The Green Building Revolution:

A Primer for Plumbing and Mechanical Professionals

By Jane Lee

In the very recent past, "green" building principles were part of a fringe movement — one that many associated with patchouli-scented tree huggers shod in Birkenstocks rather than as a forward-thinking trend of the future. But as more and more homeowners, developers, and corporations have begun to realize the viability — both financial and environmental — of implementing green technologies into their homes and offices, the movement has started to gain considerable momentum. Green building is becoming less a blip on the radar, and more the standard by which new construction is measured. So how does the new push toward eco-friendly construction affect those in the plumbing and mechanical industries?

green (grēn) *adj.*

First, let's begin with a quick primer on what green building is. In a nutshell, to be "green" means to be environmentally responsible. The goal of using green technologies is to increase a building's overall efficiency and reduce its "footprint," or total impact, on the environment. This could range from the materials used for construction and how those materials were collected, to how the building itself harvests energy and uses water. Also called "sustainable building" or "sustainable design," these principles can start from the ground up, from initial design and construction all the way through operation and maintenance, or they can be implemented in stages into already-existing buildings. The concept of sustainability goes to the heart of the green building movement; the main objective of striving to minimize a building's footprint is to create a structure that efficiently utilizes renewable resources and produces as little waste as possible, reducing negative impact on the environment by essentially becoming a self-sustained unit.

The cost of going green

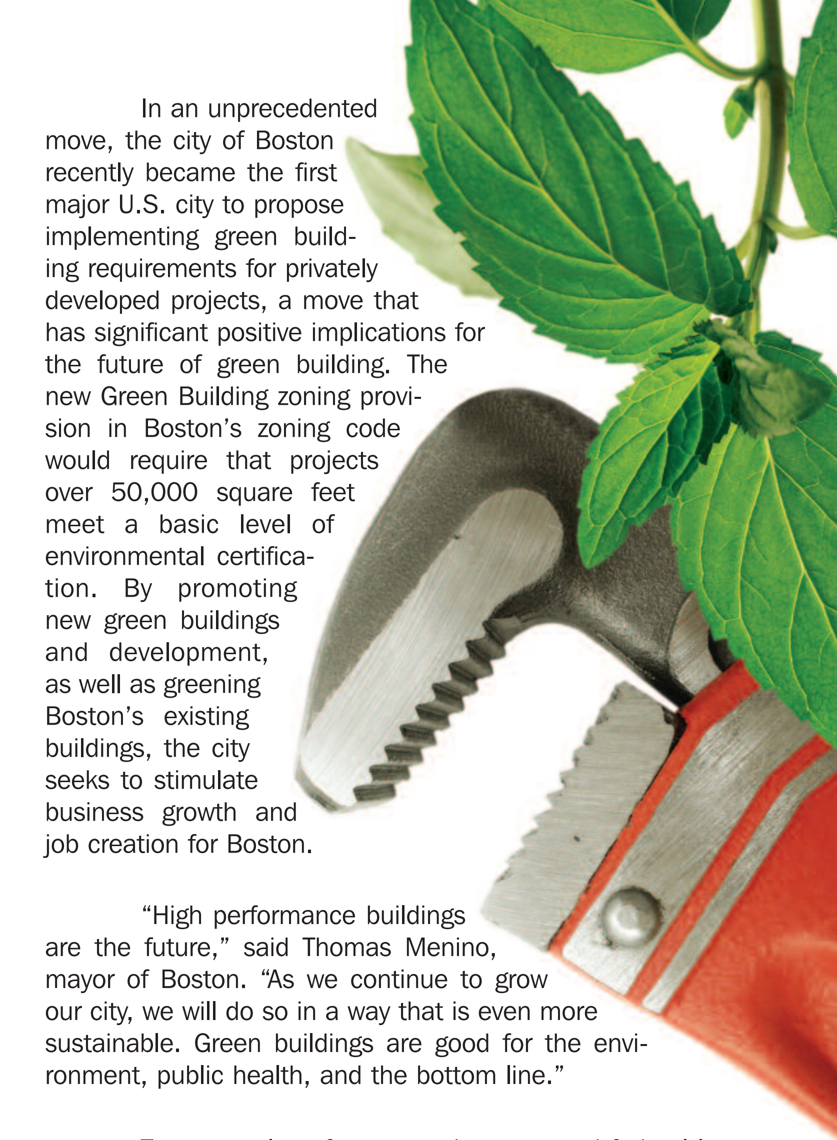
Sound expensive? Maybe in the past, but with greater acceptance of green design pushing it into the mainstream, environmentally friendly technologies are growing increasingly cost effective. In a 2003 report to California's Sustainable Building Task Force, researchers acknowledged what they called the "green premium," but an analysis of thirty-three green buildings in that report showed that the average reported cost was in fact only around two percent higher than that of a standard, or non-green, building.

Even more convincingly, in a 2004 report by Davis Langdon, a cost consulting company, analysts found that the 138 buildings in their data pool presented no significant differences in average cost per square foot between green and standard buildings. In fact, most of the buildings they studied achieved green goals without additional funding, suggesting that construction projects can incorporate sustainable design without substantial added expense. However, the report emphasized the potential for wide variations in cost outside of its data sample based on other factors, such as demographic location and what the company terms the "bidding climate," or the response of builders to the green requirements in the contract. But whether or not actual up-front costs end up being higher than with standard construction, it is arguable that the long-term benefits of building green will flesh out through reduced operating costs, tax credits, government subsidies, and enhanced resale value.

"Our house is all electric, no gas," said Lake Arrowhead, California resident James Bellis, whose family switched entirely to solar power in spring 2005. "The initial cost of installing the solar system was about $45,000, but it dropped to around $30,000 after tax credits and rebates. It seemed like a lot at first, but when the first electric bill came in at 19¢ — yes, cents — I knew it was well worth it."

Who's going green?

Though spending more now to save more in the future may sound like a blind leap of faith to many, the green movement has earned enough respect to get several major cities, states, corporations, and even the federal government on board. At least sixty cities and regions across the country have adopted municipal green building practices, as have a number of states, including Arizona, California, Colorado, Nevada, Oregon, and Washington. The U.S. General Services Administration (GSA) has mandated that all new GSA construction projects and substantial renovations must comply with nationally recognized green standards. Additionally, companies including IBM, Toyota, Ford Motor Company, Bank of America, and Wal-Mart have turned to green practices in much of their new construction.



In an unprecedented move, the city of Boston recently became the first major U.S. city to propose implementing green building requirements for privately developed projects, a move that has significant positive implications for the future of green building. The new Green Building zoning provision in Boston's zoning code would require that projects over 50,000 square feet meet a basic level of environmental certification. By promoting new green buildings and development, as well as greening Boston's existing buildings, the city seeks to stimulate business growth and job creation for Boston.

"High performance buildings are the future," said Thomas Menino, mayor of Boston. "As we continue to grow our city, we will do so in a way that is even more sustainable. Green buildings are good for the environment, public health, and the bottom line."

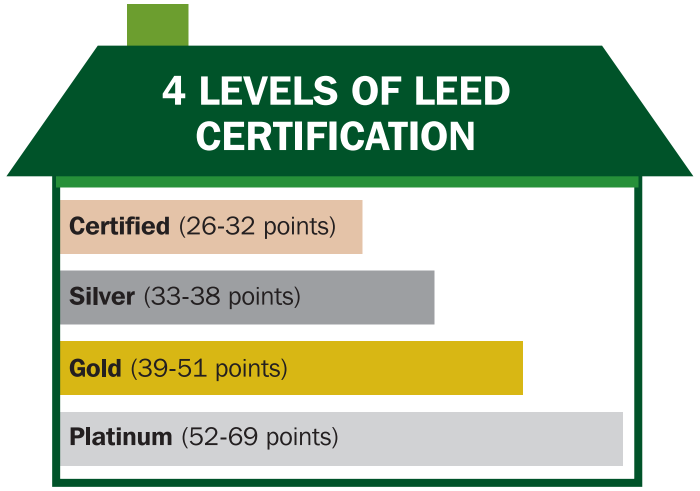
Two examples of green at the state and federal levels are President George W. Bush's Solar America Initiative and California governor Arnold Schwarzenegger's Million Solar Roofs Plan. As part of Bush's Advanced Energy Initiative, the $148 million Solar America Initiative aims to make solar power costs competitive with conventional electricity sources by 2015. Going one step further, Schwarzenegger signed legislation in August 2006 implementing California's Million Solar Roofs Plan, which will subsidize the installation of one million solar roofs by 2018, the output equivalent of five modern electric power plants, or 3,000 megawatts of electricity.

So what's in it for them? For the public sector, the push to reduce dependence on fossil fuels, save precious water, and encourage growth has stimulated the shift toward green. In the corporate world, green buildings have been shown to increase not only financial benefits but also worker productivity and contentment through more healthful and worker-friendly environments. Additionally, demonstrating eco-sensibility through building green can be a boon to a company's image, as it exhibits corporate responsibility and a desire to be socially progressive.

Green certification standards

The U.S. Green Building Council (USGBC) has spearheaded the modern green building movement. Comprised of more than 6,900 member organizations, USGBC is a coalition of leaders from every sector of the building industry working to promote buildings that are environmentally responsible, profitable, and healthy places to live and work. USBGC is responsible for the LEED (Leadership in Energy and Environmental Design) Green Building Rating System, the nationally accepted benchmark for green building standards. Much like IAPMO's own consensus-based code development process, LEED standards are developed through an open consensus process that continually reviews and refines the rating system.

Individuals or corporations desiring recognition for their adherence to green standards in a building can voluntarily apply for LEED certification — similar to IAPMO R&T's certification process for plumbing and mechanical products. Certification provides third party verification of compliance to certain standards. The LEED certification rating system applies to five major areas: sustainable site development, water savings, energy efficiency, materials selection, and indoor environmental quality. Points are earned in each category according to how many predetermined performance benchmarks the building project achieves. These points translate into four levels of LEED recognition: Certified (26-32 points), Silver (33-38 points), Gold (39-51 points), or Platinum (52-69 points). In sustainable design parlance, a Platinum LEED Certification is the "green" standard.



Earning points toward LEED certification is where plumbing and mechanical professionals become a significant part of the green building picture. But a building doesn't necessarily have to be LEED-certified to still be green; there are many small but significant steps that homeowners, developers, and corporations can take toward greening their homes and offices without going through a formal certification process.

Reduce, reuse . . . replace?

Maximizing water efficiency and minimizing energy expenditure are two major concerns in sustainable design. According to the U.S. Geological Service, buildings use approximately 12% of all potable water, or 15 trillion gallons per year. The U.S. Department of Energy notes that buildings represent 39% of U.S. primary energy use and 70% of U.S. energy consumption.

A program implemented by one southern California water agency is taking proactive measures toward meeting its conservation goals ahead of schedule. The Rancho California Water District is planning to move forward with its High Efficiency Toilet Direct Installation Program, which will replace hundreds of older, less efficient toilets at apartment complexes throughout the area it serves. The replacement toilets will be installed at no cost to property owners, thanks to a conservation grant from the Metropolitan Water District of Southern California.

From waste to water

Installing high-efficiency plumbing fixtures and low-flow devices are key steps toward saving water. Additionally, technologies such as infrared sensors and auto-flush toilets can provide substantial reductions in wasted water. Better design and technology play a significant part in conservation, but there are many more creative ways through which savings can be achieved, such as capturing rainwater or recycling water. Some cities and neighborhoods have implemented a water reclamation system that uses treated blackwater (sewage) or graywater (non-fecal domestic wastewater from showers, sinks, washing machines, etc.) for such purposes as landscape irrigation, property grading, industrial use, and street sweeping.

This 200 horsepower pump in a Chino Hills, California booster station is capable of pumping 1440 gallons of recycled water per minute. The station houses three 200 horsepower pumps and one 25 horsepower pump; up to 2 million gallons pass through the station each day.

In the city of Chino Hills, California, a rural bedroom community located about forty miles east of downtown Los Angeles, purple pipes seem to sprout from the ground everywhere you turn. The lavender-colored fixtures, which indicate the use of recycled water, are present throughout many of the newer parts of the city for irrigation of both municipal and private developments. In fact, if a recycled water line is available, businesses and developments in the city are required to tap into it. According to Steve Setlak, a water quality technician for Chino Hills, the city saves an average of 1.5 million gallons of potable water per day just by using recycled water for landscape irrigation. During the hot summer months, the city can save as much as 2 to 3 million gallons per day. With recycled water costs approximately 20% lower than domestic water costs in Chino Hills, the savings can really add up. Setlak mentioned one local golf course that saves between $10,000 and $20,000 per month simply by using recycled water for irrigation.

"Recycled water provides an uninterrupted, draught-resistant supply of water," Setlak said. "It's also less expensive than using domestic water."

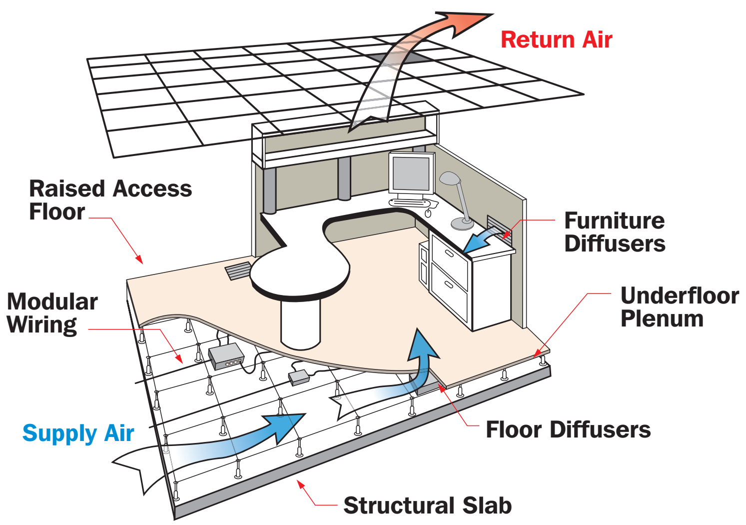
Use of recycled water for non-consumptive purposes helps conserve potable water supplies. See Chapter 16 of the *Uniform Plumbing Code* for code requirements of reclaimed water systems.

Eco-mechanics

There are also many energy-saving innovations that help reduce the strain on a building's mechanical system. One of the most popular forms of energy conservation is found in photovoltaic (solar) panels and wind turbines that decrease a structure's dependence on municipally supplied power. The naturally generated energy in turn powers heating and cooling systems — among other things — inside the building.

According to the Center for the Built Environment (CBE), a non-partisan university/industry collaborative research group, underfloor air distribution (UFAD) systems are gaining popularity in Europe, South Africa,

Asia, and more recently, North America. Fred Bauman, P.E., a research specialist with the CBE, notes, "UFAD used to be considered a weird, fringe technology, but now it's fairly regularly considered when you have a choice. It's become a quite typical approach when considering air distribution systems for new construction." In fact, Bauman notes, market data shows UFAD systems grew from 0.3% percent of new North American office space in 1999 to 6% in 2005 — an increase of 2000% in just six years. Even some big-ticket green building projects, including New York's Bank of America tower at One Bryant Park, are utilizing underfloor air technology to allow for more efficient heating and cooling.



Courtesy of Center for the Built Environment, University of California, Berkeley, CA

UFAD technology delivers conditioned air at the floor level by utilizing the underfloor plenum between the structural concrete slab and the underside of a raised access floor system. While conventional HVAC systems maintain comfortable room temperatures by delivering conditioned air from the ceiling to mix with room air, UFAD systems introduce air from the floor into the "occupied zone," or where people actually stand. Since air is introduced directly to the space where it's needed most, temperatures can be set to more moderate levels and individuals can also maintain control over the air in their immediate space — all adding up to potential energy savings. Yet Bauman added as a caveat, "Underfloor systems have the potential to save energy, but they don't do so automatically. You've got to be educated and you've got to do it right."

Radiant floor heating is another method of warming a building; hot water runs in tubes or coils underneath the floor, emanating heat aboveground. According to the Hydronics Industry Alliance, radiant floor heating and other forms of hydronic heating — that is, heating with hot water — have become increasingly popular with both contractors and homeowners. The clean heat provided by hydronic systems is a major draw for those seeking increased energy efficiency. Hydronic heat is delivered through sealed systems that prevent loss of heat and, in buildings heated with this type of technology, each room can be zoned separately for maximum energy savings.

"Hydronic home heating has really come full cycle from one of the first forms of central heating to a premium form of heating," said Richard Simons, chair of the Hydronics Industry Alliance. "Innovations in equipment and system design have made hydronics a comfortable and efficient type of home heating."

At least one major retailer has implemented radiant heating technology into its stores. Wal-Mart, a corporation not normally known for progressive labor or environmental policies, has built two experimental stores, one in McKinney, Texas, and another in Aurora, Colorado, that utilize green technologies. Radiant floor heating is among the experimental technologies being used in the stores, as is a white "cool" roof that reflects sunlight, reducing heat gain inside the building and also reducing energy costs. The experimental stores recycle on-site resources and systems, for example, using waste cooking oil from the deli mixed with used motor oil from the auto service center to serve as fuel to heat the building. The stores also utilize displacement ventilation to distribute air throughout the building. In this system, the fabric ducts have many small holes that can distribute an even airflow along the entire length of the duct. The ducts are mounted eleven feet above the floor and supply air at low velocity and moderate temperatures (typically 65-68°F). The supply air quickly mixes with the surrounding air and slowly falls to the floor level, maintaining a comfortable temperature. Additionally, glass doors have been added to the display cases in an effort to reduce the load on the refrigeration systems, which have been redesigned as water-cooled units and relocated to the roof, ultimately reducing copper piping and refrigerant loads.

"Wal-Mart wants to be a leader in corporate responsibility for the environment and our shareholders," said Pat Curran, executive vice president of Wal-Mart Stores USA. "We believe that being a good steward of the environment and operating an efficient and profitable business are not mutually exclusive."

Another unlikely entrepreneur who has gone green is motorcycle builder Jesse James, of the popular television show "Monster Garage." James opened Cisco Burger, an organic, eco-friendly fast food restaurant next door to his famed West Coast Choppers compound, in 2006. The Long Beach, California restaurant uses biodegradable paper products to serve its organic, preservative-free Kobe beef, dairy, and produce. Moreover, the building is powered by solar energy, and James is working with the Long Beach Recycling Program to make the venture as environmentally friendly as possible.

IAPMO involvement

IAPMO recently demonstrated its commitment to supporting conservation efforts at a Los Angeles USGBC chapter function by contributing $5,000 toward a $20,000 grant awarded to the chapter by the Piping Industry Progress and Education Trust Fund (P.I.P.E.).

U.S. GREEN BUILDING COUNCIL CHAPTER LOS ANGELES

Lance Williams, executive director of USGBC-LA, noted, "This is a very exciting event within the construction industry. For a union-based organization such as P.I.P.E. to provide direct financial support to USGBC-LA's activities signals that an important new milestone has been passed."

Mike Massey, executive director of P.I.P.E., was enthusiastic about supporting green building practices. "We want to be recognized as the plumbing and piping industry's 'go-to' source when building owners go green," he said.

With the pendulum clearly swinging toward greater acceptance of green practices, plumbing and mechanical professionals need to keep up with the latest technologies and designs in their field in order to get ahead and stay ahead. Innovations in water- and energy-saving technologies for green building are moving steadily toward the mainstream as awareness of environmental issues grows.

For more ideas, information, and resources, visit:

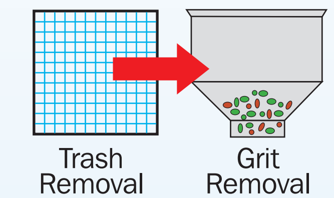
- U.S. Green Building Council: www.usgbc.org
- Environmental Protection Agency: www.epa.gov
- Natural Resources Defense Council: www.nrdc.org
- Energy Star: www.energystar.gov

Recycling Treatment Process

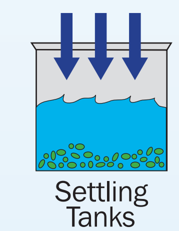
Recycled water, also known as reclaimed water, starts out as wastewater. However, before wastewater can actually be called "recycled," it must undergo a number of steps for purification and disinfection according to stringent health and safety standards.

Preliminary Treatment

In the preliminary treatment stage, the raw wastewater undergoes a series of pretreatment processes to remove coarse, non-organic, non-treatable material — basically, the stuff you're not supposed to flush down the toilet.

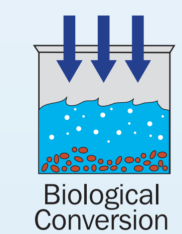


Primary Treatment



Sedimentation and flotation are used in this step to remove organic solid matter. The wastewater flows into a primary sedimentation tank, where materials more dense than water settle to the bottom and materials less dense than water rise to the top. The resulting product is known as primary effluent.

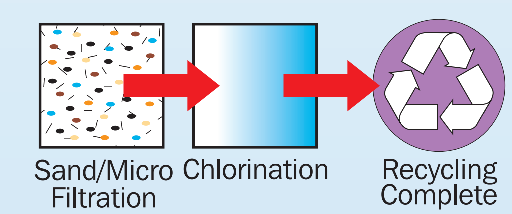
Secondary Treatment



Because primary effluent contains some organic solids that do not settle to the bottom during the sedimentation process, the materials are biologically converted to a form that allows them to settle out in a secondary clarifier. The resulting product water is called secondary effluent.

Tertiary Treatment

Chemical coagulants are added to the secondary effluent during this step, and the product is filtered through fine sand or other granular material to remove any remaining matter. The water is then chlorinated for disinfection, and becomes ready to use as recycled water.



Though completely safe, dedicated pipelines for recycled water keep it separate from potable water. Additionally, all above ground recycled water fixtures must be denoted with purple piping and recurrent signage to distinguish it from potable lines. Extensive precautions are taken to ensure that recycled and potable supplies are not cross connected and that bodily contact with recycled water is minimized. Check with your local recycled water purveyor for specific rules and regulations.

OFFICIAL *Classic Series*

IAPMO Member Builds Prototype Solar Home

By Jerry Wall

From time to time, Official *runs articles pulled from its archives as part of a "Classic" series. The following article about a then-state of the art solar home is reprinted from the March/April 1981 edition of the magazine.*

Everybody talks about the cost of energy, but nobody has done much about it.

But somebody has done something. IAPMO board member Mike Weix, mechanical supervisor for the city of Albuquerque, built a solar home that may be the prototype for some future solar homes.

Weix was elected to the IAPMO board at the 1980 conference in San Jose, representing the southern district for the three-year term.

He built his solar house with energy from the sun in mind when he made the original plans. It was solar-oriented from the ground up.

"There was never any thought in my mind of using any other source," he said. "The idea of building a solar house occurred to me while I was teaching a course on energy conservation and solar energy at the University of New Mexico."

The house is his own design, and Weix says to the best of his knowledge there are not more than five or six units with similar designs anywhere in the country. He also believes his is the first of this particular design.

In order to get an idea of what Weix has undertaken to heat by solar energy, his home (built in 1978) is 4,868 square feet in area, with 288 feet of that porch and decking, 480 feet of garage space, and 4,100 feet heated by solar energy.

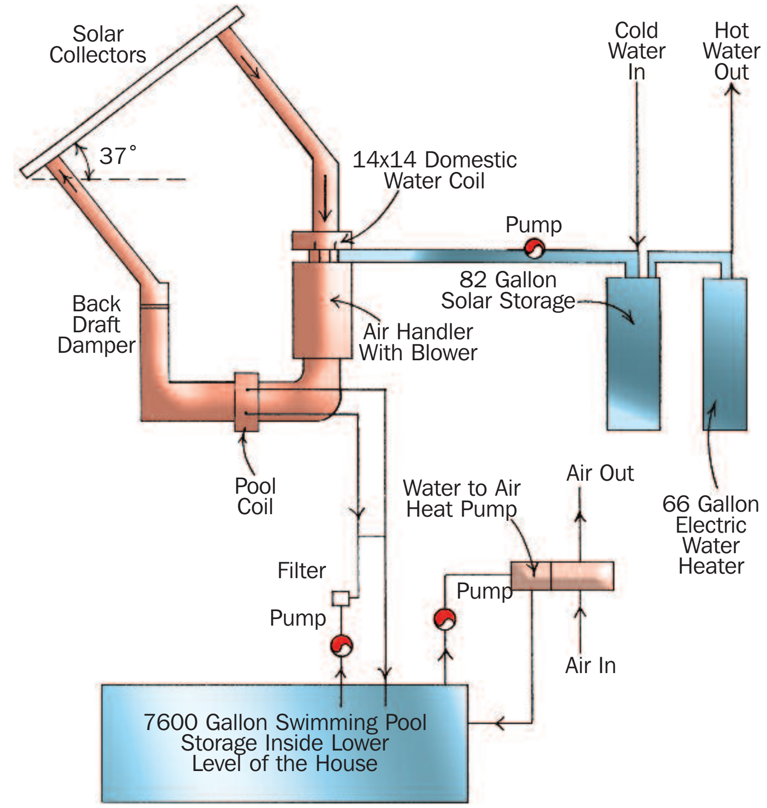
The solar system is an air system using 20 solar panels, furnished by Solaron Corp. of Denver.

"The way the system works," he said, "is we collect warm air on the roof. The air travels through a heat exchanger, which is for high temperature heating of domestic water. It then goes through the fan unit, which is actually the mechanism that blows the air around through the panels. After it goes through the fan assembly, the air goes through a large heat exchanger, which heats the water for a 7,600-gallon swimming pool on the lower level of the home. The air then returns to the panels on the roof."

Weix said the heat from the swimming pool does two things.

"First," he explained, "it passively solar heats the house. Second, it serves as a heat sink for a water-to-air heat pump."

It is obvious that he doesn't have a heat storage problem. And Weix says that if his area went a week or perhaps even two weeks without sunshine, he believes he'd still have sufficient heat in the pool to heat his home. In other words, the indoor swimming pool is the heat storage for the Weix solar system.



"The pool is not only a storage medium," he said, "but it is useful as well as providing a recreation room and a place to swim. The pool is a more useful storage medium than rocks."

In warm air systems, rocks are often used to store heat collected during periods of sunshine, and then used to release stored heat at night or on cloudy days.

Weix designed the system himself, and he acted as general contractor.

All parts for the system, other than ductwork, were purchased on a national or local level. And these are all off-the-shelf items.

"The system [in 1978] cost approximately $10,000," Weix revealed, "excluding the pool and the water-to-air heat pump. But we were able to get $2,000 credit on federal income tax, and a $1,000 credit from the state of New Mexico."

How much cheaper is solar energy than electrical energy?

"Solar energy is approximately one-half the cost of electrical energy," Weix estimated. "Although we never had a comparable home to compare, we lived in an apartment that was about one-third the size of the house and we paid about the same amount for electricity and gas. Now I'd like to point out that the present home has no gas service. Only other source of electricity is electrical."

He also points out he is not on a photovoltaic system, which converts the solar energy into electrical energy. Presently, the cost of photovoltaic conversion is prohibitive.

The same amount of insulation is used in this home as would be used in a standard electric home in Albuquerque. This is six inches in the walls, and 12 inches in the ceiling. And in Weix's case, because of the Energy Conservation Code in New Mexico, a perimeter insulation is used around the slab on the lower level. He said this has proved to be quite successful in his home.

Solar panels were the most expensive single part of the system, costing between $7,000 and $8,000. The labor cost, however, turned out to be only a small portion of the total. Weix said it required three days for six men to install the panels, which was the bulk of the labor.

He cites the advantages and disadvantages of a home solar system.

"Main advantage," he said, "is that it is the most uniform heat we have ever had in a home. It gives you a warm feeling all the time. And the knowledge that your energy savings will pay for the system in 10 years." (As energy costs go up, this 10-year total should shrink.)

"Main disadvantage," he said, "is the high initial cost. And a 10-year payback may seem long to some. But I don't think there's any doubt about it. In the long run, it's a very successful system."

He feels this particular system would be too expensive to install in an existing home.

He sees solar systems as a coming trend in private residences and, as he pointed out, mainly in new homes. Weix said there are many passive solar systems coming on the market now, but he believes these are most effective in mid-size single-family dwellings in the 1,800 to 2,000 square foot range.

"These are cost-effective on mid-sized houses," he said, "but mine was not designed that way. Mine is a hybrid system, which is a solar house using mechanical means as well as passive."

A passive system would incorporate architectural features such as those walls on mass floors to heat the home. A hybrid would employ such devices as solar panels, fans, and heat pumps in addition to passive means. The hybrid system eliminates "hot spots" you may find in purely passive systems, which may cause discomfort in the early fall and late spring.

"The solar house is definitely better than conventional heating systems, temperature-wise," Weix said. "In fact, the water-to-air heat pump cycle is reversed and used to heat the pool in the summertime instead of using solar. (He uses refrigerated air in summer.)

He describes his water heater capacity as "awesome."

"We have a 66-gallon electric water heater and an 82-gallon makeup tank, which is solar heated. Nine months of the year, when the electric water heater draws water from the cold side, it's actually receiving 140-degree water from the makeup tank. So the electric water heater seldom runs."

There is enough hot water by solar even for a couple with two teenagers and a third grader living in the house, which happens to be the description of the Weix family.

"Heating and cooling is central, and we have two separate systems. One heats approximately 3,100 square feet upstairs and the other heats about 1,000 feet in the swimming pool room. The pool room unit is an air-to-heat pump, just a standard heat pump. And as of December 15, 1980, we hadn't turned on the heat in the pool room, because the temperature never dropped below 65 degrees."

In the Weix residence, the swimming pool is a very central part of the lower level of the house. In addition, a spa is built into the master bath, which measures 3 x 6 feet. Water for filling the spa is heated by solar.

"I'm very happy with our solar system," Weix said. "There were few problems. At first, we had some leaks in the insulation and we didn't find those until the second winter. My wife and I reinsulated in a couple of areas.

"Results have been gratifying. We're estimating now that the average kilowatt hour usage in running the house for the entire year will be roughly 1,200 kilowatt hours per month, and that includes the swimming pool and three refrigerators. It's a very comfortable house and it has in it every electronic device known to man."

Weix discusses the "key" to the system. "I think that the key item is that it is an air system that heats the house. We use air collectors, because we felt that we've seen so many disastrous results with the liquid systems either leaking or freezing up, or having malfunctions of one kind or another.

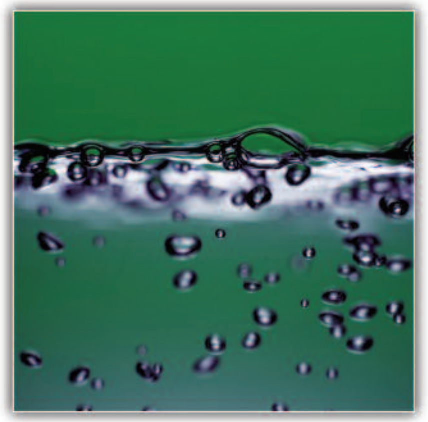
"The winter of 1980-81 will be the third winter we've had the system, and we really haven't changed anything in the solar system appreciably except one pump in the pool. And that was strictly to downsize it. The company that sold it to us gave us credit for it because they really put in too large a pump to start with."

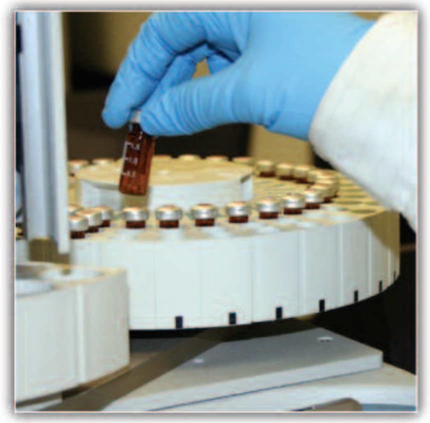
The original design still stands today. He said if he was going to build this large a house now with an indoor swimming pool, he thinks he'd go back to the same system.

The solar panels (400 square feet total) comprise ten percent of the area. This is low. Most systems use 20 percent to 30 percent of the heated area of the house in collection area.

"One reason we use only 400 feet," Weix said, "is that we run our collectors rather cold instead of trying to get 140- to 160-degree water or rocks to heat the house directly. We're only trying to get 75- to 85-degree water in the swimming pool, and this allows our collectors to run substantially more efficiently than collectors at higher temperatures."

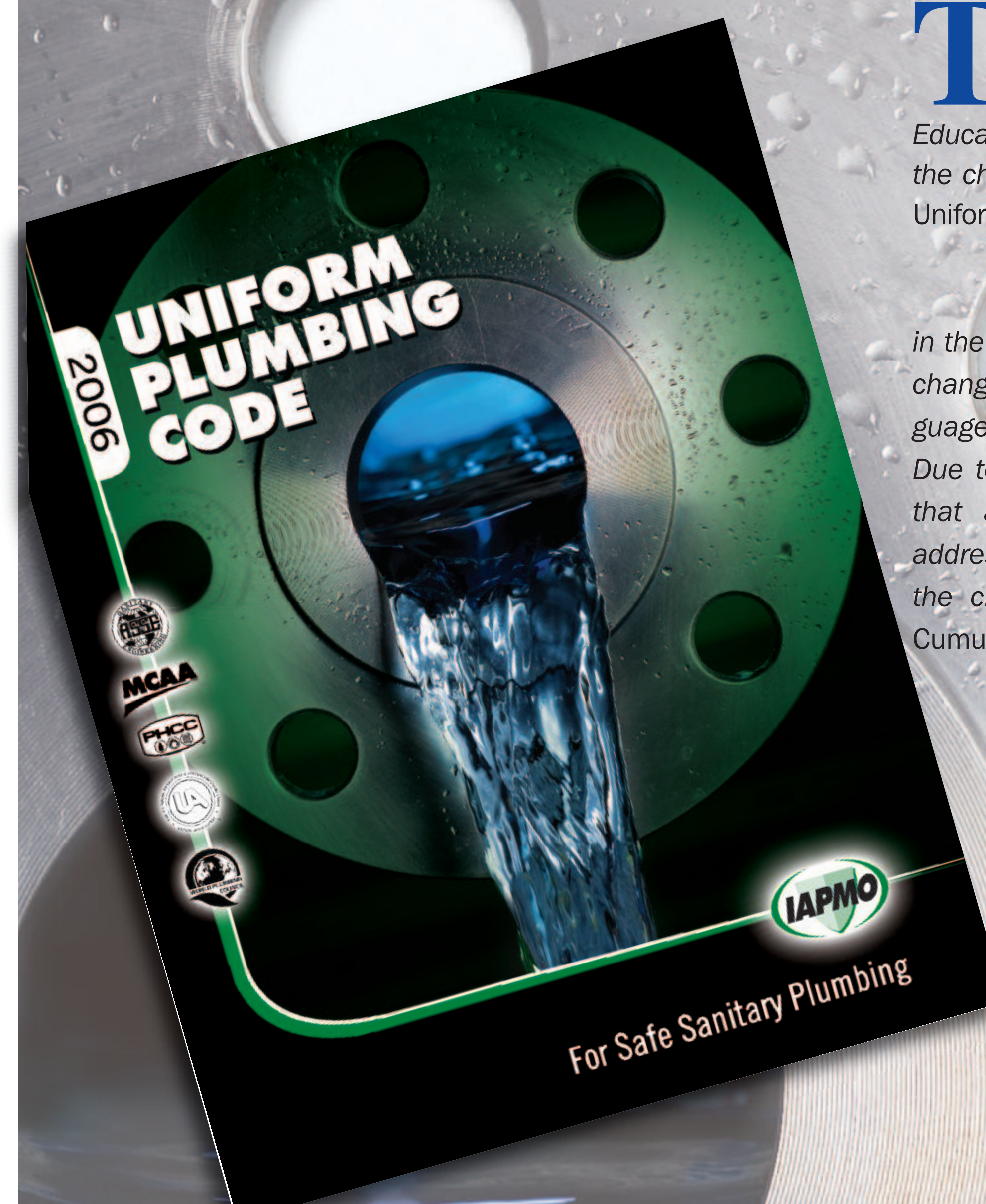
In conclusion, Weix said systems similar to his should work anywhere in the southern half of the United States, including Hawaii. Albuquerque (from information supplied by its Chamber of Commerce) has almost 365 days of sunshine annually. The exact figure is 3,418 hours annually based on daylight hours.





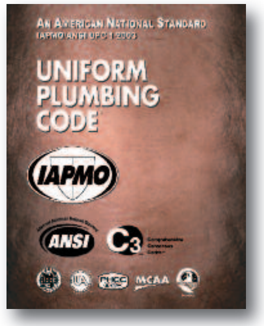
2006 *Uniform Plumbing Code* Seminar Overview

By Bob Shepherd



The Uniform Plumbing Code *seminar, presented by IAPMO instructor Roger Courtney at the 77th Annual Education and Business Conference, focused on the changes contained in the 2006 edition of the* Uniform Plumbing Code.

There are over two hundred code changes in the 2006 edition of the UPC. *Many of the code changes were made to delete non-essential language to clarify the code's meaning and intent. Due to the large number of changes, only those that are considered a major change will be addressed in this article. A complete review of all the changes may be found in the 2006* UPC *Cumulative Analysis.*



2003 *UPC*

2006 *UPC*

Section: 202.0	Section: 202.0
Definitions	Definitions

Analysis: There are twelve (12) new definitions that pertain to new and revised terms used in the code.

Section: 301.2	Section: 301.2
Alternate Materials and Methods	Alternate Materials and Methods of Construction Equivalency

Analysis: The title change clarifies the intent of these sections, removes non-essential language, and gives the Authority Having Jurisdiction additional authority to limit the scope of the approval for one or more installations.

Section: None	Section: 301.3
	Flood Hazard Resistance

Analysis: The new text provides provisions for plumbing systems located below the design flood elevation (provided they are properly designed) and to take into consideration hydrodynamic and hydrostatic forces that can cause widespread environmental damage and health risks.

Pipe sleeves are required in poured concrete floors and walls according to 2006 UPC Section 313.10.1.

Section: None	Section: 301.4
	Alternative Engineered Design

Analysis: This additional language provides for evaluating an alternative engineered design plumbing system that protects the health and safety of the public, and the opportunity for an engineer to design a plumbing system that may not comply with all the provisions found in this code. These designs must conform to accepted engineering practices and provide the level of protection intended by this code.

Section: 313.10.1	Section: 313.10.1
Sleeves	Sleeves

Analysis: Pipe sleeves are typically required in poured concrete floors as well as walls because the pipe is subjected to loading conditions. Sleeves are not normally required where pipe openings are drilled or bored because the load is not transferred to the pipe, therefore protecting from breakage.

Section: 313.12.4	Section: 313.12.4
Ratproofing	Ratproofing

Analysis: The intent of this code section addresses tub waste openings in framed construction and clarifies how to ratproof such openings. This section does not apply to slab construction.

Section: 412.7	Section: 411.7
Shower Compartments	Shower Compartments

Analysis: The proposed change is intended to allow for easy replacement of a standard 30” x 60” bathtub or bathtub/shower with an existing similarly sized shower receptor, and references ANSI A117.1 as the applicable standard establishing accessibility provisions.

This change is necessary to address the increasing demand to provide greater access to our aging population.

Section: 414.0	Section: 414.0
Bathtubs and Whirlpool Bathtubs	Bathtubs and Whirlpool Bathtubs

Analysis: The intent of this section is to provide requirements for the installation of pumps in both bathtubs and whirlpool bathtubs.

Section: 421.0	Section: 414.5
Limitation of Hot Water in Bathtubs and Whirlpool Bathtubs	Limitation of Hot Water in Bathtubs and Whirlpool Bathtubs

Analysis: Scald injuries do occur in bathtubs and whirlpool bathtubs, and over the last several years, ASSE has provided a list of approved referenced standards (listed in Table 14-1) for the installation of temperature-limiting devices to prevent scalding. The intent of this section is to provide a water temperature-limiting device to reduce temperature limitations and not to recognize the water heater thermostat as a device to prevent scalding.

New Tables 4-1 and A address the restrictive nature of occupancy load factors.

Table 4-1	Table 4-1 and Table A
Minimum Plumbing Facilities	Minimum Plumbing Facilities

Analysis: The building code describes occupancies that are not yet addressed under minimum plumbing requirements; these additions will help fill some of those gaps.

Architects and other building designers have expressed ongoing concerns with the restrictive nature of occupancy load factors — as currently described in the code — for calculation of minimum plumbing fixture requirements, hence the inclusion of a new load factor table. This table correlates with building code occupancy design criteria. Also, the table is based on usage rather then fire exiting criteria.

Section: 505.1	Section: 505.1
Location	Location

Analysis: The code change provides coverage in accordance with NFPA 54 (extraction) for the installation of water heaters in bedrooms and bathrooms.

Section: None	Section : 505.1.1
	Self-Closing Doors

Analysis: The code change provides for requirements where a listed self-closing door is installed as an additional safety provision and such text is extracted from NFPA 80.

Section: None	Section: 505.1.2
	Gasketing

Analysis: The code change provides for requirements for gasketing on gasketed doors or frames in accordance with the listing, and an alternative where approved by the Authority Having Jurisdiction.

Section: None	Section: 509.4
	Appliances in Attics

Analysis: The proposed change provides additional requirements for the access to equipment in attics. Access to equipment installed in these spaces may be difficult, and the intent of this section is to provide an access opening and work space that allows the user the ability to service such equipment.

Tables: 5-9 — 5-21(b)	Tables: 5-8 — 5-22
Sizing of Category I Venting Systems	Sizing of Category I Venting Systems

Analysis: The tables for NFPA 54 have been expanded and values have been adjusted to industry standards. The *UPC* Technical Committee recommended accepting the tables that have been extracted from NFPA 54-2005 and provide an up-to-date sizing method in this code.

Section: 602.2	Section: 602.2
Unlawful Connections	Unlawful Connections

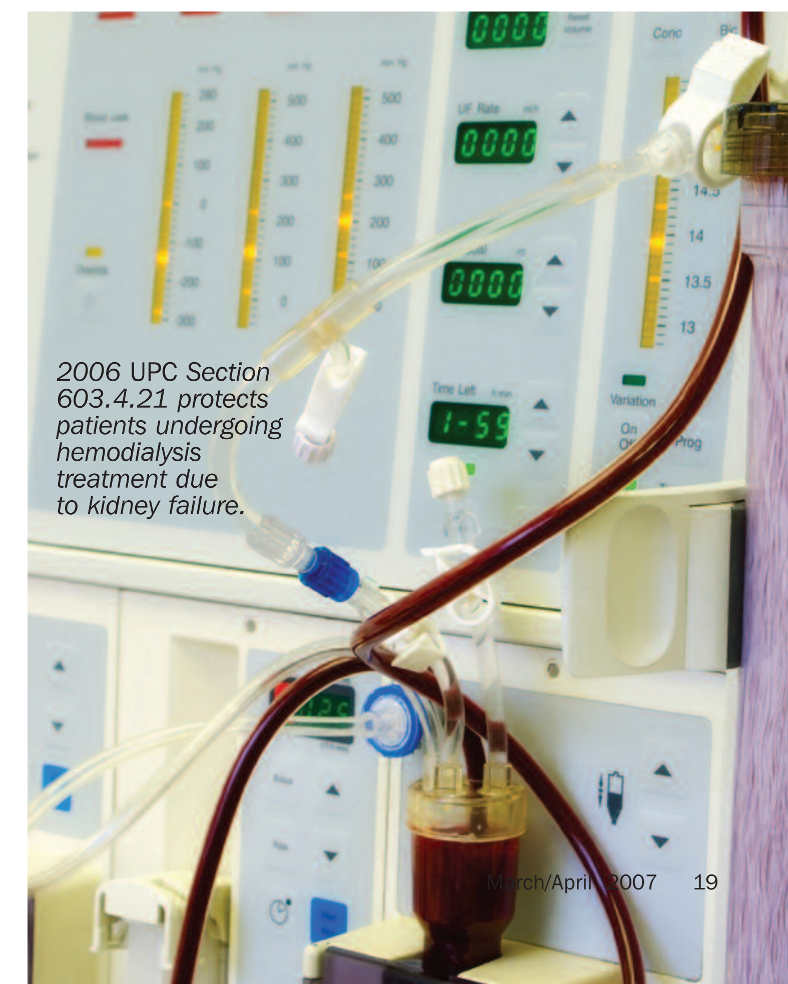
Analysis: Each device should be separately protected. Such protection does not prevent one device from contaminating another. Current text is unclear and, as such, needs to add additional language for clarification that each point of use must be protected where contamination of individual units exists.

Section: 603.3.8	Section: 603.3.8
General Requirements	General Requirements

Analysis: Additional language was added to include an outdoor enclosure as one of the methods of freeze protection, as each jurisdiction needs to be evaluated on a case by case basis.

Section: None	Section: 603.4.21
	Pure Water Process Systems

Analysis: The added section is intended to protect the health and safety of patients undergoing hemodialysis due to kidney failure. A single backflow prevention device on the input line(s) to the dialysis water system will adequately protect the potable water source from cross contamination should there be a drop in water pressure.



2006 UPC Section 603.4.21 protects patients undergoing hemodialysis treatment due to kidney failure.

Table: None	Table: 6-4 Materials

Analysis: The new, user-friendly table shows approved materials for piping and fittings for the building supply and water distribution systems. This is an easy-to-use table along with the similar companion change in Section 604.1. This table provides the materials that the user would need to reference Table 14-1 for the correct standard number.

Section: 609.10 Water Hammer	Section: 609.10 Water Hammer

Analysis: Field use has demonstrated that air chambers do not work and become water logged — usually in a very short time. Air chambers are deleted as an approved method for controlling water hammer. Mechanical devices are required to address the issue of water hammer.

No. 15 water hammer arrestor

Mechanical devices are now required to control water hammer; air chambers are no longer approved by the UPC.

Table: 10-2 Grease Traps (Deleted)	Table: 10-2 Hydromechanical Grease Interceptor Sizing Chart

Analysis: The proposed change provides a new sizing table for hydromechanical grease interceptors. These types of interceptors use other means — in addition to gravity — to achieve separation and need to be differentiated from gravity interceptors, which use only gravity to achieve separation. This table provides a sizing chart for these interceptors based on drainage fixture units and flow rate.

Section: 1014.1 Grease Interceptors	Section: 1014.1 Grease Interceptors

Analysis: This code change deletes the term "grease trap" and replaces it with "grease interceptor" to be consistent with manufacturers' and standards usage.

Section: 1014.2 Deleted	Section: 1014.2 Hydromechanical Grease Interceptors

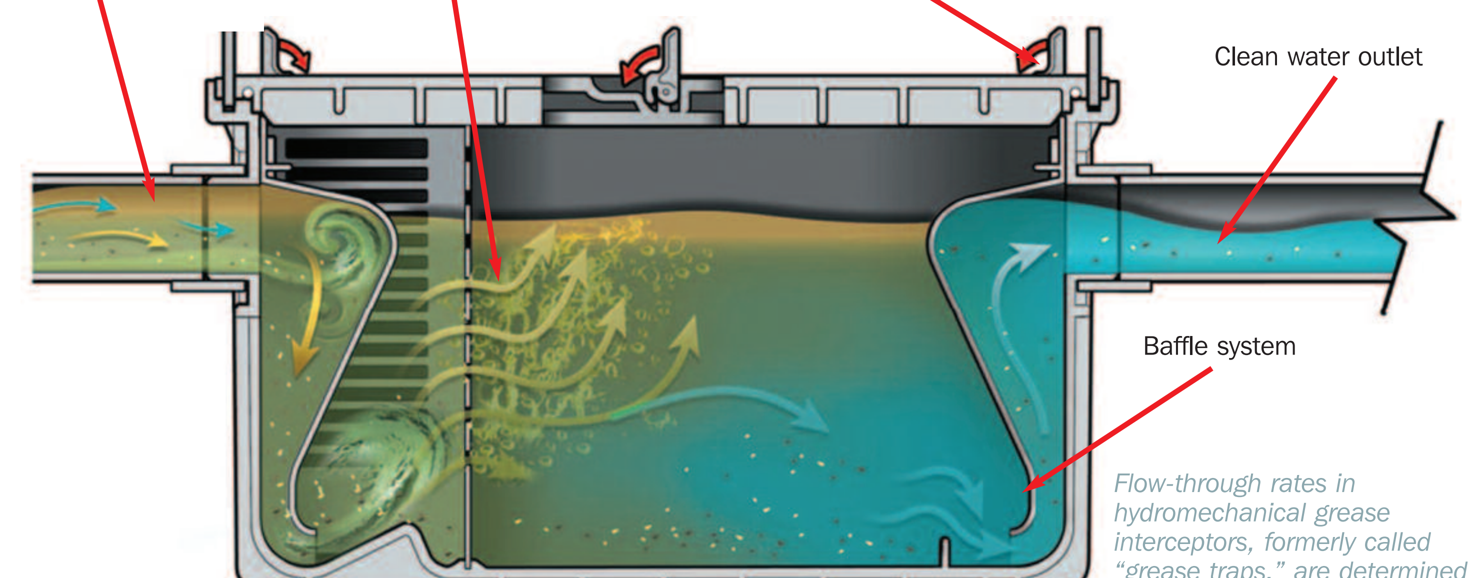
Analysis: This section was deleted in order to correlate with deletion of the term "grease trap" in accordance with current industry standards. The determination of flow-through rate and approval with the Authority Having Jurisdiction is maintained through Table 10-2, Table 10-3, and Table 14-1.

Section: 1014.8 Grease Interceptors for Commercial Kitchens Appendix "H"	Section: 1014.3.6 Sizing Criteria

Analysis: This code change provides an easy-to-use table to determine the size of a gravity grease interceptor based on DFUs or the number of DFUs allowed for the pipe size connected to the inlet (refer to Table 7-5). Drainage fixture unit values for various fixtures can be found in Table 7-3.

Section: None	Section: 1015.0 Fats, Oils, and Grease (FOG)

Analysis: Fats, oils, and grease (FOG) continue to plague waste treatment plants. The additional requirements assist with state regulations regarding FOG disposal systems to comply with a quality compliance strategy and reduce the amount of FOG in our sanitary drainage systems.



Hydromechanical grease interceptor

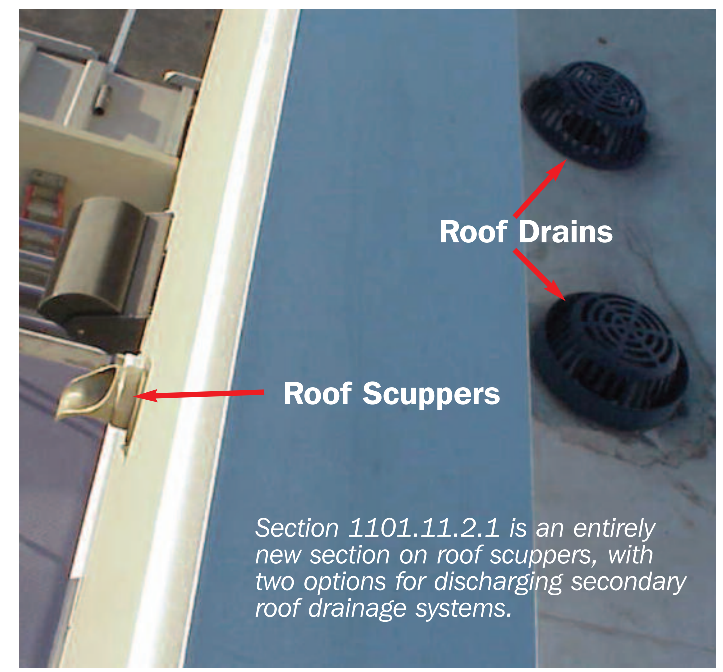
Flow-through rates in hydromechanical grease interceptors, formerly called "grease traps," are determined through 2006 UPC Tables 10-2, 10-3, and 14-1.

Section: None	Section: 1015.2 Scope

Analysis: These systems are typically engineered designed systems and refer the user back to alternate materials and Methods of Construction Equivalency (Section 301.2) with the final approval by the Authority Having Jurisdiction.

Section: 1101.2 Secondary Roof Drainage (Deleted)	Section: 1101.11.2.1 Roof Scuppers or Open Side (Completely new section)

Analysis: This code change provides a new format for the requirements of secondary roof drainage. These sections are viable methods of providing secondary storm drainage and include open-sided roof area or scuppers. An additional two options for discharging the secondary roof drainage system are included. One option is to discharge above grade or a public storm sewer, and the other is a combined system where the storm sewer is oversized to accommodate the load of the primary and secondary drains.



Section 1101.11.2.1 is an entirely new section on roof scuppers, with two options for discharging secondary roof drainage systems.

Tables: 12-7 — 12-23 Gas Pipe Sizing	Tables: 12-7 — 12-41 Gas Pipe Sizing (New updated and expanded tables)

Analysis: The *National Fuel Gas* Code has expanded and revised each of the pipe sizing tables as recommended by the *UPC* Technical Committee. These tables, extracted from the *2005 National Fuel Gas Code,* provide an up-to-date sizing method for this code.

Chapter 13 Medical Gas	Chapter 13 Medical Gas

Analysis: Chapter 13 Code Changes are an extract and update from NFPA 99-2002 and NFPA 99C-2002 to NFPA 99-2005 and NFPA 99C-2005 for health care facilities and gas and vacuum systems.

Appendix: None	Appendix "F" Firefighter Breathing Air Replenishment Systems

Analysis: This Appendix provides for breathing air replenishment systems, also known as firefighter air systems, as an important safety concern and benefit to firefighters within high-rise buildings. It increases firefighter safety by providing firefighters with a safe and reliable source of breathing air within close proximity of the emergency incident and recognizing an approved standard (NFPA) for such systems.

New Appendix F has provisions for firefighter breathing air replenishment systems.

Photo by courtesy of Rescue Air Systems, Inc.

Appendix: "L"	Appendix "L" (Changes Made)

Analysis: There are some changes to Appendix "L," however, not all jurisdictions adopt the appendices.