Single Family		1	10	7		18
Multi Family	1	3	7	7		18
Achievable		13	4	1		18





AVERAGE RATING
Single Family: 3.3
Multi Family: 3.1
Achievability: 2.3

Comments & Recommendations:

- Many third-party certifiers out there; would have to consider how many to include
- Finished products (i.e., cabinets) are more readily available
- Need lead time on purchasing Certified Products; local suppliers don't stock regularly; not always available
- Need education on this subject for local suppliers

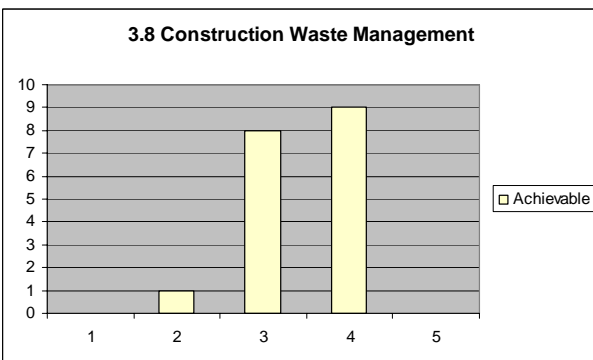
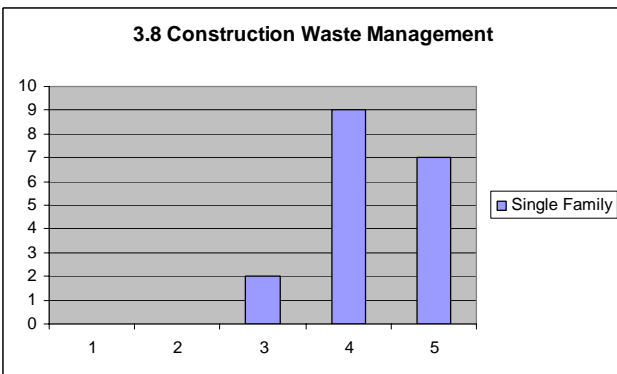
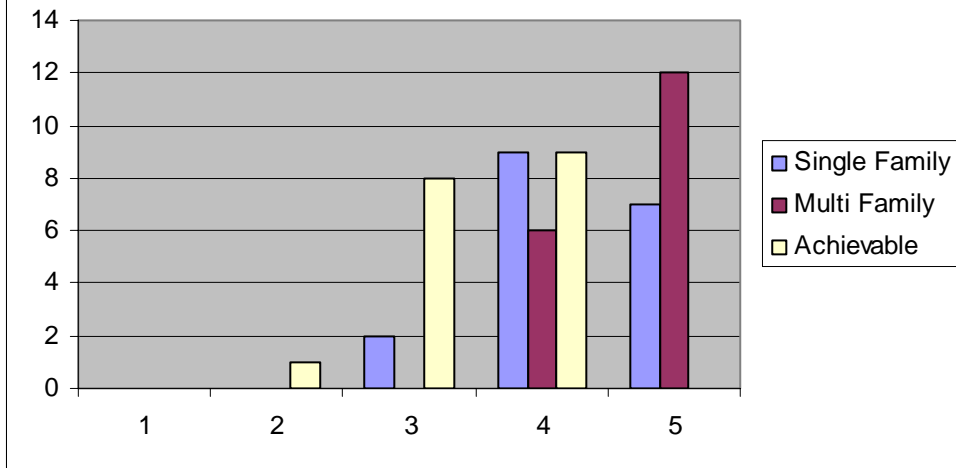
3.8 Construction Waste Management

What: Construction Waste Management refers to the **practice** of segregating waste materials and recycling them from construction sites. Compaction, such as grinding or shredding of materials, is also an acceptable form of construction waste management.

3.8 Construction Waste Management

	1	2	3	4	5	total
Single Family			2	9	7	18
Multi Family				6	12	18
Achievable		1	8	9		18

3.8 Construction Waste Management



AVERAGE RATING
Single Family: 4.3
Multi Family: 4.7
Achievability: 3.4

Comments & Recommendations:

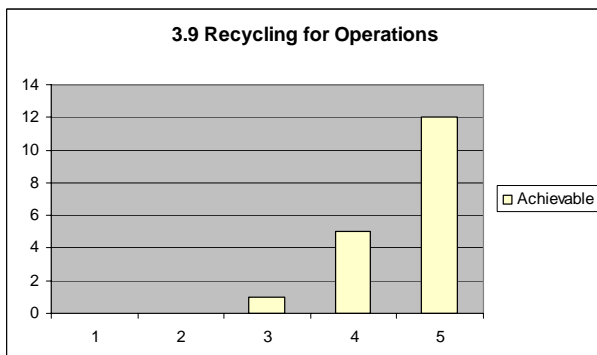
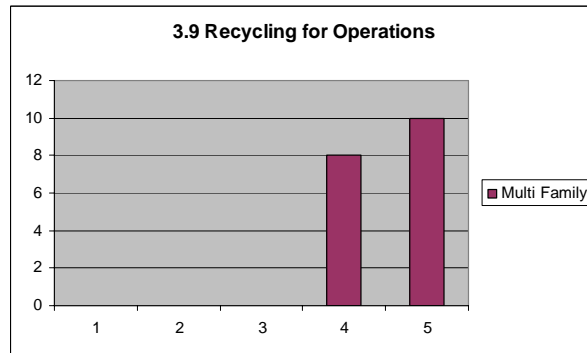
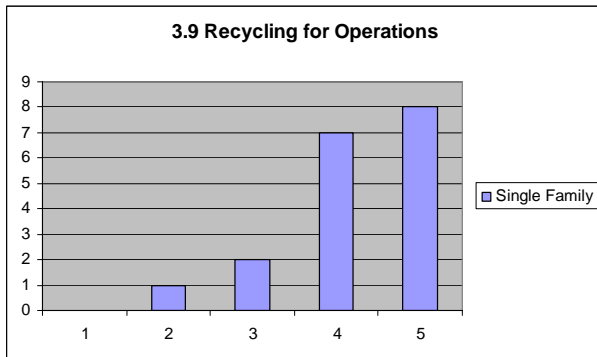
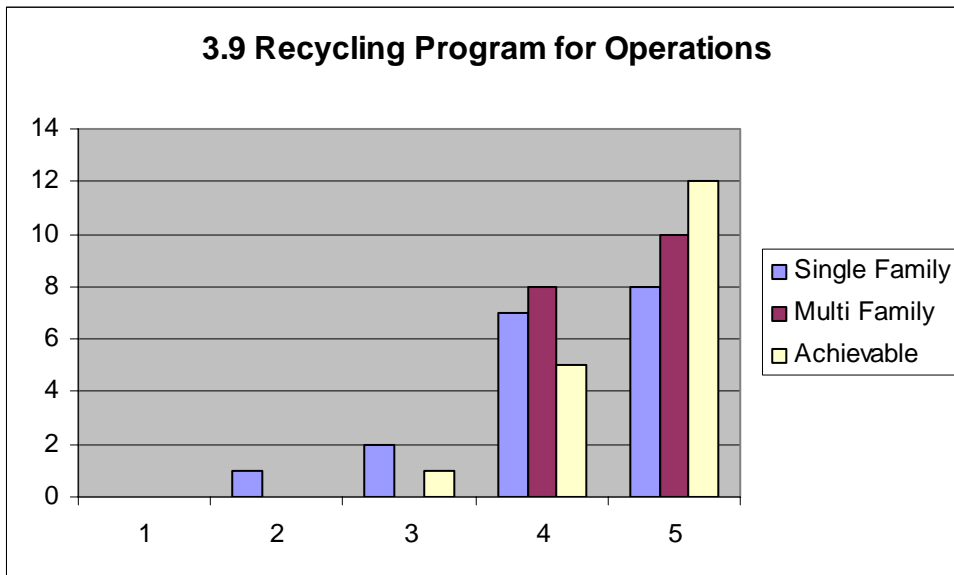
- Recycling can “compete” with reducing site disturbance
- Not always room on job sites for multiple containers; not always usable, flat land
- Market may respond with partitioned dumpsters; smaller containers
- Can “transitional landscaping” be used to allow for recycling?
- Can this be case-by-case & site dependent?
- Grinding construction debris is often considered an acceptable “waste management” practice; this may be a solution for Summit County
- Many materials (OSB, plywood, treated lumber) can’t be recycled

3.9 Recycling Program for Operations

What: Recycling Program for Operations refers to the **practice** of designing recycling systems into the building and using **products** (like bins or in-cabinet recycling containers).

3.9 Recycling Program for Operations

	1	2	3	4	5	total
Single Family		1	2	7	8	18
Multi Family				8	10	18
Achievable			1	5	12	18



AVERAGE RATING
Single Family: 4.2
Multi Family: 4.6
Achievability: 4.6

Comments & Recommendations:

- For single-family, usually means making space in kitchen for bins (often built-in cabinets)
- For multi-family, usually means providing space near dumpster enclosure for recycling bins

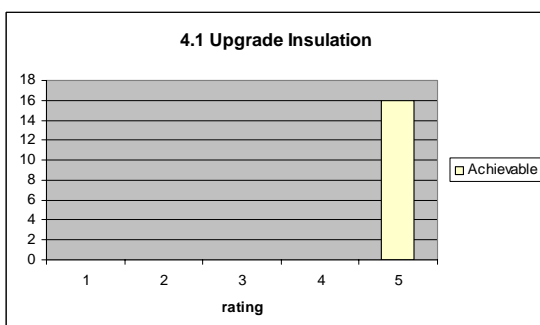
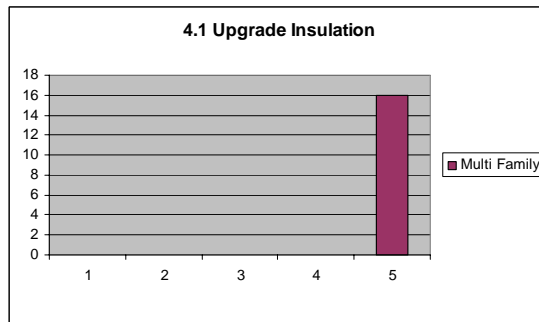
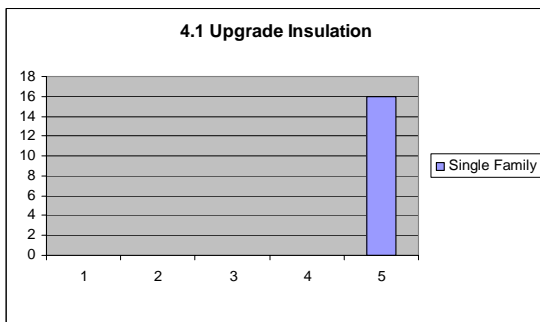
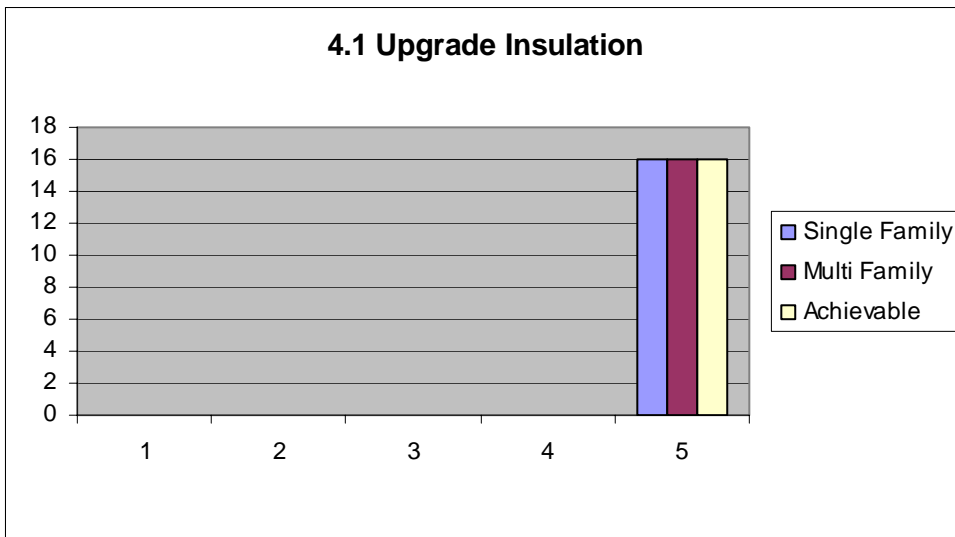
SECTION 4 – ENERGY EFFICIENCY

4.1 Upgrade Insulation

What: Use of insulation **products** that have a “higher” R Value.

4.1 Upgrade Insulation

	1	2	3	4	5	total
Single Family					16	16
Multi Family					16	16
Achievable					16	16



AVERAGE RATING

Single Family: 5.0
Multi Family: 5.0
Achievability: 5.0

Comments & Recommendations:

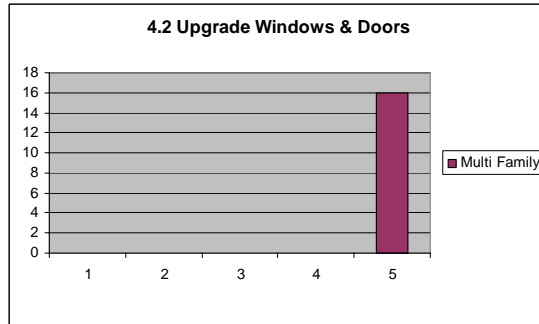
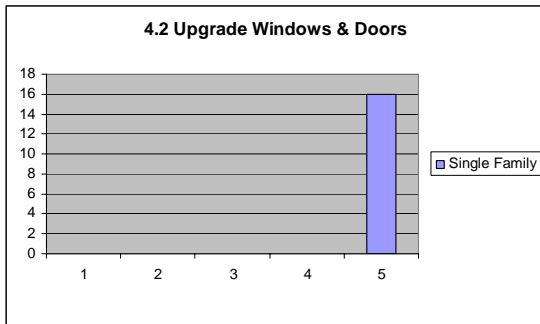
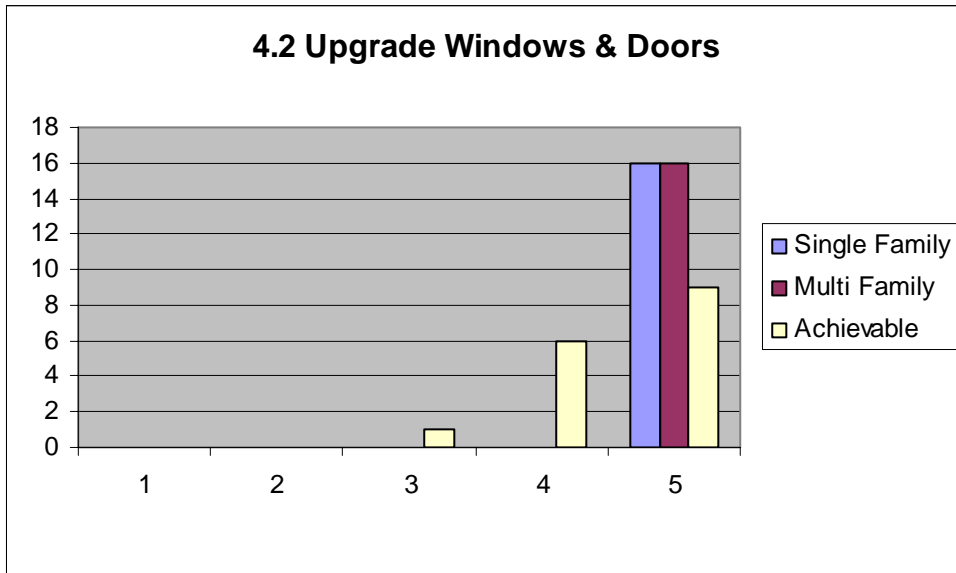
- Stacking 'R's not always the answer; stopping air filtration is key
- New products that are measured the old way can give wrong indication
- Is R-value an energy code issue?
- Insulated Foundations should be here

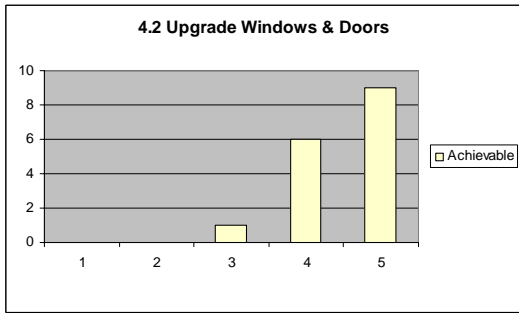
4.2 Upgrade Windows & Doors

What: Use of **products** that have better insulating properties and more resistance to heat flow.

4.2 Upgrade Windows & Doors

	1	2	3	4	5	total
Single Family					16	16
Multi Family					16	16
Achievable			1	6	9	16





AVERAGE RATING
Single Family: 5.0
Multi Family: 5.0
Achievability: 4.5

Comments & Recommendations:

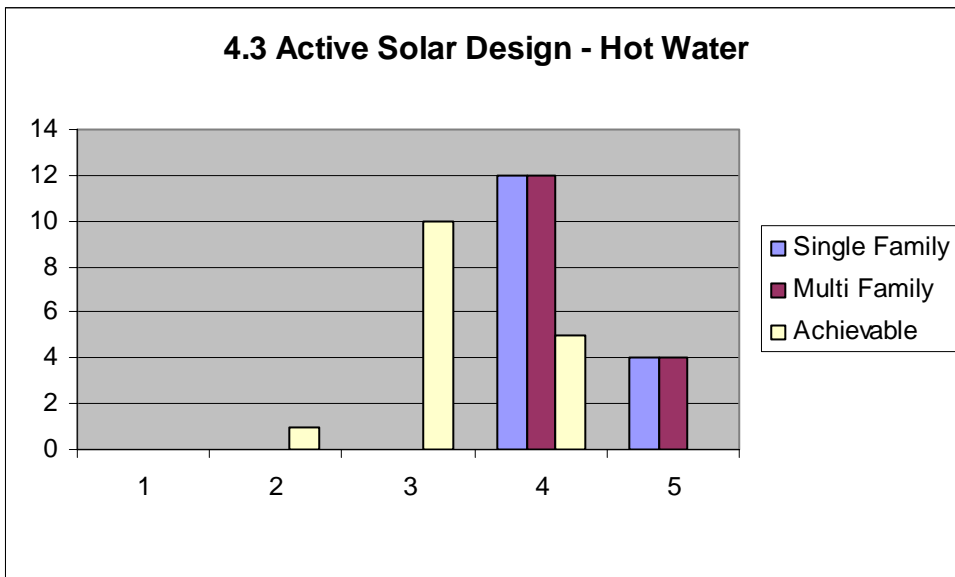
- Cost is a factor with this issue
- Different windows are better for different sides of the house

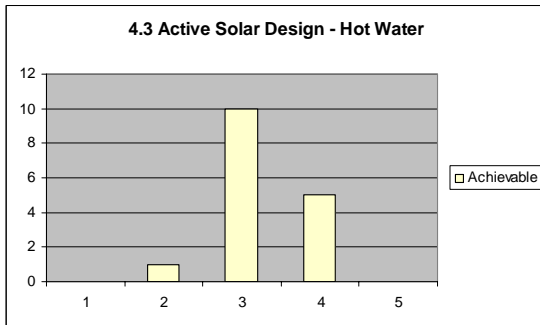
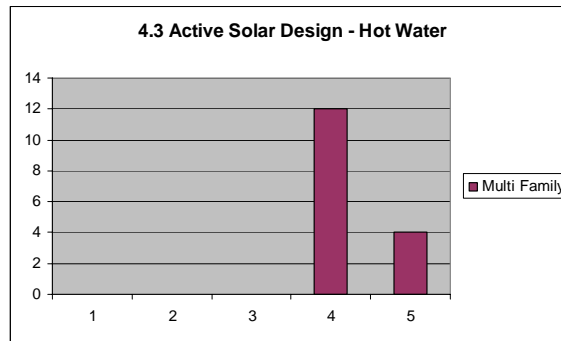
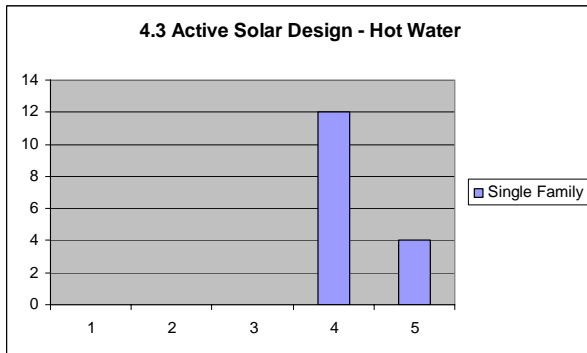
4.3 Active Solar Design – Hot Water Systems

What: Refers to the use of **products** that use the sun’s heat and light to generate heat. There are indirect and direct active solar water heaters which either use an antifreeze solution and a heat transfer unit or directly heat water that is used in the household.

4.3 Active Solar Design - Hot Water

	1	2	3	4	5	total
Single Family				12	4	16
Multi Family				12	4	16
Achievable		1	10	5		16





AVERAGE RATING
Single Family: 4.3
Multi Family: 4.3
Achievability: 3.3

Comments & Recommendations:

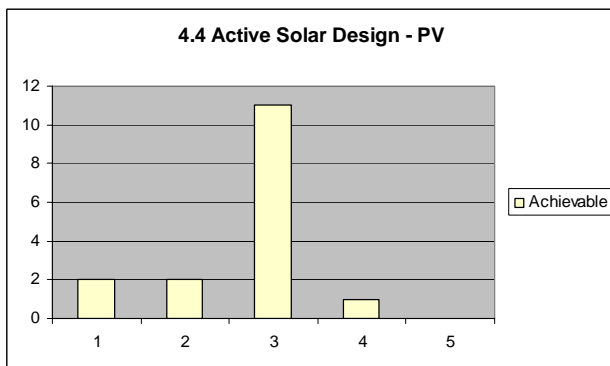
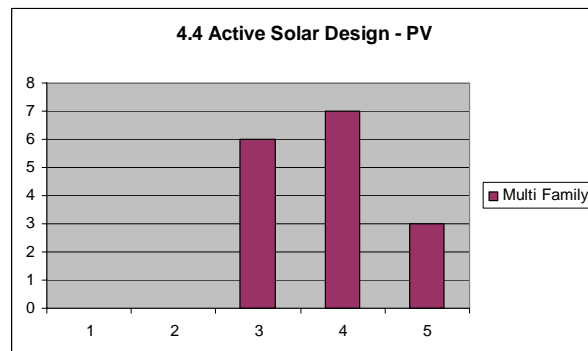
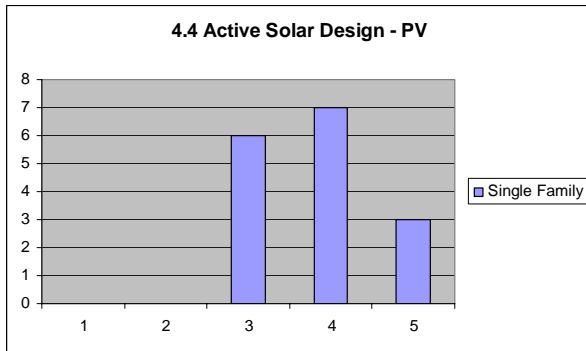
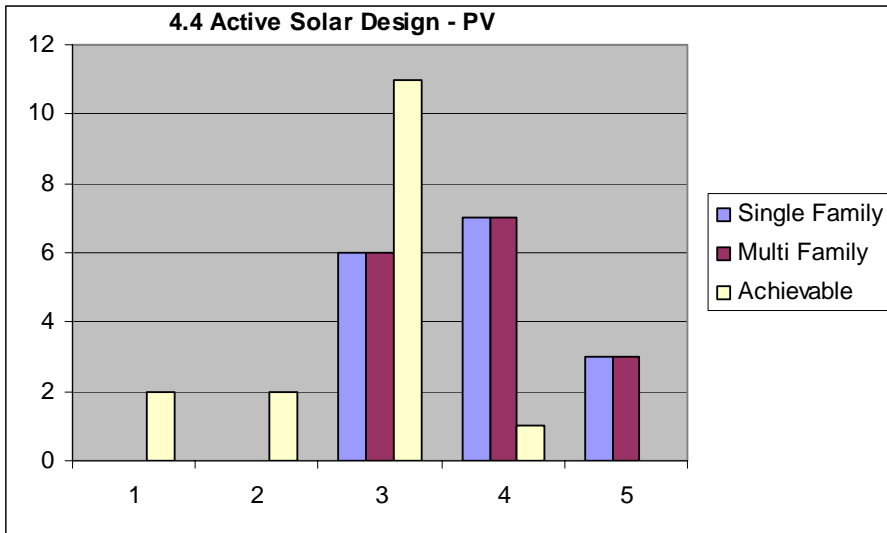
- What is the cost/technology for off-setting “extraneous energy uses” like hot tubs and heated driveways with solar? (depends on project; payback period for solar hot water systems is about 5 years)
- Can we acknowledge rough-in for this technology?
- Site specific issue; some HOA’s don’t allow panels...but is this illegal?

4.4 Active Solar Design – PV Systems

What: Refers to the use of **products** that use the sun’s heat and light to produce electricity.

4.4 Active Solar Design - PV

	1	2	3	4	5	total
Single Family			6	7	3	16
Multi Family			6	7	3	16
Achievable	2	2	11	1		16



AVERAGE RATING
Single Family: 3.8
Multi Family: 3.8
Achievability: 2.7

Comments & Recommendations:

- What is the cost/technology for off-setting “extraneous energy uses” like hot tubs and heated driveways with solar? (depends on project; payback period for solar hot water systems is about 5 years)
- Can we acknowledge rough-in for this technology?
- Site specific issue; some HOA’s don’t allow panels...but is this illegal?

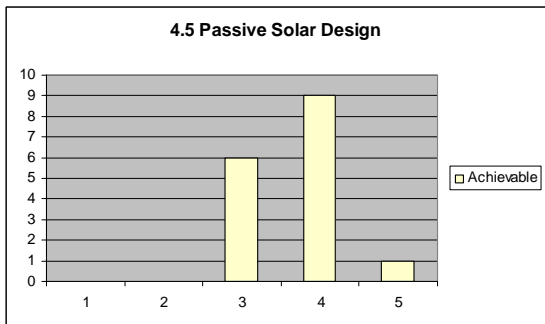
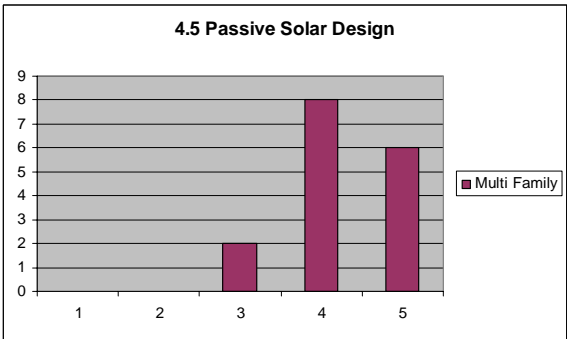
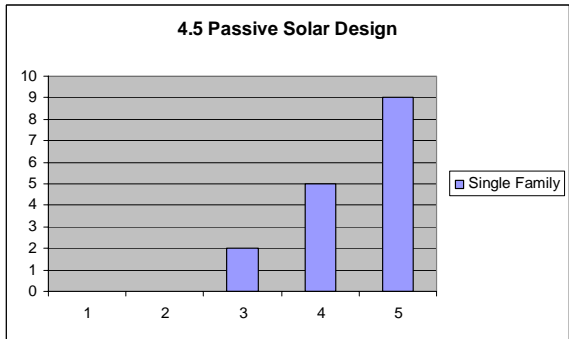
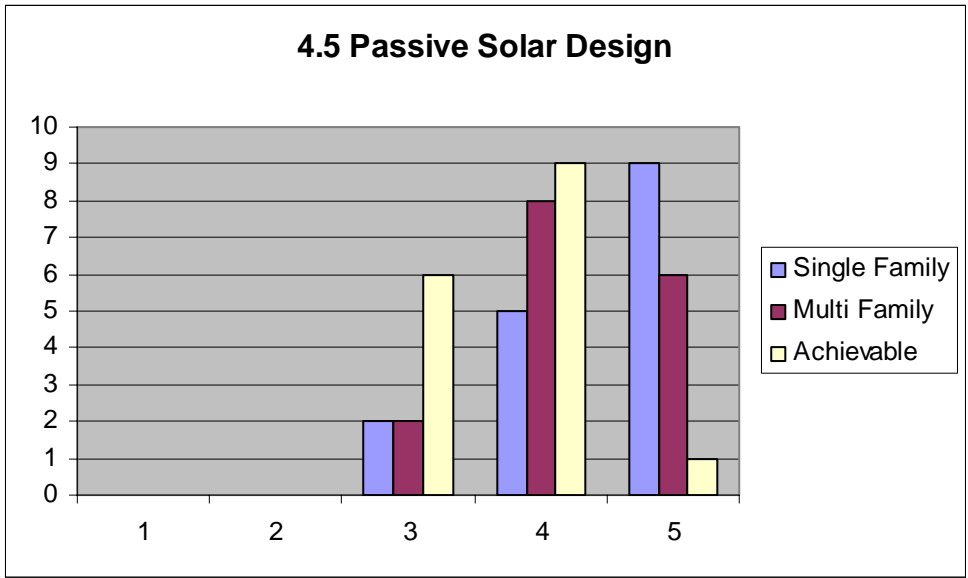
4.5 Passive Solar Design

What: Passive Solar Design refers to the use of design **practices** that collect, store, and distribute solar energy in the form of heat in the winter and reject solar heat in the summer.

Typically windows, roof overhangs, and floors play the most critical roles in passive solar design.

4.5 Passive Solar Design

	1	2	3	4	5	total
Single Family			2	5	9	16
Multi Family			2	8	6	16
Achievable			6	9	1	16



AVERAGE RATING
Single Family: 4.4
Multi Family: 4.3
Achievability: 3.7

Comments & Recommendations:

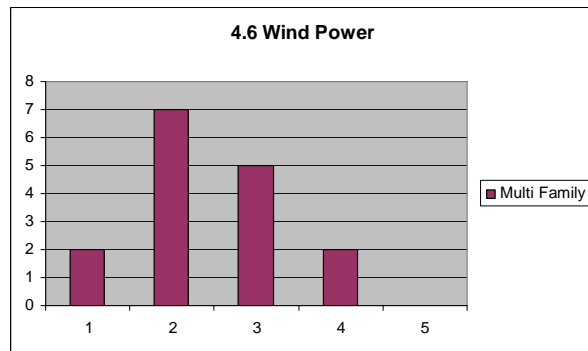
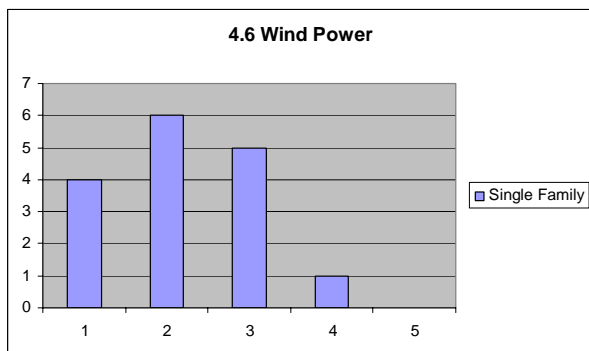
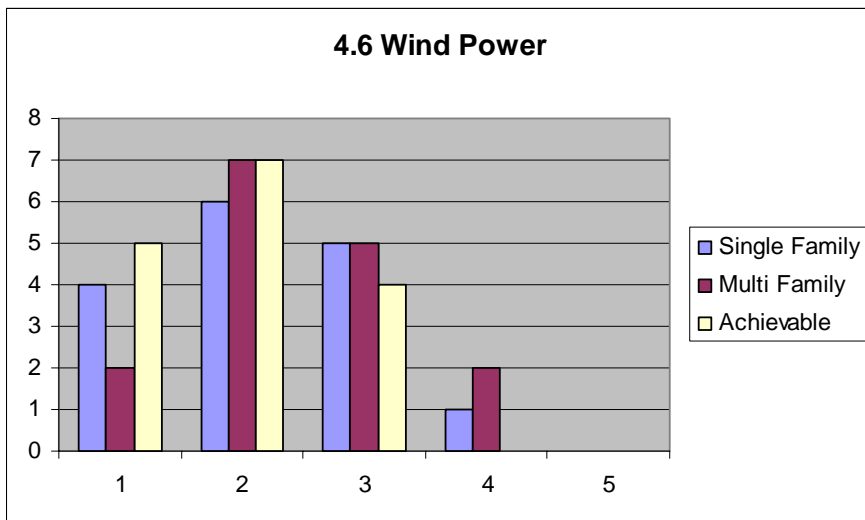
- Are overhangs an issue here? Do they keep sun out at this altitude?
- 10-12% of area as windows on South side is considered passive

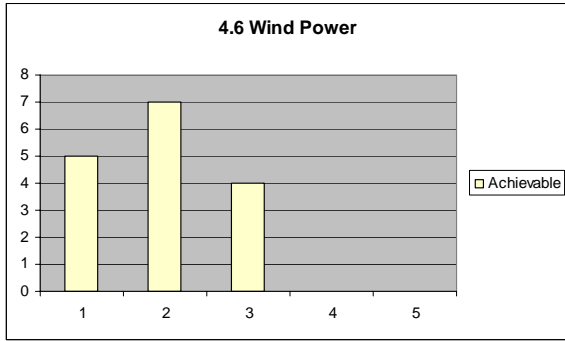
4.6 Wind Power

What: Wind Power refers to the use of **products** called turbines that capture the wind's energy with two or three propeller-like blades, which are mounted on a rotor, to generate electricity. The turbines sit high atop towers, taking advantage of the stronger and less turbulent wind at 100 feet (30 meters) or more above ground.

4.6 Wind

	1	2	3	4	5	Total
Single Family	4	6	5	1		16
Multi Family	2	7	5	2		16
Achievable	5	7	4			16





AVERAGE RATING
Single Family: 2.2
Multi Family: 2.4
Achievability: 1.9

Comments & Recommendations:

- Not really a good option for most Summit County areas
- Generally need large areas for wind turbines
- Different for Renewable Energy Credits (off-site renewable energy that is fed into the grid...see 4.9)

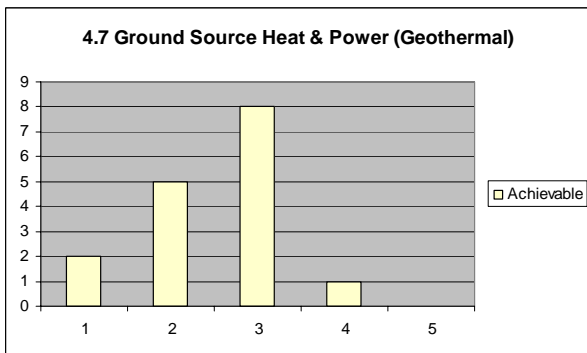
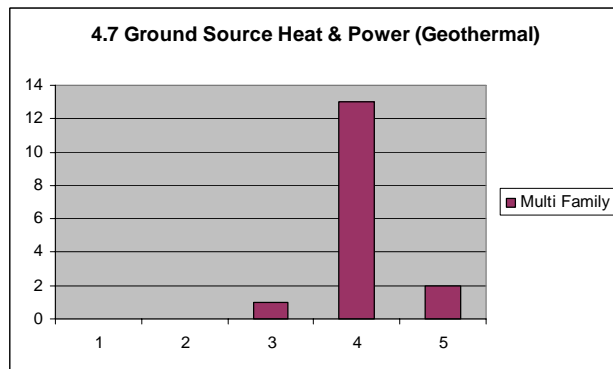
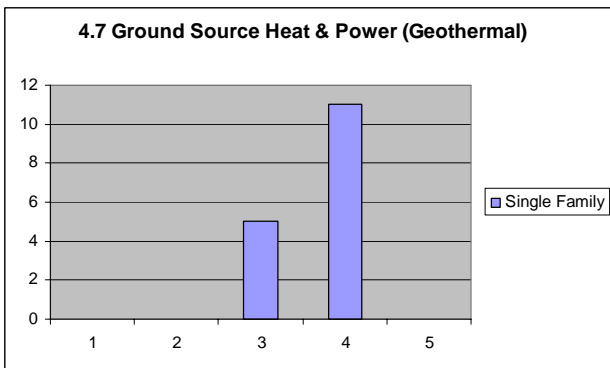
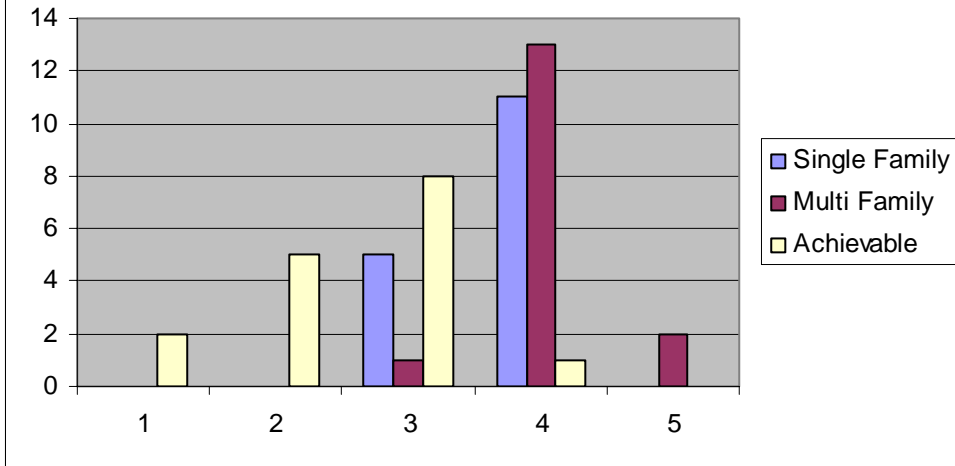
4.7 Ground Source Heat & Power (Geothermal)

What: Ground Source Heat & Power (also called Geothermal) refers to the use of mechanical and electrical system **products** that use the earth or groundwater as a heat source in winter and a heat sink in summer. Usually the geothermal system uses a closed loop system, an antifreeze liquid, and a heat transfer unit which uses the constant temperature of the earth to heat and cool a home. Typically, holes are dug vertically into the ground where the closed loop pipe system is placed. In some cases, thermal temperature variations can be used to generate electricity. *Locally, the Wendy's Gas Station Complex in Frisco used a geothermal system and the new Alpine Bank in Frisco will use a geothermal system.*

4.7 Ground Source Heat & Power (Geothermal)

	1	2	3	4	5	total
Single Family			5	11		16
Multi Family			1	13	2	16
Achievable	2	5	8	1		16

4.7 Ground Source Heat & Power (Geothermal)



AVERAGE RATING

Single Family: 3.7

Multi Family: 4.1

Achievability: 2.5

Comments & Recommendations:

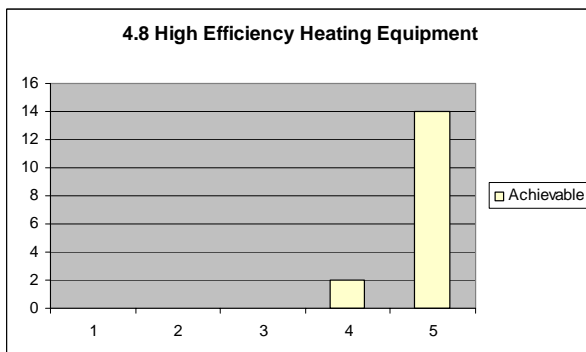
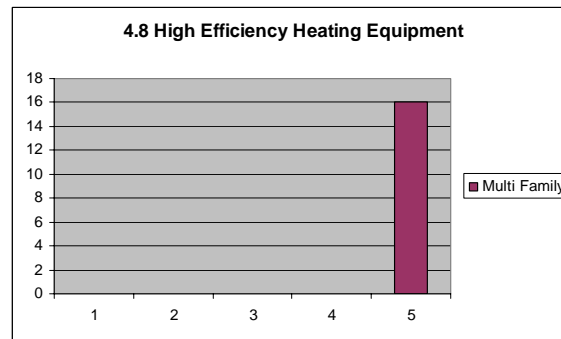
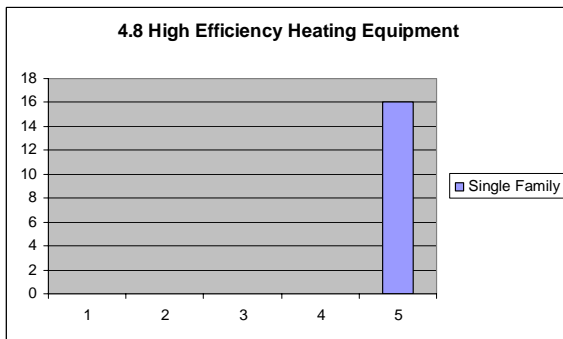
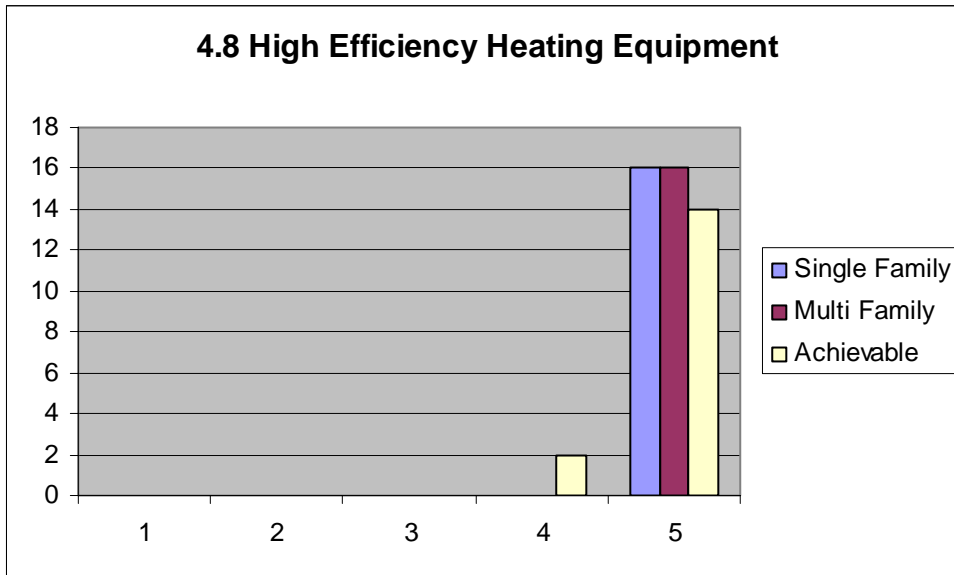
- Technology is available and used in Summit County currently
- Payback periods are pretty good

4.8(a) High Efficiency Heating Equipment

What: High Efficiency Heating Equipment refers to the use of **products** that heat a home with maximum efficiency. Generally, this topic refers to using high efficiency furnaces and boilers.

4.8 High Efficiency Heating Equipment

	1	2	3	4	5	total
Single Family					16	16
Multi Family					16	16
Achievable				2	14	16



AVERAGE RATING
Single Family: 5.0
Multi Family: 5.0
Achievability: 4.9

Comments & Recommendations:

- Tankless/on-demand hot water heaters should be included here
- Highest efficiency should be used when its available

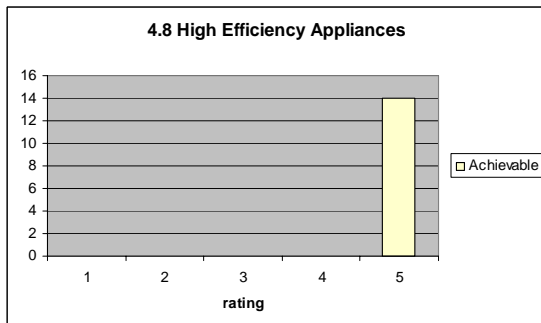
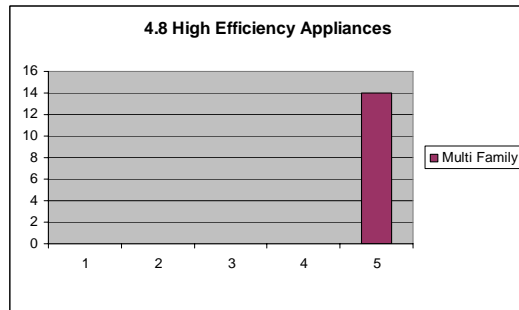
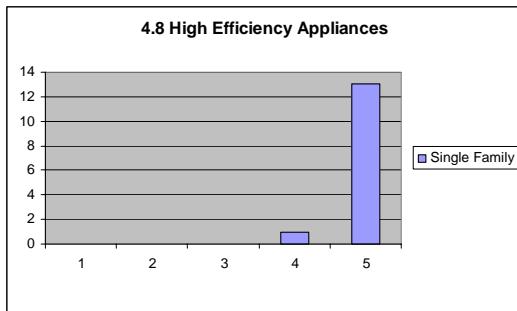
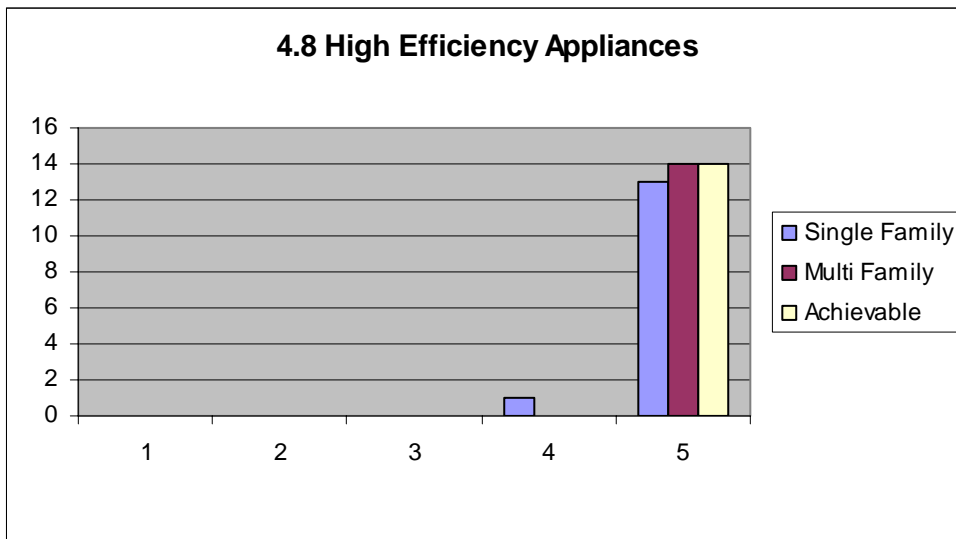
- There should be a penalty for NOT putting in high efficiency equipment.

4.8(b) High Efficiency Appliances

What: Use of home appliance **products** that use energy efficiently.

4.8 High Efficiency Appliances

	1	2	3	4	5	total
Single Family				1	13	14
Multi Family					14	14
Achievable					14	14



AVERAGE RATING

Single Family: 4.9

Multi Family: 5.0

Achievability: 5.0

Comments & Recommendations:

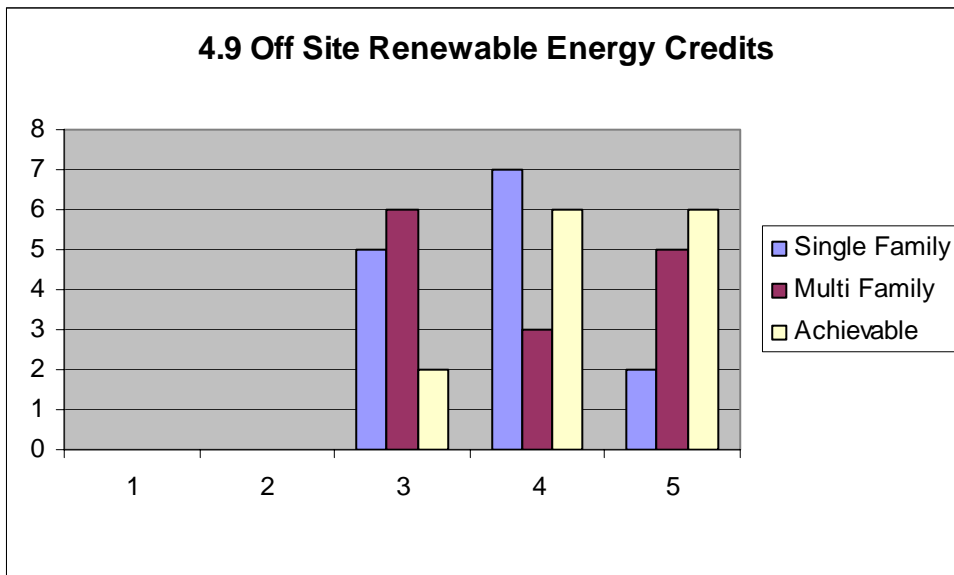
- Is there an efficiency difference between gas & electric dryers?
- Clothes lines should be in Resource Guide as “good thing to do” but not in code
- Will it be points per appliance?
- What about remodels?
- Affordable Housing & Efficient Appliances are a cost issue; but we have to remember Operating Costs

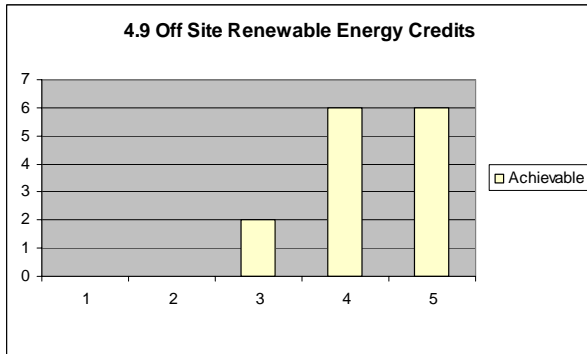
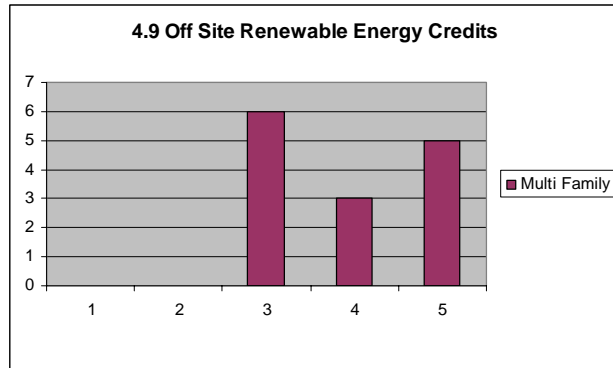
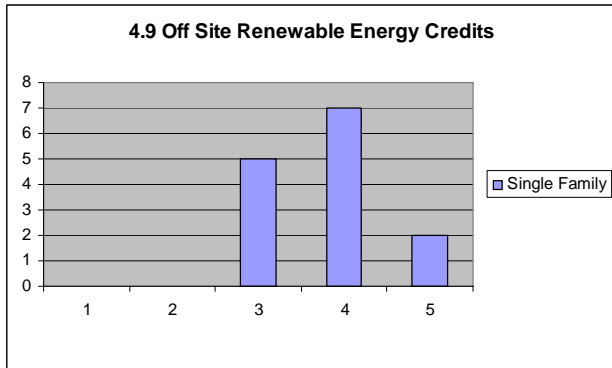
4.9 Off Site Renewable Energy Credits

What: While there is no way to dictate which power source (coal, wind, natural gas) comes to your house from the grid, you can purchase equivalent amounts of renewable energy to “return” to the grid by purchasing renewable energy credits. Off Site Renewable Energy Credits (REC) refers to purchasing **products** that supplement or fulfill your household electricity consumption with renewable energy (wind, solar, geothermal) that is generated off-site and fed into the grid.

4.9 Off Site Renewable Energy Credits

	1	2	3	4	5	total
Single Family			5	7	2	14
Multi Family			6	3	5	14
Achievable			2	6	6	14





AVERAGE RATING
Single Family: 3.8
Multi Family: 3.9
Achievability: 3.8

Comments & Recommendations:

- Difficult to enforce: how do you we know people won't sign up and then cancel?
- Just like other issues: if people want to scam they will; has to be a level of trust

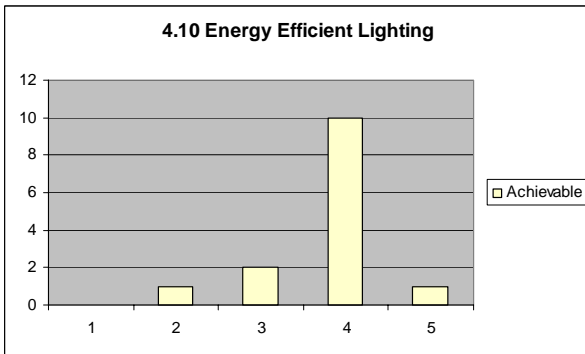
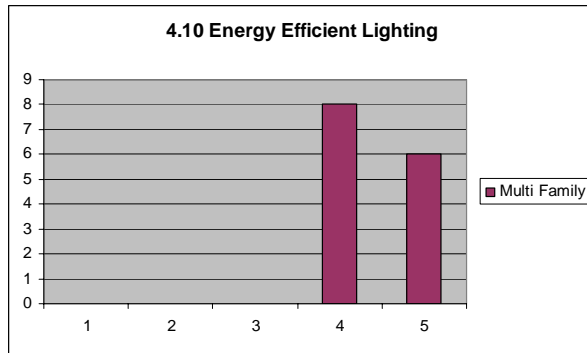
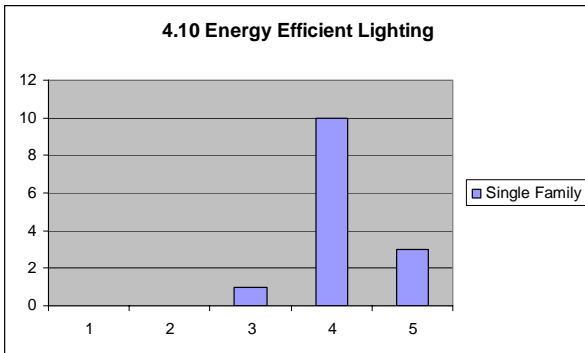
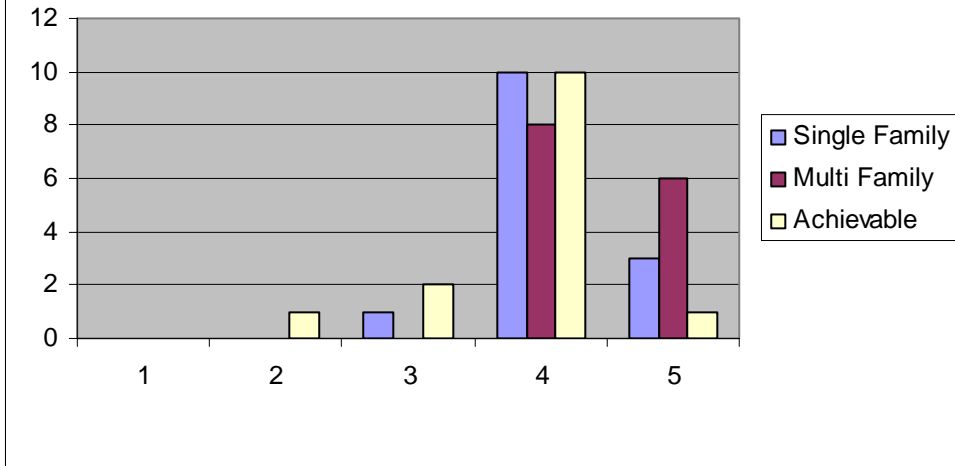
4.10 Energy Efficient Lighting

What: Energy Efficient Lighting refers to the use of lighting **products** that use less energy than the standard alternatives (type of bulbs and design of lighting).

4.10 Energy Efficient Lighting

	1	2	3	4	5	total
Single Family			1	10	3	14
Multi Family				8	6	14
Achievable		1	2	10	1	14

4.10 Energy Efficient Lighting



AVERAGE RATING

Single Family: 4.1
Multi Family: 4.4
Achievability: 3.8

Comments & Recommendations:

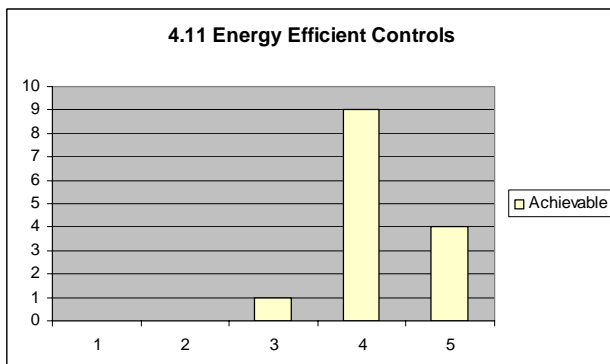
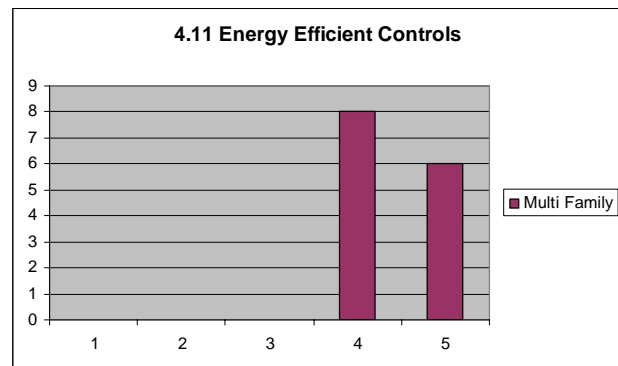
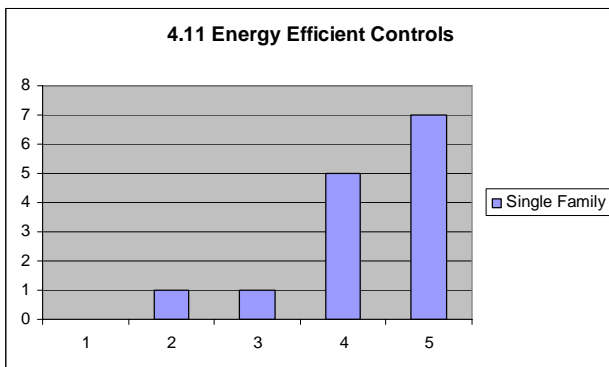
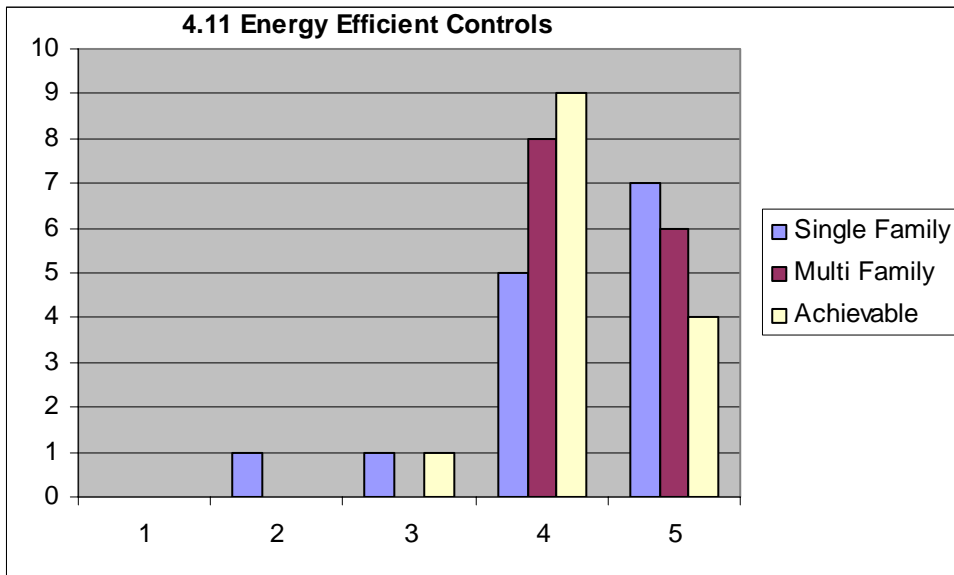
- Should include outside lighting, like LED lights
- Should include halogens as efficient
- Efficient lighting technology has room to improve – don't have bulbs that fit all lighting fixtures; three-way and dimming switches are popular
- What about reducing # of lights? Should be encouraged or included in code.

4.10 Energy Efficient Controls

What: Energy Efficient Controls refers to the use of **products** that help time and regulate temperature and light during times when the building is unoccupied or when light or heat are not needed.

4.11 Energy Efficient Controls

	1	2	3	4	5	total
Single Family		1	1	5	7	14
Multi Family				8	6	14
Achievable			1	9	4	14



AVERAGE RATING
Single Family: 4.3
Multi Family: 4.4
Achievability: 4.2

Comments & Recommendations:

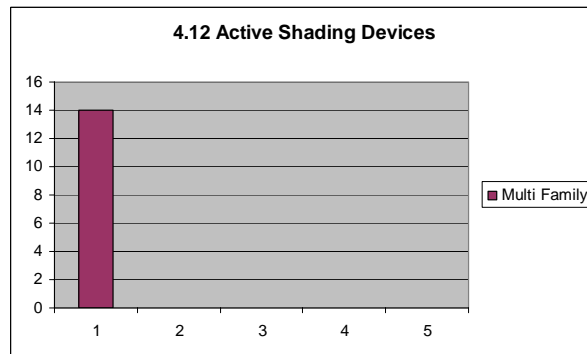
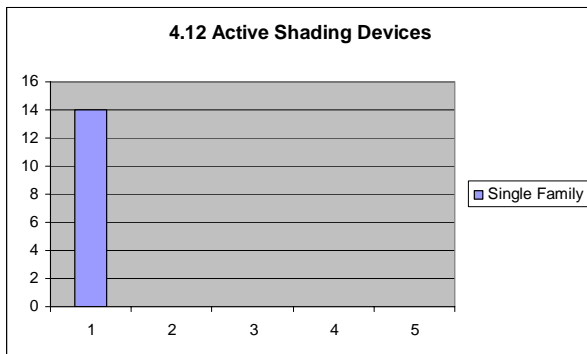
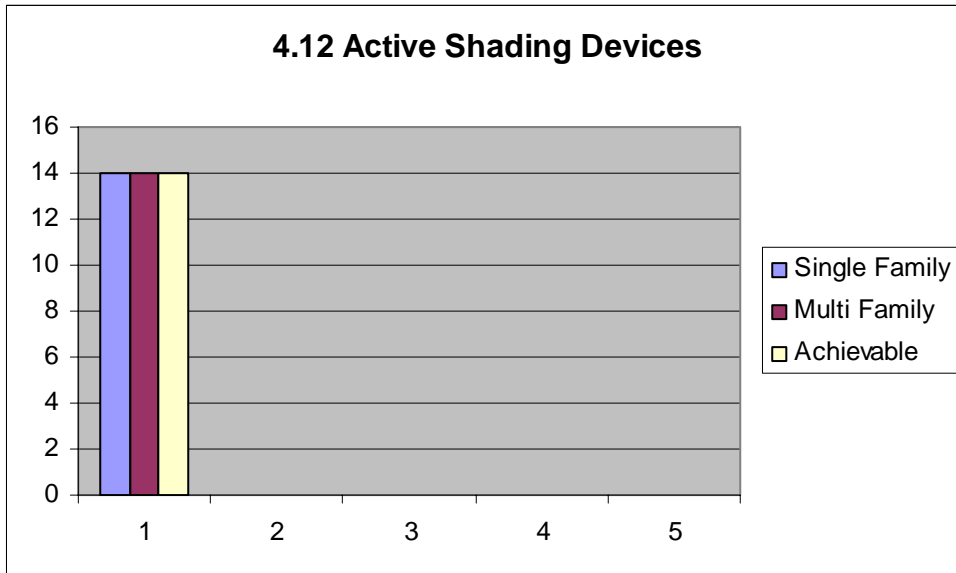
- Programmable Thermostats & Lighting Controls are affordable now
- Payback periods on these systems are good

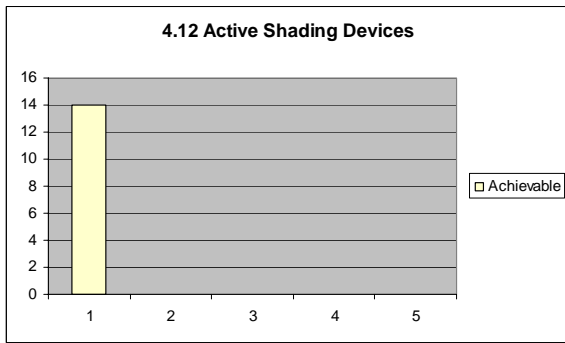
4.12 Active (Adjustable) Shading Devices

What: Active Shading refers to the use of adjustable shading **products** that let light in when you want it, and keep it out when you don't.

4.12 Active Shading Devices

	1	2	3	4	5	total
Single Family	14					14
Multi Family	14					14
Achievable	14					14





AVERAGE RATING
Single Family: 1.0
Multi Family: 1.0
Achievability: 1.0

Comments & Recommendations:

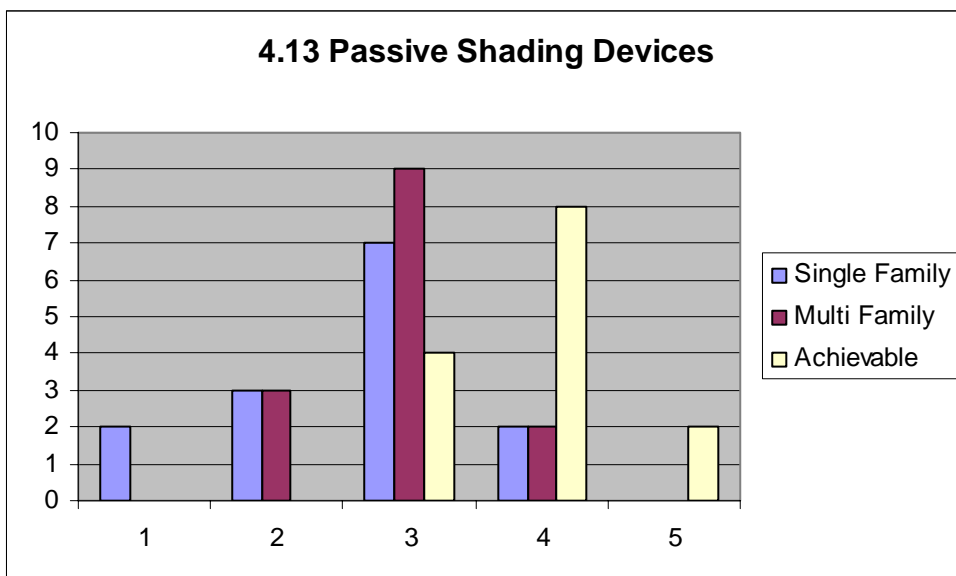
- Cooling issue more than heating
- What about winter? Let sunlight in as heat source
- Is the builder responsible for this? This is more of an operation, interior design issue.
- This is a public awareness “good thing to do, but not in code” issue – should go in the Resource Guide
- Essentially, this item got voted off the island...

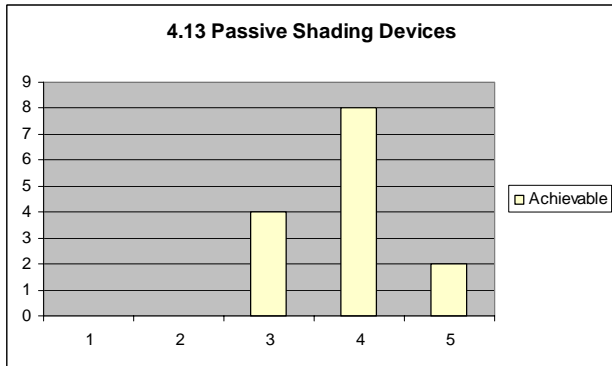
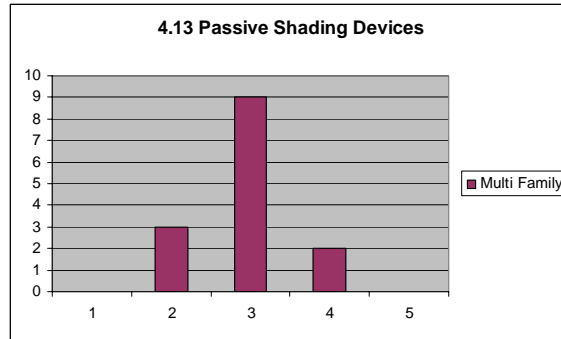
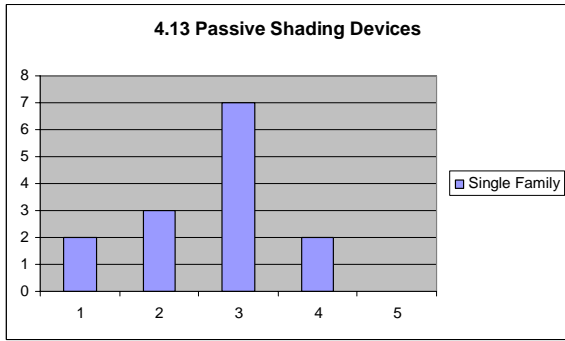
4.13 Passive (Fixed) Shading Devices

What: Passive Shading refers to the use of fixed shading **products and design practices** that let light in when you want it, and out when you don't; uses solar angles to determine design.

4.13 Passive Shading Devices

	1	2	3	4	5	total
Single Family	2	3	7	2		14
Multi Family		3	9	2		14
Achievable			4	8	2	14





AVERAGE RATING

Single Family: 2.6

Multi Family: 2.9

Achievability: 3.9

Comments & Recommendations:

- Cooling Issue more than Heating
- Location, color, and material specific
- This item can be split into other categories
- (This item was discussed & voted on – with the concept excluding windows; low-e and other windows addressed under other sections)

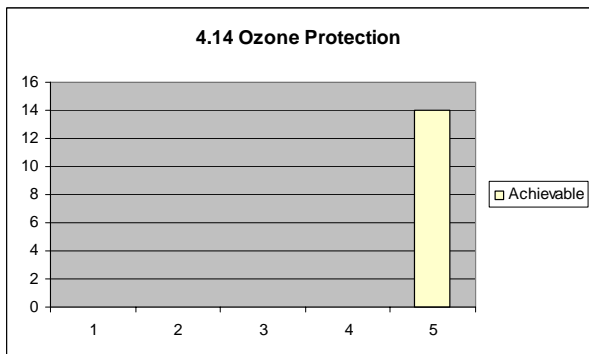
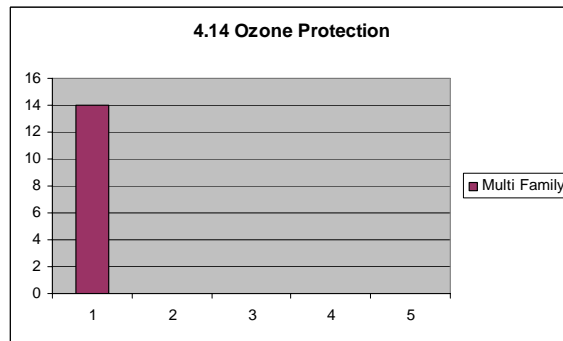
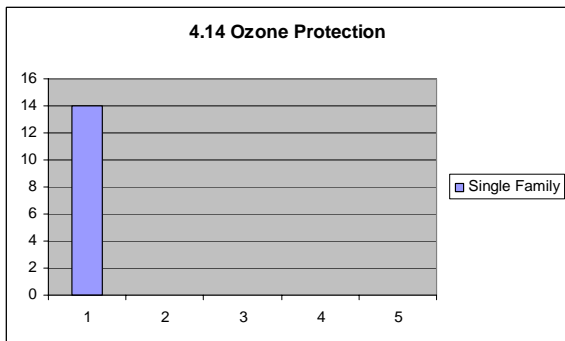
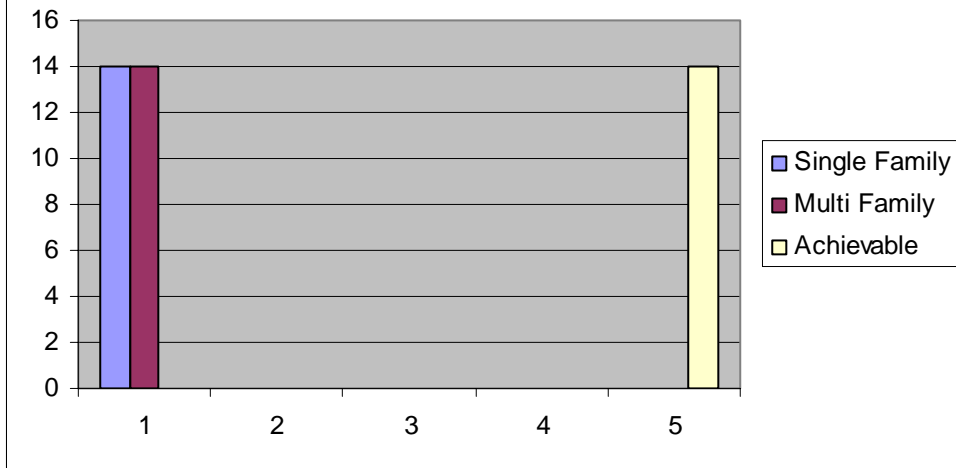
4.14 Ozone Protection

What: Ozone protection refers to the use of products that minimize or avoid the use of refrigerant gases such as CFCs, HCFCs, Halons, methyl bromide, carbon tetrachloride, and methyl chloroform.

4.14 Ozone Protection

	1	2	3	4	5	total
Single Family	14					14
Multi Family	14					14
Achievable					14	14

4.14 Ozone Protection



AVERAGE RATING

Single Family: 1.0

Multi Family: 1.0

Achievability: 5.0

Comments & Recommendations:

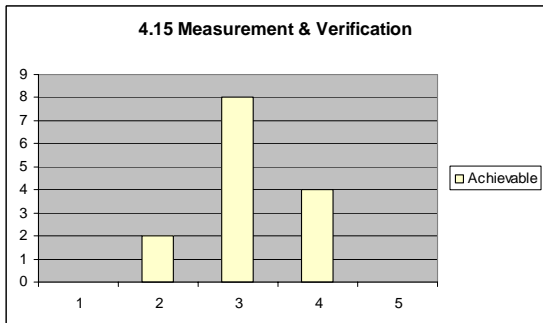
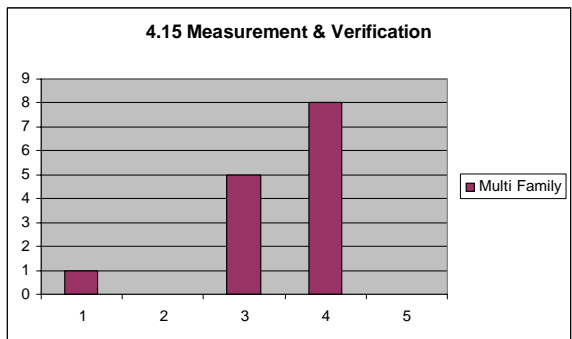
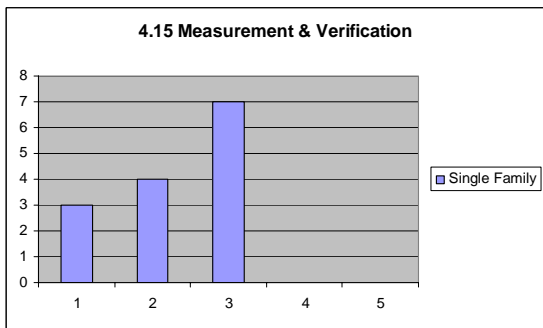
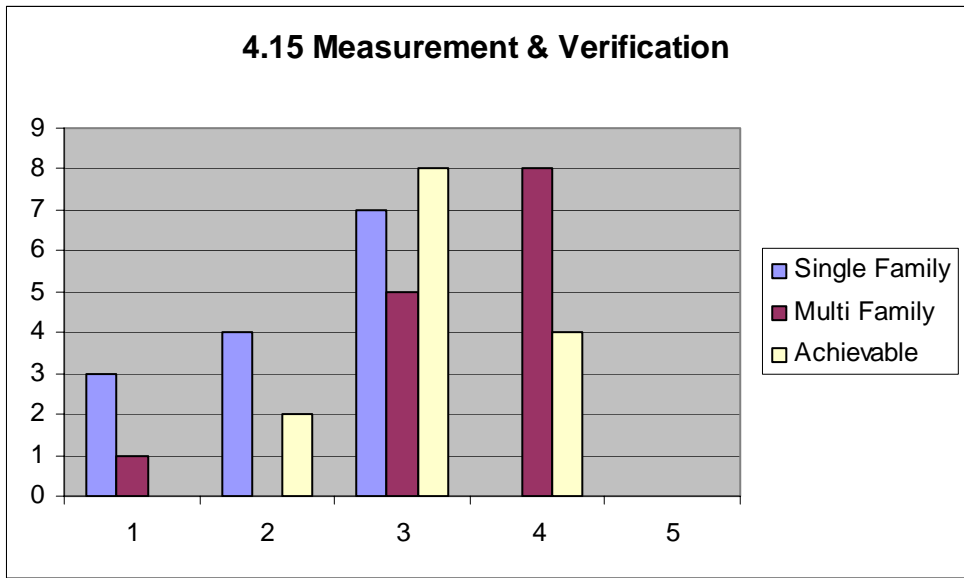
- This is mostly a cooling (air conditioning) issue
- Can be a heating issue because 2-way ceiling fans can push warm air down as well as pull cool air up.
- Ceiling fans should be moved and included in the Heating & Cooling Section.
- Essentially, this item was voted off the island....

4.15 Measurement & Verification

What: Measurement & Verification refers to the use of a wide variety of measurement practices and software products that allow a building owner to calculate energy savings.

4.15 Measurement & Verification

	1	2	3	4	5	total
Single Family	3	4	7			14
Multi Family	1		5	8		14
Achievable		2	8	4		14



AVERAGE RATING
Single Family: 2.3
Multi Family: 3.4
Achievability: 3.1

Comments & Recommendations:

- What if Builder does verification or measurement? May drive better building practices.
- This is an Administrative Step
- How does E-Star or Built Green compare to this program?
- Verification vs. Certification issue
- Is this more of an Operation Issue?
- This may be another “good thing to do; not included in code” and highlighted in resource guide.

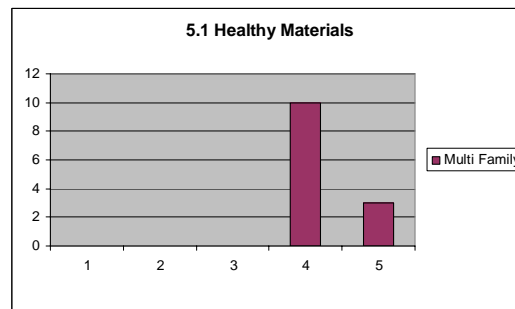
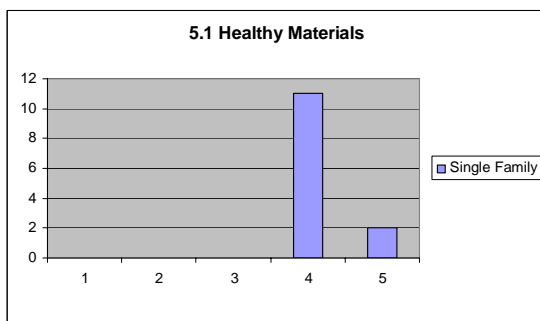
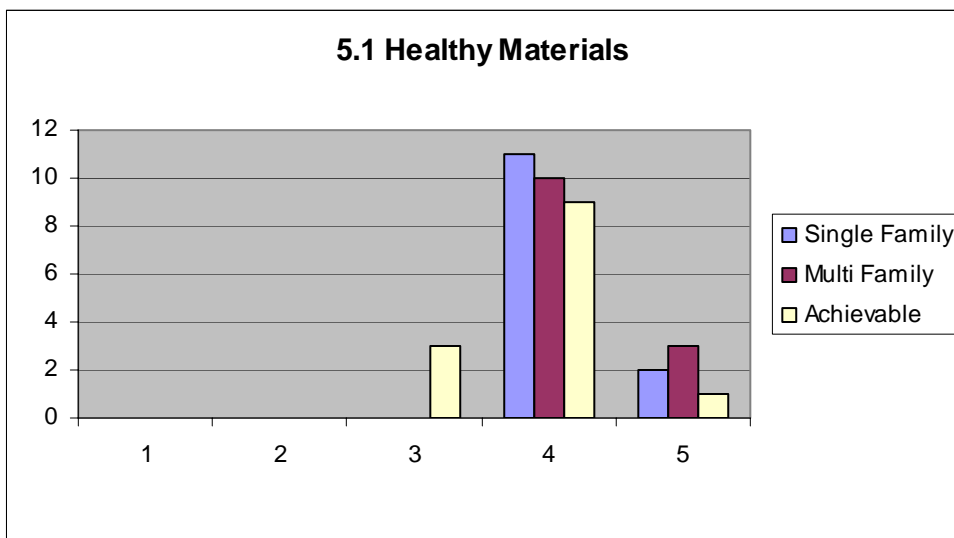
SECTION 5 – INDOOR AIR QUALITY

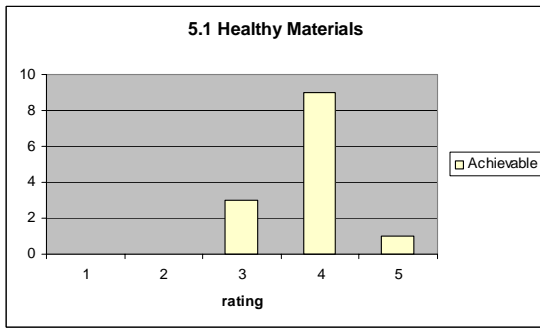
5.1 Healthy Materials

What: Use of **products** that emit no or low quantities of potentially toxic gases and fumes through their life.

5.1 Healthy Materials

	1	2	3	4	5	total
Single Family				11	2	13
Multi Family				10	3	13
Achievable			3	9	1	13





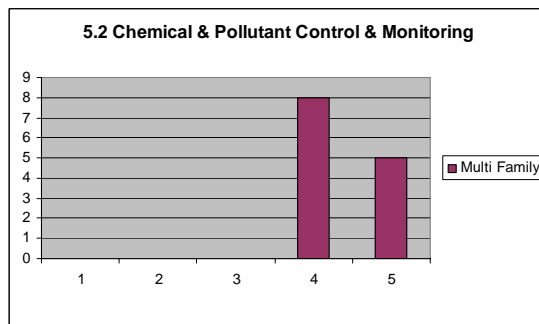
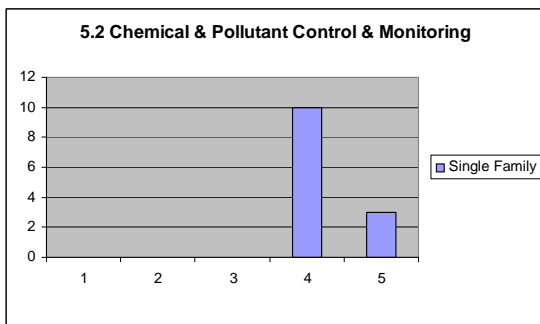
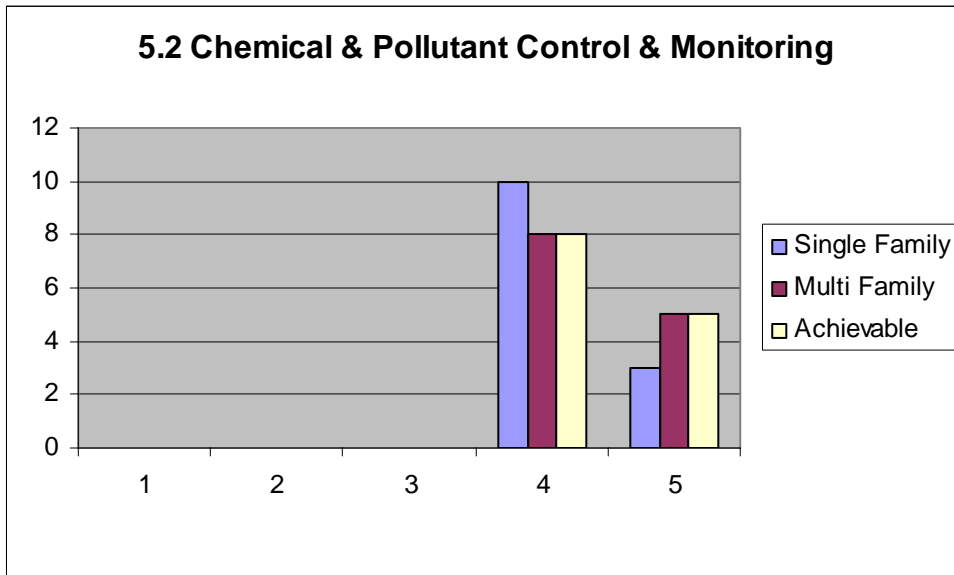
AVERAGE RATING
Single Family: 4.2
Multi Family: 4.2
Achievability: 3.8

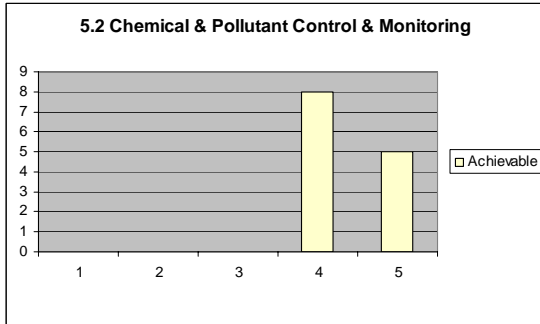
5.2 Chemical and Pollutant Control & Monitoring

What: Use of **practices** that minimize off-gassing or emission of potentially toxic materials within the home.

5.2 Chemical and Pollutant Control & Monitoring

	1	2	3	4	5	total
Single Family				10	3	13
Multi Family				8	5	13
Achievable				8	5	13





AVERAGE RATING

Single Family: 4.2

Multi Family: 4.4

Achievability: 4.4

Comments & Recommendations:

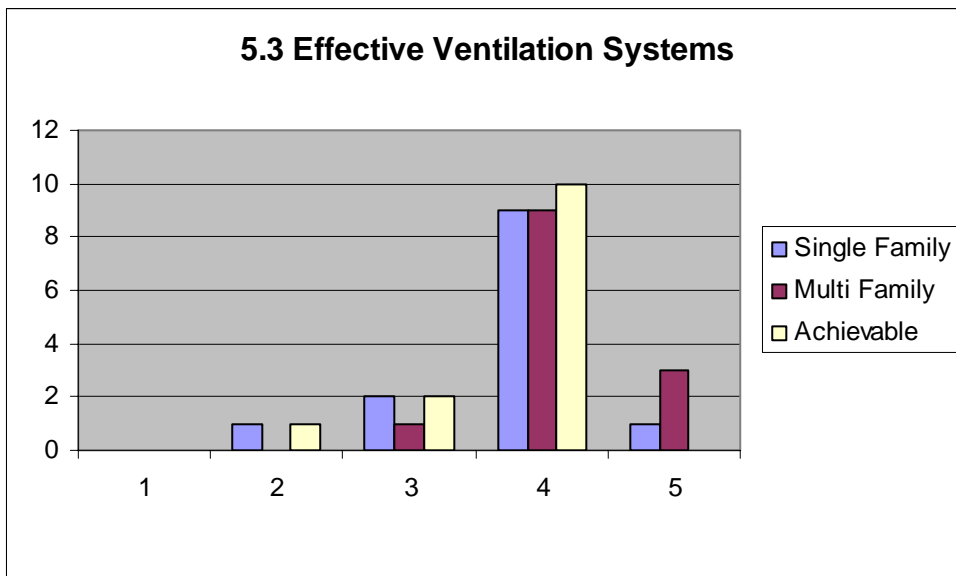
- Consider location of living space vs. garage
- Include CO monitoring here
- Include information about tobacco smoke, CO2, storage of materials in Resource Guide

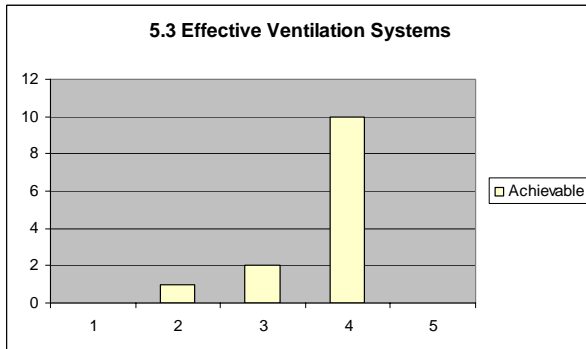
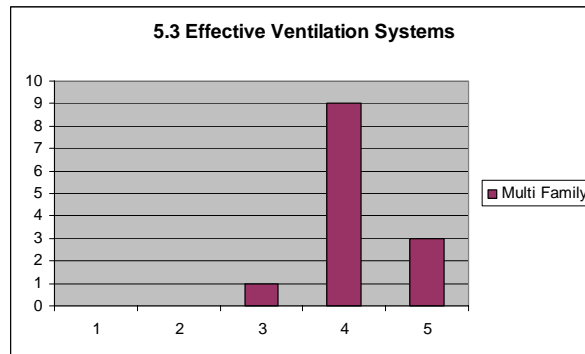
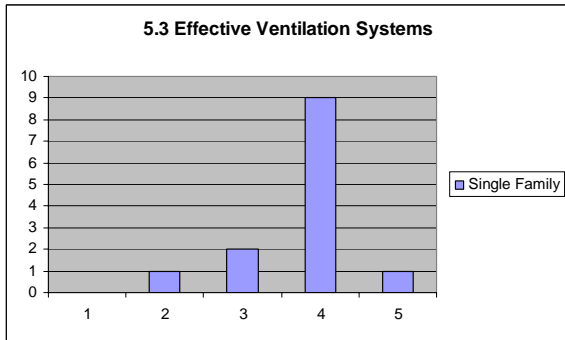
5.3 Effective Ventilation Systems

What: Use of **products and practices** that provide adequate ventilation in a home.

5.3 Effective Ventilation Systems

	1	2	3	4	5	total
Single Family		1	2	9	1	13
Multi Family			1	9	3	13
Achievable		1	2	10		13





AVERAGE RATING
Single Family: 3.8
Multi Family: 4.2
Achievability: 3.7

Comments & Recommendations:

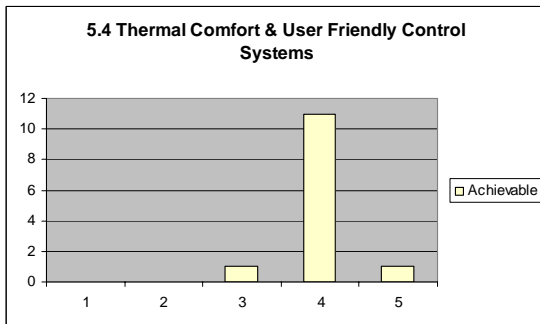
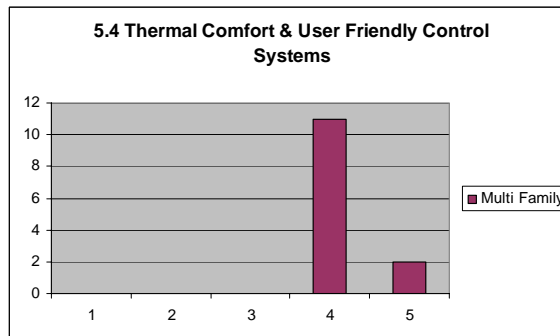
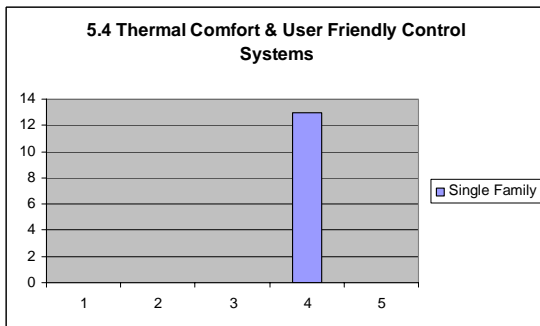
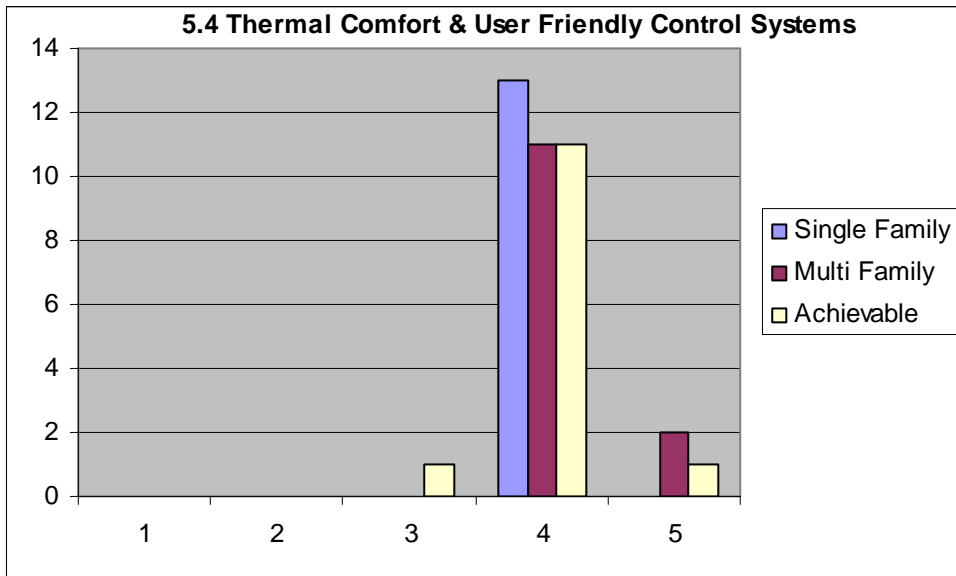
- This is already mostly in code (2003)
- Hydronic systems are more prevalent
- Can be a cost issue
- Air quality issues are an education issue – include in resource guide

5.4 Thermal Comfort & User Friendly Controls

What: Use of **products and practices** that promote comfortable heating and cooling for building occupants.

5.4 Thermal Comfort & User Friendly Controls

	1	2	3	4	5	total
Single Family				13		13
Multi Family				11	2	13
Achievable			1	11	1	13



AVERAGE RATING
Single Family: 4.0
Multi Family: 4.2
Achievability: 4.0

Comments & Recommendations:

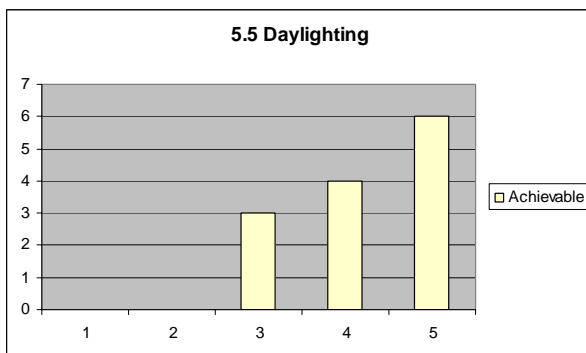
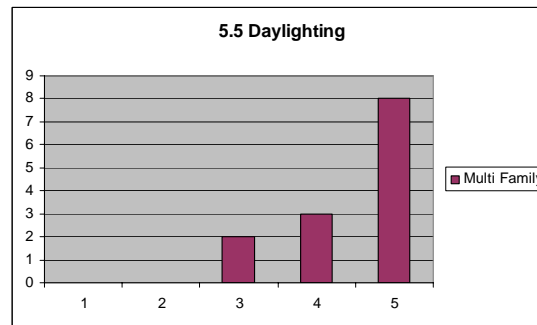
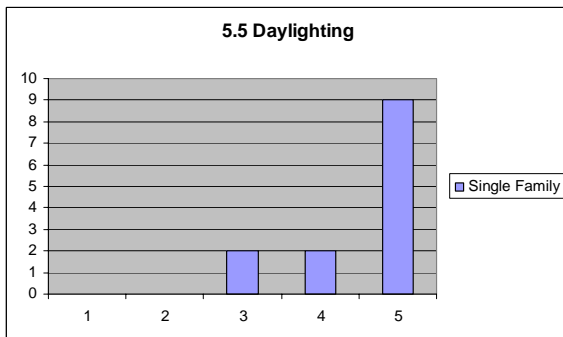
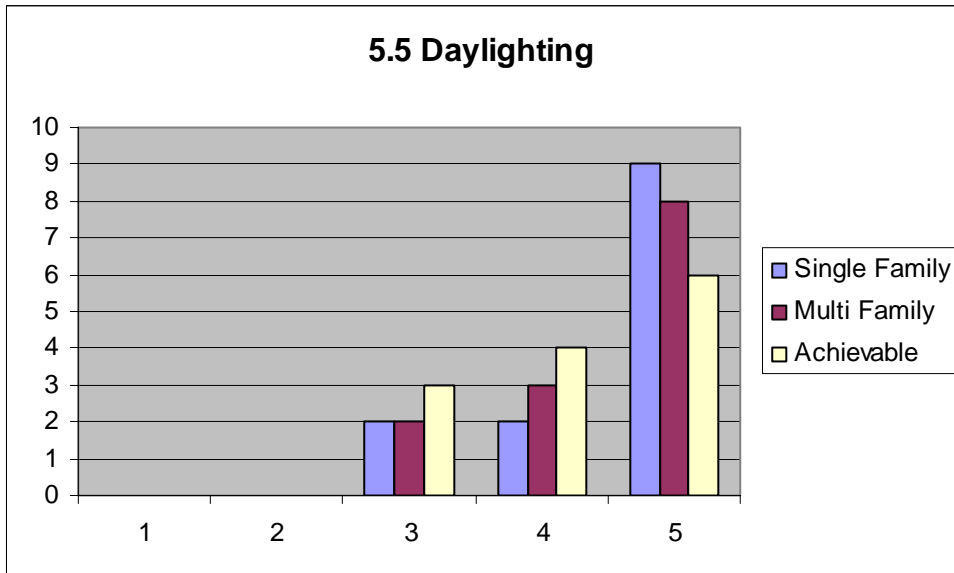
- Programmable Thermostats and heated “zones” for homes help conserve energy (especially with lock-offs)
- Individual controls are important for multi-family units
- Multiple vents allow for more individual control in rooms

5.5 Daylighting

What: Use of design **practices** that allow good daylight into individual rooms in a home possible.

5.5 Daylighting

	1	2	3	4	5	total
Single Family			2	2	9	13
Multi Family			2	3	8	13
Achievable			3	4	6	13



AVERAGE RATING

Single Family: 4.5

Multi Family: 4.5

Achievability: 4.2

Comments & Recommendations:

- Daylight is more of an issue than views; natural light = less energy use
- Light tubes should be encouraged

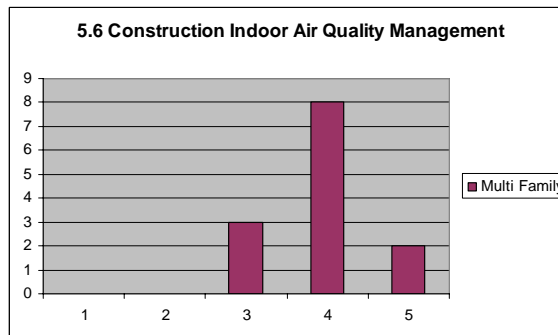
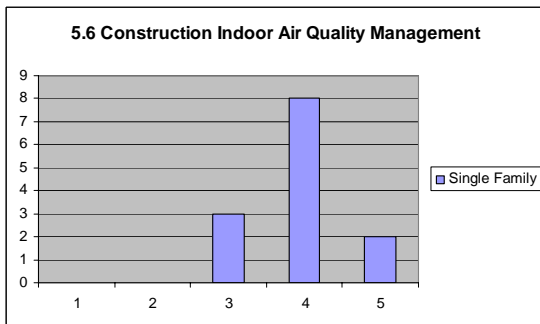
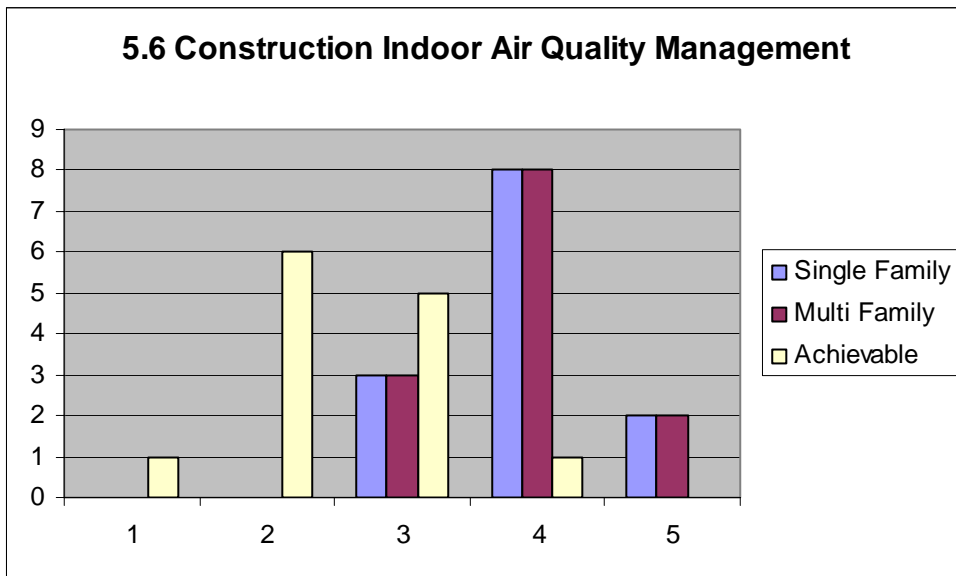
- Windows are good, even in closets, bedrooms, garages
- Put views and “happy” factor into resource guide

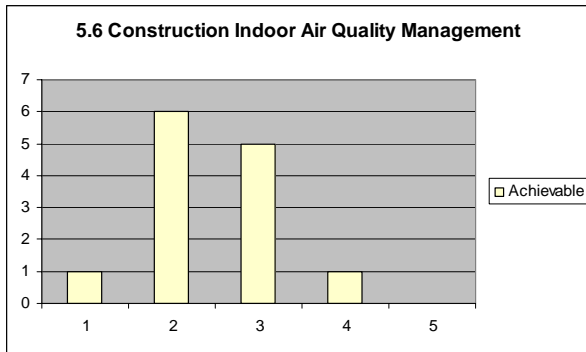
5.6 Construction Indoor Air Quality Management Plan

What: Development a construction plan that utilizes **practices** that minimize or eliminate introduction of dust, pollutants, and other potentially harmful materials into the building.

5.6 Construction Indoor Air Quality Management

	1	2	3	4	5	total
Single Family			3	8	2	13
Multi Family			3	8	2	13
Achievable	1	6	5	1		13





AVERAGE RATING

Single Family: 3.6

Multi Family: 3.6

Achievability: 2.5

Comments & Recommendations:

- How do you measure or monitor? Multiple inspections do happen...self certification? Warnings?
- 2 week building flush out is totally unrealistic and very problematic
- Education is important here

OTHER IMPORTANT ISSUES

(no rating available, but identified as important issues that should be addressed)

- Owners manual for home-owner
- Building commissioning (for multi-family, large projects)
- Rough-in for future technologies and affordability
- Highly resource intensive materials and designs:
 - Decorative fireplaces (inside and outside)
 - Heated driveways and sidewalks
 - Heated outdoor pools and spas
 - Very large homes (5000 square feet+)
- Use of local beetle-kill wood
 - Wood burning stoves (with efficiency requirements)

ORDERED RATING:

4.1 Upgrade Insulation

AVERAGE RATING = 5.0

Single Family: 5.0

Multi Family: 5.0

Achievability: 5.0

4.8(a) High Efficiency Heating Equipment

AVERAGE RATING = 4.97

Single Family: 5.0

Multi Family: 5.0

Achievability: 4.9

4.8(b) High Efficiency Appliances

AVERAGE RATING = 4.97

Single Family: 4.9

Multi Family: 5.0

Achievability: 5.0

2.2 Water Efficient Landscaping

AVERAGE RATING = 4.93

Single Family: 4.8

Multi Family: 5.0

Achievability: 5.0

4.2 Upgrade Windows & Doors

AVERAGE RATING = 4.83

Single Family: 5.0

Multi Family: 5.0

Achievability: 4.5

3.9 Recycling Program for Operations

AVERAGE RATING = 4.47

Single Family: 4.2

Multi Family: 4.6

Achievability: 4.6

5.5 Daylighting

AVERAGE RATING = 4.4

Single Family: 4.5

Multi Family: 4.5

Achievability: 4.2

- 5.2 Chemical & Pollutant Control & Monitoring
AVERAGE RATING = 4.33
Single Family: 4.2
Multi Family: 4.4
Achievability: 4.4
- 4.11 Energy Efficient Controls
AVERAGE RATING = 4.3
Single Family: 4.3
Multi Family: 4.4
Achievability: 4.2
- 3.3 Recycled Content
AVERAGE RATING = 4.2
Single Family: 4.2
Multi Family: 4.3
Achievability: 4.1
- 3.8 Construction Waste Management
AVERAGE RATING = 4.13
Single Family: 4.3
Multi Family: 4.7
Achievability: 3.4
- 4.5 Passive Solar Design
AVERAGE RATING = 4.13
Single Family: 4.4
Multi Family: 4.3
Achievability: 3.7
- 3.6 OVE Framing
AVERAGE RATING = 4.1
Single Family: 4.2
Multi Family: 4.2
Achievability: 3.9
- 4.10 Energy Efficient Lighting
AVERAGE RATING = 4.1
Single Family: 4.1
Multi Family: 4.4
Achievability: 3.8
- 5.4 Thermal Comfort & User Friendly Controls
AVERAGE RATING = 4.07
Single Family: 4.0
Multi Family: 4.2
Achievability: 4.0

- 5.1 Healthy Materials
AVERAGE RATING = 4.07
 - Single Family: 4.2
 - Multi Family: 4.2
 - Achievability: 3.8

- 4.3 Active Solar Design – Hot Water
AVERAGE RATING = 3.97
 - Single Family: 4.3
 - Multi Family: 4.3
 - Achievability: 3.3

- 3.4 Rapidly Renewable Materials
AVERAGE RATING = 3.93
 - Single Family: 3.9
 - Multi Family: 3.9
 - Achievability: 4.0

- 2.1 Water Use Reduction
AVERAGE RATING = 3.9
 - Single Family: 3.8
 - Multi Family: 4.2
 - Achievability: 3.7

- 5.3 Effective Ventilation Systems
AVERAGE RATING = 3.9
 - Single Family: 3.8
 - Multi Family: 4.2
 - Achievability: 3.7

- 4.9 Off Site Renewable Energy Credits
AVERAGE RATING = 3.83
 - Single Family: 3.8
 - Multi Family: 3.9
 - Achievability: 3.8

- 4.4 Active Solar Design – PV Systems
AVERAGE RATING = 3.43
 - Single Family: 3.8
 - Multi Family: 3.8
 - Achievability: 2.7

- 4.7 Ground Source Heat & Power
AVERAGE RATING = 3.43
 - Single Family: 3.7
 - Multi Family: 4.1
 - Achievability: 2.5

3.5 Local & Regional Materials

AVERAGE RATING = 3.4

Single Family: 3.4
Multi Family: 3.4
Achievability: 3.4

3.1 Deconstruction

AVERAGE RATING = 3.23

Single Family: 3.6
Multi Family: 4.0
Achievability: 2.1

5.6 Construction IAQ Management Plan

AVERAGE RATING = 3.23

Single Family: 3.6
Multi Family: 3.6
Achievability: 2.5

4.13 Passive Shading Devices

AVERAGE RATING = 3.13

Single Family: 2.6
Multi Family: 2.9
Achievability: 3.9

4.15 Measurement & Verification

AVERAGE RATING = 2.93

Single Family: 2.3
Multi Family: 3.4
Achievability: 3.1

3.7 Certified Wood Products

AVERAGE RATING = 2.9

Single Family: 3.3
Multi Family: 3.1
Achievability: 2.3

4.14 Ozone Protection

AVERAGE RATING = 2.33

Single Family: 1.0
Multi Family: 1.0
Achievability: 5.0

3.2 Resource Reuse
AVERAGE RATING = 2.27
Single Family: 2.8
Multi Family: 2.4
Achievability: 1.6

4.6 Wind Power
AVERAGE RATING = 2.17
Single Family: 2.2
Multi Family: 2.4
Achievability: 1.9

4.12 Active Shading Devices
AVERAGE RATING = 1.0
Single Family: 1.0
Multi Family: 1.0
Achievability: 1.0

Ratings grouped by section (Water, Materials, Energy, Etc)

SECTION 2 - WATER EFFICIENCY

Water Efficient Landscaping = 4.93
Water Use Reduction = 3.0

SECTION 3 – MATERIALS & RESOURCE EFFICIENCY

Recycling Program = 4.47
Recycled Content Materials = 4.2
Construction Waste Management = 4.13
OVE Framing = 4.1
Rapidly Renewable = 3.93
Local & Regional Materials = 3.4
Deconstruction = 3.23
Certified Wood Products = 2.9
Resource Reuse = 2.27

SECTION 4 – ENERGY EFFICIENCY

Upgrade Insulation = 5.0
High Efficiency Heating Equipment = 4.97
High Efficiency Appliances = 4.97
Upgrade Windows & Doors = 4.83
Energy Efficient Controls = 4.3
Passive Solar Design = 4.13
Energy Efficient Lighting = 4.1
Active Solar Hot Water System = 3.97
Off Site Renewable Energy Credits = 3.83
Active Solar PV Systems – 3.43

Geothermal (Ground Source) Systems = 3.43
Passive Shading = 3.13
Measurement & Verification = 2.93
Ozone Protection = 2.33
Wind Power = 2.17
Active Shading = 1.0

SECTION 5 – INDOOR AIR QUALITY

Daylighting = 4.4
Chemical & Pollutant Control & Monitoring = 4.33
Thermal Comfort & User Friendly Controls = 4.07
Healthy Materials = 4.07
Effective Ventilation Systems = 3.9
Construction IAQ Management = 3.23

Discussion on baseline home size

At the last meeting on September 21, the EBAG discussed the concept of a baseline home, or an average home in Summit County. A baseline home size may be used in the code as a starting point for a points-based system because larger homes use more resources. Ranges in the discussion went from 2000 square feet to 3500 square feet, though most were in the 3000 square foot range. It was noted that the Residential LEED program won't certify homes over 3500 square feet. Consensus was reached that a 3 bedroom, 2 bathroom home with a garage was about 3000 square feet.

Notes on Cost and Schedule Impact Discussion

Early in the process, some attempts were made to quantify the cost and schedule impacts of efficient building techniques, products, and concepts. However, it was determined that until a code is designed, there is no way to accurately quantify these costs. It is likely that there will be some cost and schedule impacts for certain parts of the code.

Appendices:

Appendix A: List of Efficient Building Advisory Group

Not all group members attended every meeting. A list of attendance is available upon request.

Ken Colvin, Colvin Construction
Thomas Davidson, Vail Resorts
Jim Dexter, Summit Professional Services
Mark Gage, Town of Frisco
Tim Pendleton, Town of Frisco
Mark Gee, Monroe & Newell Engineers
Bob Griffith, Trilogy Partners
Peter Grosshuech, Town of Breckenridge
Megan Hadaway, Summit Green Building Project
Mary Hart, Hart Howerton
Verne Hedges, Aspen Meadow Construction & Summit County Builders Association
Tom Hookanson, Ace Insulation
Steve Hornback, Town of Montezuma
Mark Leidal, Town of Silverthorne
Lina Lesmes, Town of Frisco

Randy May, Vail Resorts
Glen Morgan, Town of Breckenridge
Sonny Neely, Neely Architecture
Maeve Nevins, Hart Howerton
Thad Noll, Summit County Government
Kate Noonan, Summit County Government
Don Parret, Summit Association of Realtors
Larry Renfroe, Summit County Government
Jon Rovick, Spirit Builders
Jennifer Schenk, Intrawest
Jaymes Shackelford, Trilogy Partners
Matt Stais, Summit Green Building Project/High Country Conservation Center
Pete Turner, Town of Blue River
Freddy Valdez, Valdez Architects
Rick Weinman, Town of Silverthorne
Carly Wier, High Country Conservation Center
Eric Westerhof, Innovative Energy
Jerry Westhoff, Baker, Hogan, Houx
Melissa Wyatt, Town of Dillon

Appendix B: Outline of Concepts (from LEED Program)

1.0 Site & Community

- 1.1 Basis for Program
- 1.2 Scope of Program
- 1.3 Sustainable Site Selection
- 1.4 Alternative Transportation
- 1.5 Reduced Site Disturbance
- 1.6 Storm Water Management
- 1.7 Building Orientation
- 1.8 Efficient Landscaping
- 1.9 Simple Building Footprint
- 1.10 Light Pollution Reduction
- 1.11 Reduced Heat Islands

2.0 Water Efficiency

- 2.1 Water Use Reduction
- 2.2 Wastewater Technologies
- 2.3 Water Efficient Landscaping

3.0 Material & Resource Efficiency

- 3.1 Deconstruction
- 3.2 Resource Reuse
- 3.3 Recycled Content
- 3.4 Rapidly Renewable Materials
- 3.5 Local & Regional Materials
- 3.6 OVE Framing
- 3.7 Certified Wood Products
- 3.8 Construction Waste Management
- 3.9 Recycling Program for Operations

- 4.0 Energy Efficiency
 - 4.1 Upgrade Insulation
 - 4.2 Upgrade Windows & Doors
 - 4.3 Active Solar Design
 - 4.4 Passive Solar Design
 - 4.5 Wind Power
 - 4.6 Ground Source Heat & Power
 - 4.7 High Efficiency Heating Equipment
 - 4.8 High Efficiency Appliances
 - 4.9 Off Site Renewable Energy Credits
 - 4.10 Energy Efficient Lighting
 - 4.11 Energy Efficient Controls
 - 4.12 Active Shading Devices
 - 4.13 Passive Shading Devices
 - 4.14 Ozone Protection
 - 4.15 Measurement & Verification

- 5.0 Indoor Air Quality
 - 5.1 Healthy Materials
 - 5.2 Chemical & Pollutant Control
 - 5.3 Carbon Dioxide Monitoring
 - 5.4 Tobacco Smoke Control
 - 5.5 Effective Ventilation Systems
 - 5.6 Thermal Comfort
 - 5.7 User Friendly Control Systems
 - 5.8 Daylight & Views
 - 5.9 Construction IAQ Management Plan

- 6.0 Education & Innovation
 - 6.1 Owners Manual
 - 6.2 Building Commissioning
 - 6.3 New Technologies
 - 6.4 Future Technologies
 - 6.5 Other

Appendix C – attached (PDF – Flow Chart of EBAG Process)