

ALASKA LEGISLATURE COMMITTEE FILES 2001-2002 8672

10166 ADMINISTRATIVE REGULATION REVIEW



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Administrative Regulation Review Committee AGENDA

Tuesday, August 14, 2001 10:00am-12:00n, 2nd floor Conference Room, Anchorage

- I. Title 13 Public Safety's adoption of International Building & Plumbing Codes as opposed to Uniform Codes.

*This hearing will be teleconferenced

DATE: August 14, 2000

TO: Code Enforcement Officials, Members of Plumbing Code Adoption Boards,
and Interested Members of the Plumbing Community

FROM: Edward Saltzberg,* PE, CEM, CIPE
J. Richard Wagner,* PE, CIPE

RE: 2000 International Plumbing Code/Uniform Plumbing Code Review

The following is a general review of the 2000 versions of both the International Plumbing Code and the Uniform Plumbing Code. The review was prepared by Edward Saltzberg, PE, CEM, CIPE, and J. Richard Wagner, PE, CIPE. The review was undertaken with the health and safety of the consumer as the prime concern. However, other factors considered in our review were the life cycle cost of systems, the ease of enforcement, clarity of the code, plumbing engineering criteria, and any other reservations that the writers may have had concerning the respective provisions of the two codes. This review is not intended as a paragraph by paragraph comparison of the two code documents, but merely a comparison of the significant variations between the two documents and was modified from our 1997 code review. Therefore, we have used a vertical line (|) in the margin to indicate a change from the 1997 review and an arrow (→) in the margin to indicate a deletion from the 1997 review.

A. CHAPTER 1 - ADMINISTRATION

- 1-1. **IPC PREFACE.** The section Maintenance contains a significant disclaimer which reads, "While the development procedure of the *International Plumbing Code* assures the highest degree of care, BOCA, ICBO, SBCCI, their members and those participating in the development of this code do not accept any liability resulting from compliance or noncompliance with the provisions given herein, for any restrictions imposed on materials or processes, or for the completeness of the text. BOCA, ICBO and SBCCI do not have power or authority to police or enforce compliance with the contents of this code. Only the governmental body that enacts the code into law has such authority."

The UPC does not contain such a disclaimer.

- 1-2 **IPC Marginal Markings.** The code indicates that solid vertical lines in the margins within the body of the code indicate a change from the requirements of the 1997 edition (*except where a change was minor*) [emphasis added]. Deletion indicators (→)

* A brief bio on each writer is included at the end of this report. A complete Curriculum Vitae on each writer is available

are provided in the margin where a paragraph or item has been deleted (*if the deletion resulted in a change of requirements*) [emphasis added].

In the UPC a vertical line denotes any change and an arrow denotes any deletion.

- 1-3. **IPC Section 101.2** has been revised. Fuel gas piping is no longer regulated by the IPC.

Fuel gas piping is within the scope of the UPC.

- 1-4. **IPC Section 102.8, Referenced codes and standards.** The code indicates that those codes listed in Chapter 13 are considered part of the requirement of this code and, therefore, an enforcement agent must have copies of all of those codes and become thoroughly familiar with them.

The UPC attempts to have as much as possible within the body of the code and not refer to or incorporate other codes as part of the UPC. The 2000 UPC contains 380 pages, compared to 131 pages in the 2000 IPC.

- 1-5. **IPC Section 103.4, Restriction of employees.** This section has restrictions on work that employees of a plumbing inspection department may perform and this section may be in conflict with the administration sections of the local code and, therefore, it is normally not included as part of a plumbing code.

The UPC does not include such a restriction.

- 1-6. **IPC Section 103.5, Liability.** This section removes any liability from employees. However, from a legalistic standpoint, this section may not be valid and may be in conflict with city attorneys' rules and regulations or state interpretations.

The UPC does not include such a provision.

- 1-7. **IPC Section 104.2, Rule-making authority.** This section gives the code official the authority to adopt and promulgate rules and regulations regarding the Code.

The UPC does not address rule making by the Administrative Authority. Such authority is normally included in the ordinance that created the Administrative Authority and/or in the adopting ordinance for the plumbing code.

- 1-8. **IPC Section 105.1, Modifications, and 105.2, Alternative materials, methods and equipment.** This section is essentially the same as what is included under UPC Section 301.2, Alternate Materials and Methods.



- 1-9. **IPC Section 109, MEANS OF APPEAL.** This section provides means of appealing the decision of the code official. It includes the appeal board, board membership, qualification of members, board officers, meetings, and open hearings.

The UPC does not address the filing of appeals and the administration of an appeal board. Such authority is normally included in the ordinance that created the Administrative Authority and/or in the adopting ordinance for the plumbing code.

- 1-10. On other matters of administration, the IPC and UPC have similar requirements and address those issues that need to be in the Administrative chapter of a plumbing code.

B. CHAPTER 2 - DEFINITIONS

- 2-1 **IPC Section 202, GENERAL DEFINITIONS – ACCEPTED ENGINEERING PRACTICE.** The IPC includes a definition for this phrase and the UPC does not.

- 2-2. **IPC Section 202, GENERAL DEFINITIONS - ALTERNATIVE ENGINEERED DESIGN.** The last sentence of the IPC definition indicates "The system design is not specifically regulated by Chapters 3 through 12". Therefore, as part of any new design, an engineer would have to include all of the appropriate sections of the codes that were to still be enforced as part of his/her submission to give the code official something with which to inspect and approve the alternative engineered design, as the entire body of the IPC has been deleted by this definition.

The UPC includes alternative engineering methods under Section 301.2, Alternate Material and Methods which still requires compliance with the remaining provisions of the UPC.

- 2-3. **IPC Section 202, GENERAL DEFINITIONS - FLOOD ZONES.** The IPC defines two different flood zones, flood hazard zone, A Zone, and high hazard zone, V Zone. While the definition seems clear, there are many areas, such as mountain areas, where locations are not normally subject to flooding but could be during heavy rainstorms where runoffs could have high velocity water. Therefore, from an engineering standpoint it would be somewhat hard to define which zone a specific building is located in.

The UPC does not contain this confusing item.

- 2-4 **IPC Section 202, GENERAL DEFINITIONS – TYPE A AND TYPE B DWELLING UNITS.** The IPC indicates a change in Type A dwelling and yet there is no change from the wording of the 1997 IPC. However, Type B dwelling unit was changed from the 1997 IPC and it is not noted as a change.

The UPC does not include these definitions.

C. CHAPTER 3 - GENERAL REGULATIONS

- 3-1. **IPC Section 303.2, Installation of materials.** The material manufacturer's installation instructions are superseded by the installation provisions of the standard for that particular material. This could prevent a manufacturer from dictating the installation requirements for a specific material or product for which it is responsible.

UPC Section 310.4 requires that material be installed according to the code and the manufacturers recommendations. If there are conflicts, the more stringent is used.

- 3-2. **IPC Section 303.4, Third-party testing and certification.** The IPC has changed from requiring plumbing products and materials to be labeled by an approved agency to having them either tested or certified by a third party as indicated in Table 303.4. The IPC defines "third-party certification agency", "third-party certified", and "third-party tested", but it does not define the relationship between the third party and the first and second parties.

UPC Section 301.1.1 requires that all pipe, pipe fittings, traps, fixtures, material, and devices used in a plumbing system must be listed or labeled by a listing agency. The UPC defines "labeled", "listed", and "listing agency". The requirements of the IPC and UPC produce essentially the same end results with regard to the compliance of products and materials to accepted standards.

- 3-3. The IPC does not have any method to determine the minimum size of the hanger rods supporting pipe.

Table 3-1 of the UPC indicates the size of the pipe and the minimum rod size for hanging various size piping.

- 3-4. **IPC Table 308.5, HANGER SPACING.** An exception to Table 308.5 in Section 308.5 that is new in the 2000 IPC is that the interval of support to provide for expansion and contraction of any piping material must be handled as an alternative engineered design in accordance with IPC Section 105.4. This requires the input of a registered design professional for each project requiring provisions for the expansion and contraction of any piping. The reason for this unusual requirement is not obvious. Also, providing for expansion and contraction involves more than support spacing.

In the IPC, the maximum support spacing for ABS and PVC drainage pipe is four feet horizontally and ten feet vertically, with mid-story guides for pipe 2" and smaller.

UPC Table 3-2 requires mid-story guides for all sizes of ABS and PVC drainage pipe. In addition, it requires provisions for expansion at 30-foot intervals per the IAPMO Installation Standards for ABS and PVC drainage pipe. The provisions for expansion and contraction of such piping are addressed by the UPC and do not need to be handled as an alternative engineered design.

- 3-5. **IPC Table 308.5, HANGER SPACING.** This section lists support spacing for aluminum tubing, but aluminum tubing is not an approved material for any IPC piping systems.

The UPC does not list this material.

- 3-6. **IPC Table 308.5, HANGER SPACING.** Lists maximum vertical support spacing but does not refer to the base of risers or support at floor levels. (Section 308.9 addresses base of stacks only.)

UPC Table 3-2 is generally more detailed. It specifically calls for vertical support at the base of risers and at floor levels.

- 3-7. **IPC Table 308.5, HANGER SPACING.** Footnote "a" requires that hangers shall be increased to 10-foot spacing where 10-foot lengths of cast iron pipe are used. (Emphasis added.) Furthermore, industry standards call for the supports to be within 18 inches of the joints in cast iron soil pipe. The IPC does not require this.

UPC Table 3-2 says "may be increased." (Emphasis added.) There is no reason to prohibit support spacings of less than 10 feet in 10-foot lengths of pipe. Also, the UPC requires that the supports be within 18 inches of the joints.

- 3-8. **IPC Section 308.6, Sway bracing.** This section requires rigid-support sway bracing for all [emphasis added] pipe 4" and larger at turns greater than 45 degrees. This requirement seems excessive to the writers.

UPC Table 3-2 requires sway braces only for cast iron soil pipe (all sizes) and only at 40-foot intervals.

- 3-9. **IPC Section 308.7, Anchorage.** Calls for restraining anchors on all drain pipe 4" and larger at changes in direction and where the pipe size changes by two (2) pipe sizes. This appears to be based on no-hub cast iron soil pipe, but the IPC does not say so.

UPC Table 3-2 requires bracing on cast iron pipe at 40-foot intervals to prevent horizontal movement.

- 3-10. **IPC Section 309, FLOOD PROOFING.** The subjective classification of flood hazard zones is addressed, however, the means by which flood proofing is to be achieved are not described.

The 2000 IPC defines flood hazard zone (A Zone) and high hazard zone (V Zone), but has the same requirements for flood proofing for both zones. However, it contains no indication of how to satisfy these requirements.

The UPC does not address how to flood proof a plumbing installation.

- 3-11. **IPC Section 312, TESTS AND INSPECTIONS.** Includes tests for drain and vent piping, water supply pipe, sewers, and backflow preventers. These requirements are not included in the individual chapters.

The UPC includes individual test requirements of drain and vent, water supply, sewers, and backflow preventer assemblies, etc., in the specific individual chapters.

- 3-12. **IPC Section 312.9, Inspection and testing of backflow prevention assemblies.** This section is revised in the 2000 IPC, but it still has some confusing requirements. All backflow prevention devices, even air gaps and non-testable devices, must now be inspected annually for proper operation. There are no requirements on how to inspect these devices. However, like the UPC, testable devices must now be tested at the time of installation, after repairs or relocation, and at least annually.

The UPC, national backflow prevention organizations, and device manufacturers do not require annual inspections of non-testable devices and air gaps.

- 3-13. The IPC does not specifically address plumbing in food handling establishments except for indirect waste, Section 802.1.1.

The UPC addresses special plumbing requirements for food handling establishments in Sections 318.0 and 412.3.

- 3-14. **IPC Section 313.1** references the *International Energy Conservation Code*, but that code is not listed in Chapter 13 – Referenced Standards.

The UPC does not address equipment efficiencies. The requirements of the energy conservation code that is adopted by the jurisdiction would apply.

- 3-15. **Section 314.2.2, Drain pipe materials and sizes.** The IPC requires air conditioning condensate drain piping, but does not provide any information as to required sizing.

The UPC in Table 8-2 provides minimum required condensate drain pipe size.

- 3-16. **Section 314.2.3, Auxiliary and Secondary Drain Systems.** The IPC provides requirements in the plumbing code for the secondary drain pan which is usually provided by the HVAC contractor. Therefore, the plumbing inspector is required to approve equipment furnished under another scope of work.

The UPC does not include this provision.

D. CHAPTER 4 - FIXTURES, FAUCETS, AND FIXTURE FITTINGS

- 4-1. **IPC Table 403.1, MINIMUM NUMBER OF PLUMBING FACILITIES.** This table generally requires fewer plumbing fixtures than UPC Table 4-1.

The current trend in the plumbing industry is to increase the minimum number of required fixtures due to complaints of inadequate "potty parity".

- 4-2. **IPC Section 404, ACCESSIBLE PLUMBING FACILITIES.** This section has requirements for Type A and Type B dwelling units in residential occupancies but still does not define what these types are. IPC Section 404.1 requires that accessible plumbing fixtures comply with IPC Section 404 and ICC/ANSI A117.1. Section 404 has been revised to reference ICC/ANSI A117.1 for ordinary accessible plumbing facilities and includes additional requirements for unisex facilities, which ICC/ANSI A117.1 does not address.

UPC Section 408.7 defers to the applicable building regulations for accessibility requirements for plumbing fixtures and facilities. Table 14-1, *Mandatory Referenced Standards*, lists A117.1 except that it lists the CABO A117.1-92 edition. The UPC does not address unisex facilities, for which there are no nationally recognized requirements.

- 4-3. **IPC Section 406, AUTOMATIC CLOTHES WASHERS.** The IPC requires the installation of either an integral air gap or an external backflow preventer for a domestic clothes washer. The IPC fails to recognize that the industry standard for domestic clothes washers requires that they have an internal air gap. The mention of a possible external backflow preventer creates confusion in the field and frequently results in the installation of unnecessary devices by uninformed persons.

The UPC recognizes that domestic clothes washers have internal backflow protection. UPC Section 603.4.7 specifically excludes clothes washer hose connections from required backflow protection.

- 4-4. **IPC Section 409, DISHWASHING MACHINES.** The IPC requires either an air gap or a backflow preventer for domestic and commercial dishwashers. The IPC fails to recognize that the industry standards for dishwashing machines require that they have an internal air gap. The mention of a possible external backflow preventer creates confusion in the field and frequently results in the installation of unnecessary devices by uninformed persons.

The UPC recognizes that dishwashing machines have built-in backflow protection and does not mention the possible need for external devices.

- 4-5. **IPC Section 412.4, Public Laundries and Central Washing Facilities.** The 2000 IPC still does not require floor drains in public toilet rooms.

UPC Section 412.2.1 requires floor drains in public toilet rooms having two (2) or more water closets or a combination of one (1) water closet and one (1) urinal to accommodate housekeeping and the possible overflow of fixtures.

- 4-6. **IPC Section 419.2, Substitution for water closets.** The IPC now permits urinals to be substituted for 67% of the minimum required number of water closets instead of 50%. IPC Table 403.1 lists only required water closets.

UPC Table 4-1 lists minimum required numbers of both water closets and urinals for males. If the number of urinals is increased above the minimum, one required water closet can be deducted for each additional urinal, except that the number of water closets cannot be reduced to less than 2/3 of the minimum requirements. The UPC provides more water closets and urinals than the IPC in most occupancies and assures an adequate number of water closets.

- 4-7. **IPC Section 426.1, MANUAL FOOD AND BEVERAGE DISPENSING EQUIPMENT.** This new section requires that such equipment conform to ANSI/NSF 18. This now makes the Administrative Authority for plumbing responsible for this equipment, which is not considered plumbing equipment.

The UPC does not include manual food and beverage dispensing equipment in its scope, except for any required potable water connections or provisions for drainage.

E. CHAPTER 5 - WATER HEATERS

- 5-1. **Section 502.1, General.** The IPC references the International Fuel Gas Code for gas-fired water heaters.

The UPC includes complete requirements for gas-fired water heaters in its Chapter 5. Gas piping is included in Chapter 12 and appliance venting is in Appendix C.

- 5-2. **IPC Section 505.1, Unfired vessel insulation.** This section requires specific insulation on unfired vessels.

The UPC does not contain this requirement. It would be regulated by the local energy conservation code.

F. CHAPTER 6 - WATER SUPPLY AND DISTRIBUTION

- 6-1. **IPC Chapter 6, WATER SUPPLY AND DISTRIBUTION.** This section does not contain a water pipe sizing procedure. IPC Section 604.1 requires that piping be sized per "accepted engineering practice". It also requires that methods used to determine pipe sizes shall be approved, but it does not say how or by whom. Furthermore, it does not refer to Appendix E, which is supposedly an acceptable method.

UPC Section 610.0 covers sizing potable water piping. UPC Table 6-5 is used for sizing smaller systems of up to 50 water supply fixture units (WSFU) and 200 feet maximum length without a great deal of engineering. In addition, UPC Section 610.10 provides a mechanism for adapting flush valve fixtures in these moderate size systems that does not require the utilization of the engineered method to size the piping. This makes it much more convenient for the plumbing contractors, the plumbing inspectors for checking, and the engineers who do not want to do a lot of detailed engineering. Systems having more than 50 WSFU can be sized by Table 6-5 up to 1000 feet maximum, by the procedures in Appendix A, or by Appendix L.

- 6-2. **IPC Section 604.3, Water distribution system design criteria.** The "conditions of peak demand" under which fixtures are expected to perform according to Table 604.3 are not described. Furthermore, IPC Table 604.3 is not consistent with IPC Table 604.4 as noted below:

- a. A lavatory that flows 2.5 gpm at 60 psig will not flow 2 gpm at 8 psig.
- b. A shower head that flows 2.5 gpm at 60 psig will not flow 3 gpm at 8 psig nor 3.0 gpm at 20 psig.
- c. A sink faucet that flows 2.2 gpm at 60 psig will not flow 2.5 gpm at 8 psig.

- d. Table 604.4 lists 2.5 gpm maximum for showers but Table 604.3 lists 3 gpm required design flow.
- e. Table 604.4 lists 0.5 gpm for public lavatories but Table 604.3 lists 2 gpm design for all lavatories. The flow rate of 0.5 gpm is associated with self-closing faucets.
- f. In Table 604.4, the quantity of 0.25 gallons per metering cycle does not apply to all self-closing faucets, only the metering type.

The UPC provides a means for sizing water piping systems using flow values that are coordinated with current water conservation standards. (See UPC comment in Item 6-1 above.)

- 6-3. **IPC Table 604.3, WATER DISTRIBUTION SYSTEM DESIGN CRITERIA, REQUIRED CAPACITIES AT FIXTURE SUPPLY PIPE OUTLETS.** This table lists 8 psi flow pressure at the water supply pipe outlet for two-piece water closets. However, many ultra low flow water closets require higher water pressure for proper flushing. The IPC does not address this.

UPC Section 608.1, Inadequate Water Pressure, requires 15 psi minimum pressure at fixtures, and higher if required by the fixtures and/or fixture fittings.

- 6-4. The IPC does not dictate where self-closing and self-closing metering faucets are required to be installed.

UPC Section 402.6 requires that self-closing or self-closing metering faucets be installed on lavatories intended to serve the transient public, such as those in, but not limited to, service stations, train stations, airports, restaurants, and convention halls. This is consistent with current water conservation practices.

- 6-5. **IPC Section 604.5, Size of fixture supply.** This section allows up to a 30" reduced-size flexible tubing supply to each fixture. This can create a significant pressure drop, especially in light of the IPC's already reduced water pipe size allowance. (Also see Item 6-7 below.)

UPC Table 6-4 requires 1/2" minimum supply pipes to all fixtures. Therefore, 30" reduced-size flexible connectors will still provide sufficient water pressure and flow at the fixtures.

- 6-6. **IPC Table 604.5, MINIMUM SIZES OF FIXTURE WATER SUPPLY PIPES.** This section permits 3/8" fixture water supply pipes for the following fixtures:

Bidets
Drinking fountains
Lavatories
Flush tank water closets
Flushometer tank water closets

The pressure loss created by 3.0 gallons per minute for a water closet in 3/8" PEX is 32.4 psig for a 60-foot run. This is excessive pressure loss.

UPC Table 6-4 requires 1/2" minimum supply pipe to all fixtures.

- 6-7. **IPC Table 604.5, MINIMUM SIZES OF FIXTURE WATER SUPPLY PIPES, Footnote "a".** This footnote states "Where the developed length of the distribution line is 60 feet or less, and the available pressure at the meter is a minimum of 35 psi, the minimum size of an individual distribution line supplied from a manifold and installed as part of a parallel water distribution system shall be one nominal tube size smaller than the sizes indicated." (Emphasis added.)

This footnote requires that all parallel water distribution supply lines that were 3/8" be reduced to 1/4" and 1/2" supply lines be reduced to 3/8". This mandatory reduction in size will not allow the required flow of water to the fixtures as required by Table 604.3. For example, for a shower with 2.5 gpm flow in 60 feet of 3/8" PEX equals 23.5 psig loss; residual required pressure of 8 psig; elevational loss of, say, six pounds; meter loss of, say, 2.0 psi, equals a total of 39.5 psig losses without fitting losses. However, this pipe size reduction can be used with an incoming pressure of only 35 psig. Therefore, the water system cannot provide the required residual pressure and flow to the fixtures. Furthermore, if temperature controlled shower mixing valves or ultra low flow water closets are installed which require higher than 8 pounds residual pressure then the pressure deficiency is even greater.

UPC Table 6-4 requires 1/2" minimum supply pipe to all fixtures.

- 6-8. **IPC Section 604.9, Water hammer.** This section states that "The flow velocity of the water distribution system shall be controlled to reduce the possibility of water hammer." Flow velocities are "controlled" by pipe sizing. However, the IPC does not limit the flow velocities for the various water distribution piping materials.

The UPC limits the flow velocities in various piping materials in its Installation Standards.

- 6-9. **IPC Section 604.10.1, Manifold sizing.** This section requires that the manifold shall be sized on the basis of the summation of the gpm demand of all the outlets

(fixtures) supplied by the manifold. This oversizes the manifold because it does not allow for normally accepted diversity in the use of fixtures, i.e., normally all fixtures do not operate at the same time.

The UPC allows manifolds to be sized on the basis of the same diversity as is used in sizing water piping.

- 6-10. **IPC Table 604.10.1, MANIFOLD SIZING.** This table has two columns, velocity at 4 feet and velocity at 8 feet per second. However, there is nothing in the IPC to dictate or mandate which column an individual is to utilize in sizing the water system manifold.

The UPC limits the velocity in various materials in its Installation Standards.

- 6-11. **IPC Table 605.5, WATER DISTRIBUTION PIPE.** This table does not prohibit the use of plastic insert fittings in polybutylene (PB) tubing. It also does not reference ASTM F1390 for metal insert fittings for PB tubing. However, IPC Section 605.19.3, Mechanical joints, mentions metallic lock rings but does not prohibit plastic insert fittings. The manufacturers of polybutylene tubing have blamed the failure of the product on the use of plastic insert fittings. They now recommend only brass insert fittings.

The UPC no longer approves PB piping for water systems due to the number of failures and lawsuits. Also, some jurisdictions prohibit flexible fixture supplies that are PB because of deterioration and failure because of the chlorine in public water systems.

- 6-12. **IPC Section 605.16.2, Solvent cementing.** The IPC now permits ASTM D2846 CPVC pipe and fittings up through 2" size to be solvent cemented with ASTM F493 yellow cement without the use of a primer.

UPC Section 316.1.6 requires that CPVC and PVC pipe and fittings be cleaned and joined with listed primer(s) and solvent cements(s). There is currently no consensus among the manufacturers of pipe, fittings, and solvent cements that adequate joints can be made without using a primer. There is concern among designers, installers, and code officials about mixing pipe, fittings, and solvent cements from different manufacturers who have different recommendations regarding the use of one-step solvent cements.

- 6-13. **IPC Section 605.22.1, Copper or copper-alloy tubing to galvanized steel pipe.** This section does not restrict the joining of copper tubing and galvanized steel pipe except for how the joining is to be made. Also the IPC does not require such dissimilar joint connections to be exposed or accessible.

UPC Section 604.1 indicates that all material used in the water supply system, except valves and similar devices, shall be of a like material, except where otherwise approved by the Administrative Authority. Furthermore, UPC Section 311.6 indicates that except for necessary valves where intermingling or mixing of dissimilar metals occurs, the point of connection shall be confined to exposed or accessible locations.

- 6-14. **IPC Section 606.2, Location of shutoff valves.** Paragraph 2 requires a shutoff valve ahead of every sillcock.

The UPC does not have this mandatory requirement for all sillcocks. Shutoff valves could be installed if the installer wanted them.

- 6-15. **IPC Section 606.4, Valve Identification.** This section requires that all service valves, hose bibb valves, and valves not located adjacent to fixtures shall be identified. It is assumed that "hose bibb valves" are the shutoff valves required in 606.2 and not the hose bibb itself.

The UPC does not require valve identification. The function of most shutoff valves is obvious. Typical specifications for commercial construction work generally require labeling of valves.

- 6-16. **IPC Table 606.5.4, SIZES FOR OVERFLOW PIPES FOR WATER SUPPLY TANKS.** This table provides the required size for overflow pipes from various sizes of storage tanks. However, normally the overflow pipe size is dictated only by the size of the water supply pipe inlet. (The amount of water entering the tank and not by the size of the tank.) Therefore, if the tank has a 1" supply pipe it might have a 2" overflow. However, this table does not relate to the size of the inlet pipe, but simply to the capacity of the storage tank. This results in extremely large overflow pipe sizes. The IPC seems to be overly conservative on this.

The UPC does not have this excessive requirement.

- 6-17. **IPC Table 606.5.7, SIZE OF DRAIN PIPES FOR WATER TANKS.** This table dictates the mandatory size of a drain pipe from a water storage tank. This extremely oversized drain piping might create serious damage as to where this large volume of water drainage is going to discharge. Furthermore, if someone wishes to take a little longer to drain a tank, why does the IPC restrict them? The IPC seems to be overly conservative on this.

The UPC does not contain this requirement.

- 6-18. **IPC Section 607.2, Hot water supply temperature maintenance.** This section requires that if a fixture is beyond 100 feet developed length from the water

heater, a means for maintaining temperature shall be provided to within 100 feet of the fixture. This procedure achieves very little in energy conservation or water conservation with the allowance of 100 feet of unmaintained hot water supply. In many cases, this could require that only the first few feet of hot water pipe be insulated.

The UPC does not address hot water maintenance systems, however, the various state energy conservation laws do address this subject.

- 6-19. **IPC Section 607.2.1, Piping insulation.** This section is not clear as to where insulation is required on hot water piping. Is it required only on the maintained piping, or the circulated supply and return piping, and is insulation required only to within 100 feet of the farthest fixture?

The UPC does not have requirements for thermal insulation on hot water piping. The requirements of the energy conservation code for the jurisdiction would apply.

- 6-20. **IPC Section 607.3.1, Pressure-reducing valve.** This section is very confusing being that the requirement for a means of controlling expansion is only required for service pipes 2" and smaller, which seems strange to the writers. Secondly, there is no indication that a device to control thermal expansion is required if the incoming pressure is higher than the relief valve pressure so that subsequently the integral bypass on a pressure-reducing valve would be non-functioning and, therefore, the system would have no provision to compensate for thermal expansion.

The UPC addresses this problem very clearly in the third paragraph of Section 608.3 where it indicates that if the water supply pressure is higher than the relief valve setting, a means of addressing thermal expansion must be provided regardless of the size of the water service.

- 6-21. **IPC Table 608.15.1, MINIMUM REQUIRED AIR GAPS.** In the IPC table "with effective openings not greater than 3/4" in diameter close to the wall," the minimum required air gap is 2-1/2", which is more restrictive than the UPC, which is only 2-1/4".

- 6-22. **IPC Section 608.16.3, Heat exchangers.** This section uses the terms "essentially toxic" and "essentially non-toxic" to address restrictions on the use of single-wall heat exchangers for domestic hot water. The IPC defines essentially non-toxic in Section 202, GENERAL DEFINITIONS, as having a Gosselin rating of 1. However, Gosselin ratings indicate the relative toxicity of various substances and household products ranging from a low of "1" to a high of "6". Furthermore, Gosselin's book is intended as an aid to doctors and poison control centers in quickly evaluating potential cases of poisoning that are phoned in. Products are not labeled with a Gosselin rating. The amount of the substance ingested is also a

factor in its toxicity. For example, potable water can cause death if too much is ingested.

The Commentary on the 1997 IPC describes a Gosselin rating of "1" as practically non-toxic. (Emphasis added.) The lethal dose of a substance having a Gosselin rating of "1" is listed as "more than 1 quart" for a 150 pound person. The IPC does not require that single-wall heat exchangers be permanently marked to indicate the restrictions on additives nor does IPC Section 608.16.3 require single-wall heat exchangers to have warning labels.

UPC Appendix L 3.2 permits single-wall heat exchangers if any additives used are recognized as safe by the FDA. Such products would typically bear the FDA approval. Furthermore, the UPC requires that the equipment must be permanently labeled to indicate that only FDA approved additives shall be used.

- 6-23. **IPC Section 608.16.4, Connections to automatic fire sprinkler systems and standpipe systems.** This section places no restrictions on the use of double check valve assemblies or double check detector assemblies for backflow protection from fire protection systems.

UPC Section 603.4.18.2 permits only reduced pressure backflow preventers or reduced pressure detector assemblies where there is a non-potable water source (such as a pond or stream) within 1700 feet of a fire department connection. This corresponds to the recommendations of national backflow prevention organizations. (AWWA M14, Class 4)

- 6-24. **IPC Table 608.17.1, DISTANCE FROM SOURCES OF CONTAMINATION TO PRIVATE WATER SUPPLIES AND PUMP SUCTION LINES.** A comparison of IPC Table 608.17.1 and UPC Table K-1 shows a significant reduction in the IPC in the required separation between water wells and seepage pits, septic tanks, sewers, and subsurface disposal fields. The writers are not aware of any justification for this significant reduction in these dimensions.

IPC TABLE 608.17.1 DISTANCE FROM SOURCES OF CONTAMINATION TO PRIVATE WATER SUPPLIES AND PUMP SUCTION LINES		UPC TABLE K-1 LOCATION OF WATER SUPPLY WELLS
SOURCE OF CONTAMINATION	DISTANCE (Feet)	DISTANCE (Feet)
Barnyard	100	Not included
Farm Silo	25	Not included
Pasture	100	Not included
Pumphouse floor drain of cast iron draining to	2	Not included

ground surface		
Seepage pits	50	150
Septic tank	25	50
Sewer	10	50 ³
Subsurface disposal fields	50	100
Subsurface pits	50	Not included

For SI: 1 foot = 304.8 mm.

UPC Footnote 3, "All drainage piping shall clear domestic water supply wells by at least fifty (50) feet (15240 mm). This distance may be reduced to not less than twenty-five (25) feet (7620 mm) when the drainage piping is constructed of materials approved for use within a building."

- 6-25. **IPC Section 609, HEALTH CARE PLUMBING.** This section deals with partial requirements of health care plumbing and health care water systems.

The UPC has added some special requirements for health care plumbing in Chapter 13 and in the backflow protection section of Chapter 6. The unique requirements for plumbing in hospitals are usually established by the design professionals and governmental agencies that oversee their design and operation.

- 6-26. **IPC Section 609.2, Water service.** This section requires that all hospitals have two water services regardless of the size of the facility, the number of beds, or the fact that the public water system may only have one water main in the adjacent area. Therefore, this code requirement seems to be excessive and beyond the normal requirements of a minimum plumbing code.

The UPC does not have this requirement.

- 6-27. **IPC Section 609.7, Condensate drain trap seal.** This section requires that a water supply be provided for cleaning, flushing, and resealing the [emphasis added] condensate traps in health care facilities. It is not clear whether this requirement is meant for all condensate traps in health care facilities or just certain traps on special equipment, which are not identified. As written, the IPC requires that water supplies be run to all HVAC condensate traps for maintenance purposes. This is a very unusual and excessive requirement. A local water supply is not needed to maintain HVAC traps. The writers are not aware of any piece of equipment that needs a local water supply for condensate trap maintenance.

The UPC does not have this requirement.

G. CHAPTER 7, SANITARY DRAINAGE

- 7-1. **IPC Section 702, MATERIALS.** This section has no restrictions on the location of ABS and PVC drain and waste piping.

UPC Section 701.1.2 has been revised and no longer prohibits ABS and PVC DWV piping in structures that are higher than three stories above grade. It does add limits on flame-spread index and smoke-developed index for piping exposed in ducts or plenums, except in individual dwellings.

- 7-2. **IPC Tables 704.1, SLOPE OF HORIZONTAL DRAINAGE PIPE, and 710.1(1), BUILDING DRAINS AND SEWERS.** These tables permit 3" horizontal drains to run at 1/8" per foot slope. All other model plumbing codes require that 3" and smaller drain piping be run at 1/4" per foot minimum slope. The 1/4" minimum slope assures sufficient flow velocity for the transport of solids. Two (2) feet per second velocity is the minimum recommended for soil and waste lines. A 3" drain at 1/8" per foot slope has a flow velocity of only 1.59 fps. A 3" drain at 1/4" per foot slope has a flow velocity of 2.25 fps. This is particularly important where 1.6 gpf water closets are involved due to the limited waste carry of some low flow water closets.

UPC Section 708.0 requires that horizontal drain piping be run at 1/4" per foot minimum slope where possible. It permits pipe 4" and larger to be run at 1/8" per foot slope when approved by the Administrative Authority.

- 7-3. **IPC Section 704.3, Connections to offsets and bases of stacks.** This section allows fixture connections at bases of stacks or stack offsets as close as ten pipe diameters downstream from the base of the stacks or the stack offsets. However, with sudsing, this dimension could be insufficient to prevent the suds from coming up into a fixture located near the base of the stack or stack offset.

UPC Section 711.0, Suds Relief, dictates a minimum of 8 feet from the base of the stack containing discharge from suds-producing fixtures to any connection to a fixture, with certain exceptions.

- 7-4. **IPC Section 704.5, Dead ends.** This section prohibits the installation of dead ends which in the definitions are listed as any developed length of greater than two feet. However, cleanout extensions and approved future fixture drainage piping are not considered dead ends. Therefore, with all of these exceptions, why does the IPC prohibit dead ends?

The UPC does not have this restriction on dead ends.

- 7-5. **IPC Section 705.16.2, Copper or copper-alloy tubing to galvanized steel pipe.** This section requires that the connection between copper tubing and galvanized steel be made with a brass converter fitting or dielectric fitting. The writers have not seen dielectric fittings normally used on waste or vent piping.

The UPC does not have this requirement in the drainage section of the code.

- 7-6. **IPC Table 706.3, FITTINGS FOR CHANGE IN DIRECTION.** This table is more liberal than the UPC in its use of short radius fittings, particularly on individual fixture drains. However, the table fails to recognize the differences in terminology for the various fitting patterns in different drain pipe materials. For example, a hubless cast iron short sweep is not a short radius fitting and its use need not be restricted. In the plumbing industry, there are some fitting pattern names that are specific to only one material.

UPC Section 706.0 does not permit 1/4 bends or other short radius fittings in individual branch drains.

- 7-7. **IPC Section 708.3.2, Building Sewers.** The IPC requires that all [emphasis added] sewers 8" and larger have manholes installed at each change of direction and at intervals not to exceed 400 feet. However, as now written, building sewers 8" size and larger require cleanouts at 100-foot intervals plus [emphasis added] manholes at 400-foot intervals.

UPC Section 719.6 indicates that manholes may be used on any size sewer in lieu of cleanouts when approved by the Administrative Authority. Distance between manholes shall not exceed 300 feet.

- 7-8. **IPC Section 708.3.3, Change of Direction.** The IPC requires a cleanout at every change of direction greater than 45 degrees, but does not require a cleanout closer than every 40 feet. Therefore, this section may require more cleanouts in drainage piping than UPC 707.0. Furthermore, regardless of how many changes of direction occur on a drain or waste line within a 40' interval, still only one cleanout is required by the IPC.

UPC Section 707.0 requires cleanouts every 100 feet. Exceptions include lines less than five feet long and all lines above the first floor of the building. Furthermore, an additional cleanout is required for each aggregate horizontal change of direction exceeding 135 degrees. The requirement for fewer cleanouts in the UPC has not proven to be a problem in clearing blockages in drainage piping when modern drain cleaning equipment is used.

- 7-9. **IPC Section 708.3.4, Base of stack.** This section requires that cleanouts be installed at the base of each waste or soil stack regardless of their location within the building.

The UPC only requires cleanouts if the base of the stack is part of the building drain or the lowest drain line. The requirement for fewer cleanouts in the UPC has not proven to be a problem in clearing blockages in drainage piping when modern drain cleaning equipment is used.

- 7-10. **IPC Section 708.4, Concealed piping.** This section requires that cleanouts be provided on all drainage piping in concealed spaces. This would require that drainage piping above the ceiling is required to be provided with cleanouts and, if the ceiling space is less than 24", the cleanout would have to be extended up to a finished wall or out through the face of the building.

The UPC only requires cleanouts on the building drain, not on drainage piping above the lowest floor.

- 7-11. **IPC Section 708.4, Concealed Piping.** This section requires that the piping cleanout, where the crawl space is less than 24", shall be extended through and terminate flush with finished wall, floor, or ground surface, or shall be extended to outside the building.

UPC Section 707.10 indicates that the piping cleanout shall be extended to outside the building when there is less than 18" vertical and 30" horizontal clearance from the means of access to such cleanout and that no under-floor cleanout shall be located more than 20 feet from an access door, trap door, or crawl hole. This provides better safety for the building occupant and service personnel.

- 7-12. **IPC Section 708.8, Clearances.** This section requires that cleanouts on 6" and smaller pipes shall be provided with clearance of not less than 18" and cleanouts on 8" and larger pipes shall have a clearance of not less than 36".

UPC Section 707.10 is less restrictive than the IPC as it only requires that cleanouts on piping 2" or less shall have a clearance of 12" in front of the cleanout, and cleanouts on piping larger than 2" shall have a clearance of not less than 18". The requirement for less clearance for cleanouts in the UPC has not proven to be a problem in clearing blockages in drainage piping.

- 7-13. **IPC Table 709.1, DRAINAGE FIXTURE UNITS FOR FIXTURES AND GROUPS.** The IPC now distinguishes between 1.6 gpf water closets and greater than 1.6 gpf water closets. However, they distinguish between the demands of private and public plumbing fixtures only for water closets. The dfu values for flushometer tank water closets is the same whether private or public. The IPC fails to recognize use patterns for most other fixtures, which the UPC does. Plus the IPC does not recognize the higher demands caused by continuous use in assembly occupancies. Furthermore, the table omits listing significant types of fixtures which are in common use.

UPC Table 7-3 has been revised and now provides three (3) different use groups for all fixtures in lieu of four (4). There is no longer a distinction between single dwellings and 3 or more dwellings. The groups are now private, public, and assembly. The table still better addresses the demands of the

various fixtures based on their application. The dfu values in Table 7-3 are based on research by Stevens Institute, which revealed that peak drainage loads in dwellings are caused by bathtubs or combination bath/showers, clothes washers, and dishwashers. The time duration of these discharges is relatively long and combines with other fixtures to create the peak drainage loads.

UPC Table 7-3 also includes a much greater classification of fixture types for simplicity of use, as shown below. The UPC table contains 41 line items as opposed to only 27 contained in the IPC Table 709.1 (a 50% increase in fixture classifications).

↓ ARROWS INDICATE IPC TABLE 709.1 FIXTURE CLASSIFICATIONS.	UNIFORM PLUMBING CODE TABLE 7-3 DRAINAGE FIXTURE UNIT VALUES (DFU)				INTERNATIONAL PLUMBING CODE TABLE 709.1 DRAINAGE FIXTURE UNITS FOR FIXTURES & GROUPS		
	UPC TABLE 7-3 - PLUMBING APPLIANCE, APPURTENANCE OR FIXTURE	MINIMUM SIZE TRAP & TRAP ARM ⁷	PRIVATE	PUBLIC	ASSEMBLY ⁸	DRAINAGE FIXTURE UNIT VALUE AS LOAD FACTORS	MINIMUM SIZE OF TRAP (INCHES)
→ Automatic Clothes Washers, commercial ^a	—	—	—	—	—	3	2"
→ Bathroom group as defined in Section 202 (1.6 GPF water closet) ^f	—	—	—	—	—	5	—
→ Bathroom group as defined in Section 202 (water closet flushing greater than 1.6 GPF) ^f	—	—	—	—	—	6	—
→ Bathtub ^b (with or without overhead shower or whirlpool attachments)	—	—	—	—	—	2	1-1/2"
Bathtub or Combination Bath/Shower	1-1/2"	2.0	2.0	—	—	—	—
→ Bidet	1-1/4"	1.0	—	—	—	1	1-1/4"
Bidet	1-1/2"	2.0	—	—	—	—	—
→ Clothes Washer, domestic, standpipe ⁵ (Residential)	2"	3.0	3.0	3.0	—	2	2"
→ Combination Sink and Tray	—	—	—	—	—	2	1-1/2"
→ Dental Lavatory	—	—	—	—	—	1	1-1/4"
→ Dental Unit or Cuspidor	1-1/4"	—	1.0	1.0	—	1	1-1/4"
→ Dishwasher, domestic, with independent drain	1-1/2" ²	2.0	2.0	2.0	—	2	1-1/2" ^c
→ Drinking Fountain or Watercooler (per head)	1-1/4"	0.5	0.5	1.0	—	0.5	1-1/4"
Food-waste-grinder, commercial	2"	—	3.0	3.0	—	—	—
→ Floor Drain, emergency	2"	—	0.0	0.0	—	0	2"
Floor Drain (for additional sizes see Section 702)	2"	2.0	2.0	2.0	—	—	—
→ Floor Drains	—	—	—	—	—	2	2"
Shower single head trap	2"	2.0	2.0	2.0	—	—	—
Multi-head, each additional	2"	1.0	1.0	1.0	—	—	—
→ Lavatory, single	1-1/4"	1.0	1.0	1.0	—	1	1-1/4"
Lavatory in sets of two or three	1-1/2"	2.0	2.0	2.0	—	—	—
Washfountain	1-1/2"	—	2.0	2.0	—	—	—
Washfountain	2"	—	3.0	3.0	—	—	—
Mobile Home, trap	3"	12.0	—	—	—	—	—
Receptor, indirect waste ^{1,3}	1-1/2"	—	See Footnote 1,3		—	—	—
Receptor, indirect waste ^{1,4}	2"	—	See Footnote 1,4		—	—	—
Receptor, indirect waste ¹	3"	—	See Footnote 1		—	—	—
→ Shower	—	—	—	—	—	2	1-1/2"
Sinks							
Bar	1-1/2"	1.0	—	—	—	—	—
Bar	1-1/2" ²	—	2.0	2.0	—	—	—
Clinical	3"	—	6.0	6.0	—	—	—
Commercial with food waste	1-1/2" ²	—	3.0	3.0	—	—	—

→ Sink	—	—	—	—	2	1-1/2"
Special Purpose	1-1/2"	2.0	3.0	3.0	—	—
Special Purpose	2"	3.0	4.0	4.0	—	—
Special Purpose	3"	—	6.0	6.0	—	—
→ Kitchen, domestic (with or without food-waste-grinder and/or dishwasher)	1-1/2" ²	2.0	2.0	—	2	1-1/2"

Laundry (with or without discharge from a clothes washer) → (1 or 2 compartments)	1-1/2"	2.0	2.0	2.0	2	1-1/2"
Service or Mop Basin	2"	—	3.0	3.0	—	—
Service or Mop Basin	3"	—	3.0	3.0	—	—
Service, flushing rim	3"	—	6.0	6.0	—	—
→ Wash, each set of faucets (circular or multiple)	—	—	2.0	2.0	2	1-1/2"
→ Urinal	—	—	—	—	4	Footnote d
→ Urinal, 1 gallon per flush or less	—	—	—	—	2 ^e	Footnote d
Urinal, integral trap 1.0 GPF ²	2"	2.0	2.0	5.0	—	—
Urinal, integral trap greater than 1.0 GPF	2"	2.0	2.0	6.0	—	—
Urinal, exposed trap	1-1/2" ²	2.0	2.0	5.0	—	—
→ Water Closet, 1.6 GPF Gravity Tank ⁶	3"	3.0	4.0	6.0	3 ^e Private	Footnote d
Water Closet, 1.6 GPF Flushometer Tank ⁶	3"	3.0	4.0	6.0	—	—
→ Water Closet, Flushometer Tank, public or private	—	—	—	—	4 ^e	Footnote d
Water Closet, 1.6 GPF Flushometer Valve ⁶	3"	3.0	4.0	6.0	—	—
→ Water Closet, greater than 1.6 GPF Gravity Tank ⁶	3"	4.0	6.0	8.0	4 ^e Private	Footnote d
Water Closet, greater than 1.6 GPF Flushometer Valve ⁶	3"	4.0	6.0	8.0	—	—
→ Water Closet, public (1.6 GPF)	—	—	—	—	4 ^e	Footnote d
→ Water Closet, public (flushing greater than 1.6 GPF)	—	—	—	—	6 ^e	Footnote d

UPC FOOTNOTES

- 1 Indirect waste receptors shall be sized based on the total drainage capacity of the fixtures that drain therein to, in accordance with Table 7-4.
- 2 Provide a 2" (52 mm) minimum drain.
- 3 For refrigerators, coffee urns, water stations, and similar low demands.
- 4 For commercial sinks, dishwashers, and similar moderate or heavy demands.
- 5 Buildings having a clothes washing area with clothes washers in a battery of three (3) or more clothes washers shall be rated at six (6) fixture units each for purposes of sizing common horizontal and vertical drainage piping.
- 6 Water closets shall be computed as six (6) fixture units when determining septic tank sizes based on Appendix K of this Code.
- 7 Trap sizes shall not be increased to the point where the fixture discharge may be inadequate to maintain their self-scouring properties.
- 8 Assembly [public use (See Table 4-1)].

IPC FOOTNOTES

- a For traps larger than 3 inches, use Table 709.2.
- b A showerhead over a bathtub or whirlpool bathtub attachments does not increase the drainage fixture unit value.
- c See Sections 709.2 through 709.4 for methods of computing unit value of fixtures not listed in Table 709.1 or for rating of devices with intermittent flows.
- d Trap size shall be consistent with the fixture outlet size.
- e For the purpose of computing loads on building drains and sewers, water closets or urinals shall not be rated at a lower drainage fixture unit unless the lower values are confirmed by testing.
- f For fixtures added to a dwelling unit bathroom group, add the DFU value of those additional fixtures to the bathroom group fixture count.

Inch 1-1/4 1-1/2 2 2-1/2 3
mm 32 40 50 65 80

For SI: 1 inch = 25.4 mm, 1 gallon = 3.785 L.

7-14. The IPC and UPC both require 1-1/2" minimum traps on kitchen sinks. The IPC permits a 1-1/2" branch drain. However, the UPC requires a 2" drain beyond the trap on any sink, as there may be food waste now or in the future.

7-15. **IPC Table 709.2, DRAINAGE FIXTURE UNITS FOR FIXTURE DRAINS OR TRAPS.** The DFU values for drain and trap sizes of fixtures not listed in Table 709.1 are less than required in UPC 702.0 as shown below.

IPC TABLE 709.2
DRAINAGE FIXTURE UNITS FOR FIXTURE DRAINS OR

UPC TABLE 702.0
FIXTURE UNIT EQUIVALENTS

TRAPS	
FIXTURE DRAIN OR TRAP SIZE (INCHES)	DRAINAGE FIXTURE UNIT VALUE
1-1/4	1
1-1/2	2
2	3
2-1/2	4
3	5
4	6

For SI: 1 inch = 25.4 mm.

DRAINAGE FIXTURE UNIT VALUE	
1-1/4"	1 Unit
1-1/2"	3 Units
2"	4 Units
3"	6 Units
4"	8 Units

Exception: On self-service laundries.

7-16. **IPC Section 710:1, Maximum fixture unit load.** The IPC fixture loading for drainage piping as shown in Table 710.1(1), BUILDING DRAINS AND SEWERS, is more liberal in some cases than the fixture loading shown in UPC Table 7-5. However, UPC Table 7-5 allows greater DFUs on horizontal lines than does IPC Table 710.1(2) for "total for a horizontal branch". Therefore, the UPC has greater allowance for DFU carrying capacity in horizontal drain lines for most installations. See comparisons below.

IPC TABLE 710.1(1) Building Drains and Sewers		
DIAMETER OF PIPE (INCHES)	MAXIMUM NUMBER OF DRAINAGE FIXTURE UNITS CONNECTED TO ANY PORTION OF THE BUILDING DRAIN OR THE BUILDING SEWER, INCLUDING BRANCHES OF THE BUILDING DRAIN ^a	
	SLOPE PER FOOT	
	1/4 INCH	
1-1/4	1	
1-1/2	3	
2	21	
2-1/2	24	
3	42	
4	216	
5	480	
6	840	
8	1,920	
10	3,500	
12	5,600	
15	10,000	

For SI: 1 inch = 25.4 mm, 1 inch per foot = 0.0833 mm/m.
^a The minimum size of any building drain serving a water closet shall be 3 inches.

IPC Table 710.1(2) Horizontal Fixture Branches and Stacks ^a	
MAXIMUM NUMBER OF DRAINAGE FIXTURE UNITS (DFU)	
TOTAL FOR A Horizontal Branch	
—	3
3	6
6	12
12	20
20	160
360	360
620	1,400
1,400	2,500
2,900	2,900
7,000	7,000

For SI: 1 inch = 25.4 mm.
^a Does not include branches of the building drain. Refer to Table 710.1(1).

UPC TABLE 7-5 MAXIMUM UNIT LOADING AND MAXIMUM LENGTH OF DRAINAGE AND VENT PIPING	
SIZE OF PIPE INCHES (mm)	MAXIMUM UNITS DRAINAGE PIPING ¹
	HORIZONTAL
1-1/4 (32)	1
1-1/2 (40)	1
2 (50)	8 ³
2-1/2 (65)	14 ³
3 (80)	35 ⁴
4 (100)	216 ⁵
5 (125)	428 ⁵
6 (150)	720 ⁵
8 (200)	2,640 ⁵
10 (250)	4,680 ⁵
12 (300)	8,200 ⁵

¹ Excluding trap arm.
² Except sinks, urinals and dishwashers.
³ Except six-unit traps or water closets.
⁴ Only four (4) water closets or six-unit traps allowed on any vertical pipe or stack; and not to exceed three (3) water closets or six-unit traps on any horizontal branch or drain.
⁵ Based on one-fourth (1/4) inch per foot (20.9 mm/m) slope. For one-eighth (1/8) inch per foot (10.4 mm/m) slope, multiply horizontal fixture units by a factor of 0.8.

7-17. **IPC Section 710, DRAINAGE SYSTEM SIZING, and Tables 709.1 and 709.2.** Nowhere does it require that the minimum size for drainage piping for a water closet shall be 3". Also, Table 710.1(1) indicates that the minimum size for a building drain (emphasis added) serving a water closet shall be 3" but the IPC does not indicate the requirement that a minimum branch size to the water closet

shall be 3". Therefore, it could be 2-1/2", which is the trap way for some water closets.

UPC Tables 7-3 and 7-5 require a minimum of 3" drain piping for water closets.

- 7-18. **IPC Section 710.1.1, Horizontal stack offsets.** The IPC requires that horizontal stack offsets be sized as shown in Table 710.1(1), except as modified by Section 711.4.

The UPC requires only Table 7-5 for determination of vertical and horizontal pipe sizing and does not require other considerations for pipe sizing.

- 7-19. **IPC Table 710.1(2), HORIZONTAL FIXTURE BRANCHES AND STACKS.** There appears to be a typographical error for the maximum number of DFUs on a 12" horizontal branch drain. The "2900" should probably read "3900".

- 7-20. **IPC Section 710.1.2, Vertical stack offsets.** The IPC requires that vertical offsets be sized in accordance with Table 710.1(2) except as modified by Section 711.1.1.

The UPC only requires the sizing of the offsets to be as shown in Table 7-5 with no other considerations required for pipe sizing.

- 7-21. **IPC Section 710, DRAINAGE SYSTEM SIZING, and Section 711, OFFSETS IN DRAINAGE PIPING IN BUILDINGS OF FIVE STORIES OR MORE.** These sections use branch intervals in sizing drainage stacks. Table 710.1(2) has limits on the total number of drainage fixture units that:

- (1) can discharge into one (1) branch interval. This makes sure that the stack is large enough that the flow introduced in one (1) branch interval does not block the stack and restrict its flow.
- (2) can discharge into stacks of up to three (3) branch intervals. This adds some diversity in the total number of DFUs allowed.
- (3) can discharge into stacks of greater than three (3) branch intervals. This includes more diversity in the total allowable load on the stack.

By definition, branch intervals correspond to a story height but are not less than eight (8) feet high. This is so that where there are branch connections from fixtures on one floor that have connections both above and below the floor, it does not count as more than one (1) branch interval. However, a problem can occur if the floors of the building are staggered and drain connections from fixtures on two (2) floors occur within an eight (8) foot height.

UPC Table 7-5 does not use the branch interval principle and also allows 1-1/4" stacks for one DFU fixtures. Furthermore, the UPC permits greater carrying capacity in vertical drainage piping than does the IPC in most of their "one branch interval stacks" and "three branch intervals or less" which results in smaller drainage sizing with the UPC method for most installations. For comparison of the carrying capacity of stacks, see tables below.

IPC TABLE 710.1(2)			
HORIZONTAL FIXTURE BRANCHES AND STACKS ^a			
DIAMETER OF PIPE (INCHES)	MAXIMUM NUMBER OF DRAINAGE FIXTURE UNITS (DFU)		
	STACKS ^b		
	TOTAL DISCHARGE INTO ONE BRANCH INTERVAL	TOTAL FOR STACK OF THREE BRANCH INTERVALS OR LESS	TOTAL FOR STACK GREATER THAN THREE BRANCH INTERVALS
1-1/2	2	4	8
2	6	10	24
2-1/2	9	20	42
3	20	48	72
4	90	240	500
5	200	540	1,100
6	350	960	1,900
8	600	2,200	3,600
10	1,000	3,800	5,600
12	1,500	6,000	8,400
15	Footnote c	Footnote c	Footnote c

For SI: 1 inch = 25.4 mm.
 a Does not include branches of the building drain. Refer to Table 710.1(1).
 b Stacks shall be sized based on the local accumulated connected load at each story or branch interval. As the total accumulated connected load decreases, stacks are permitted to be reduced in size. Stack diameters shall not be reduced to less than one-half of the diameter of the largest stack size required.
 c Sizing load based on design criteria.

UPC TABLE 7-5	
MAXIMUM UNIT LOADING AND MAXIMUM LENGTH OF DRAINAGE AND VENT PIPING	
SIZE OF PIPE INCHES (mm)	MAXIMUM UNITS (DRAINAGE PIPING) ¹ VERTICAL
1-1/4 (32)	1
1-1/2 (40)	2 ²
2 (50)	16 ³
2-1/2 (65)	32 ³
3 (80)	48 ⁴
4 (100)	256
5 (125)	600
6 (150)	1,380
8 (200)	3,600
10 (250)	5,600
12 (300)	8,400

1 Excluding trap arm.
 2 Except sinks, urinals and dishwashers.
 3 Except six-unit traps or water closets.
 4 Only four (4) water closets or six-unit traps allowed on any vertical pipe or stack; and not to exceed three (3) water closets or six-unit traps on any horizontal branch or drain.
 5 Based on one-fourth (1/4) inch per foot (20.9 mm/m) slope, for one-eighth (1/8) inch per foot (10.4 mm/m) slope, multiply horizontal fixture units by a factor of 0.8.

7-22. **IPC Table 710.1(2), HORIZONTAL FIXTURE BRANCHES AND STACKS.** IPC 709.1 now addresses whether or not water closets are rated for 1.6 GPF or greater than 1.6 GPF, but the IPC still has no restrictions on the number of water closets on a 3" drainage stack. As an example, if the stack served only water closets in hotel guest rooms, the IPC would permit as many as twenty-four (24) 1.6 GPF water closets on the stack.

The UPC restricts 3" stacks to four (4) water closets to avoid possible overloading of the stack in the event that more than the predicted number of fixtures are flushed simultaneously.

7-23. **IPC Section 711, OFFSETS IN DRAINAGE PIPING IN BUILDINGS OF FIVE STORIES OR MORE.** This section contains six sections with different requirements as to where the vents are required, how and where they have to be installed, and their sizing, etc. Furthermore, while the title of IPC Section 711 refers to "buildings of five stories or more", the text refers to branch intervals.

UPC Table 7-5 can be used directly to size stacks and offsets in stacks, but the UPC does not require sizing changes for venting offsets.

- 7-24. **IPC Section 712, SUMPS AND EJECTORS.** This section does not require that sewage ejector pumps in commercial and other "public use" occupancies be duplexed. Also Section 712.3 refers to a "sump pump" for a sewage sump. Sump pumps do not have the solids-handling capacity of a sewage pump.

UPC Section 710.9 requires dual sewage pumps or ejectors in "public-use" occupancies that function independently to assure continuous operation of the drainage system during maintenance or in the event of equipment failure.

- 7-25. **IPC Section 713, HEALTH CARE PLUMBING.** This section still includes many provisions that are outdated regarding local vents for sterilizers and bed pan washers. Boiling-type sterilizers are no longer used in modern health care facilities. The requirements for vacuum systems in Sections 713.4, 713.5, 713.6 and 713.7 are far from complete and do not include sufficient requirements to assure that medical vacuum disposal systems in health care facilities are safe and sanitary. These four (4) sections are not coordinated with IPC Section 1202.1, which references NFPA 99C for the design and installation of medical vacuum systems.

The UPC has been revised to include the special requirements for plumbing in health care facilities in its Chapter 13, where its extensive requirements for medical gas and vacuum systems are located. The UPC references both NFPA 99C - *Gas and Vacuum Systems* and its parent document, NFPA 99 - *Health Care Facilities*, either of which can be used for medical gas and vacuum systems in health care facilities.

- 7-26. The IPC has no specific requirements for suds relief at the base of stacks or offsets of stacks serving suds-producing fixtures, such as bathtubs, clothes washers, kitchen sinks, and dishwashers.

UPC Section 711.0, in order to prevent the sudsing backup problem, prohibits fixture connections within eight (8) feet of the base of the stack or offsets of stacks having suds-producing fixtures except in dwellings or stacks less than three (3) stories high.

- 7-27. **IPC Section 714, COMPUTERIZED DRAINAGE DESIGN.** This sounds impressive but it is largely meaningless. The section does not indicate what computer program design methods are approved. Furthermore, **COMPUTERIZED DRAINAGE DESIGN** does not mandate that the design comply with the minimum requirements of IPC Section 105.4, Alternative engineered design.

- a. **IPC Section 714.1** could be interpreted to mean that all plumbing drainage systems must be sized by computer.
- b. **IPC Section 714.2** requires that the load on the drainage system be determined by:
 - 1) the simultaneous discharge conditions from fixtures, appurtenances, and appliances, or
 - 2) the sequential discharge conditions from fixtures, appurtenances, and appliances, or
 - 3) the peak usage design condition.

These three criteria represent three (3) completely different conditions and the IPC does not specify which condition is to be used.

- c. **IPC Section 714.2.1, Fixture discharge profiles.** This section requires that the flow rate versus time be in accordance with manufacturer's specifications. This data is normally not published by manufacturers and would normally be difficult to obtain.
- d. **IPC Section 714.3, Selections of drainage pipe sizes.** This section permits sizing the drainage pipe up to (but not at) its full-bore flow. Historically, drainage pipe sizing tables have been typically based on the drainage pipes flowing only half full. This provides for air movement above the flow and allows for temporary overloads and surges. The writers are not aware of any engineering exception to this fundamental requirement.
- e. **IPC Section 714.3.1, Selecting pipe wall roughness.** This section sounds impressive but does not say anything. Allowance for aging, deposit, and corrosion are historically included in the drainage pipe sizing tables in most plumbing codes, being that over time most drainage piping ends up with a similar roughness factor.

The UPC does not prohibit the use of computers to size drainage piping, provided that the sizing complies with all requirements of Chapter 7, Sanitary Drainage. If the resulting pipe sizing is different from that required by Chapter 7, the design would be considered as an "engineered plumbing system" and would have to comply with the requirements of Appendix L. Appendix L includes provisions to assure that the alternate design will comply with the public health and safety requirements of the code.

- 8-1. **IPC Section 802.1.1, Food handling.** This section contains an exception which does not require an air gap in the discharge from a domestic dishwasher. It is possible for waste water from a flooded kitchen sink to flow back into the dishwasher and contaminate dishes that were clean.

UPC Section 807.4 requires dishwasher air gap fittings to be installed above the flood level of the kitchen sink on all domestic dishwasher discharge lines, and UPC Section 704.3 requires that commercial dishwashers be directly connected to maintain the sanitary conditions in the restaurant but also requires a floor drain be installed adjacent to the fixture to prevent backup of sewage, thereby protecting the sanitation of the dishes in the dishwasher.

- 8.2. **IPC Section 802.1.2, Floor drains in food storage area.** The exception to this section permits an air break in lieu of an air gap on an indirect waste line from a food storage area that has a backwater valve. A backwater valve would be of benefit only if the flood level rim of the receptor was at or above the flood level of the food storage area. This exception places total reliance on the backwater valve to protect the stored food from contamination by backflow of sewage. Backwater valves typically do not provide the leak-tightness that this exception should require.

UPC Section 801.2.2 permits air breaks in indirect wastes from food storage areas, but requires that the floor level rim of the receptor be at least six (6) inches lower than the lowest floor drain (in the food storage area). It further requires that where the food storage area (and indirect waste pipe) may be under a vacuum, only air gaps are permitted. The UPC thus requires more protection from sewage backflow in food storage areas than the IPC.

- 8-3. **IPC Section 803.1, Waste water temperature.** This section requires that waste water above 140° Fahrenheit simply be discharged to an indirect waste receptor that is connected to the drainage system. This method, in itself, does not prevent the excessively hot water from entering the sanitary discharge system. Plumbing codes limit the temperature of waste discharge to protect the drain piping and also to prevent the high temperature from adversely affecting bacterial action in the sewage.

UPC Section 810.0 contains detailed requirements for the sumps and condensers that are necessary to cool the waste before it enters the drainage system. Furthermore, Table 8-1 contains minimum sizing for blowoff condensers and sump pipe sizing.

- 8-4. **IPC Section 803, SPECIAL WASTES.** This section provides minimum criteria for corrosive/chemical wastes.

UPC Section 811.0 provides a far more comprehensive code section controlling chemical waste discharge.

- 8-5. The IPC does not contain any specific criteria for sizing air conditioning condensate piping.

UPC Section 815.1 and 815.2 and Table 8-2 provide complete criteria for sizing air conditioning condensate piping.

I. CHAPTER 9, VENTS

- 9-1. **IPC Section 901, GENERAL.** This section requires that every trap and trap fixture shall be vented in accordance with the venting method specified in this chapter.

UPC Section 902.0, Vents Not Required, specifies where indirect waste can be installed without vents which allows for lesser cost installations for specific equipment.

- 9-2 **IPC Section 902.1, Vents.** This section has no restrictions on the location of ABS and PVC vent piping.

UPC Section 903.1.2 has been revised and no longer prohibits ABS and PVC vent piping in structures that are higher than three stories above grade. It does add limits on flame-spread index and smoke-developed index for piping exposed in ducts or plenums, except in individual dwellings.

- 9.3 **IPC Section 903.1, Stack required.** This section was entitled "Main vent required" in the 1997 IPC and required a vent to run undiminished in size and as directly as possible from the building drain to the open air above the roof. The required size of this vent was not clear. This section has been changed in the 2000 IPC and no longer refers to the "main vent" as such. It now requires at least one stack that is not less than one-half the size of the required building drain, but it does not indicate whether this refers to a vent stack or a stack vent, which is the title of Section 903. If it is a stack vent, there would be a drainage stack connected as directly as possible to the building drain instead of a vent. New Section 903.1.1 indicates that the main vent could be a stack vent, in which case would the drainage stack have to be at least one-half the size of the required building drain? This section is still not clear on what it requires.

UPC Section 904.1 requires that each drainage system have one or more vents with an aggregate cross-sectional area that is not less than that of the largest required building sewer. This assures adequate venting of the system and typically adds little or no cost to the plumbing system, depending on its layout.

- 9-4. **IPC Section 903.2, Vent stack required.** This section requires vent stacks for drainage stacks having only five (5) branch intervals or more.

UPC Section 907.1 only requires vent stacks for drainage stacks extending ten (10) stories or more. There are no indications that this causes inadequate venting of the stack and branches of the building drain.

- 9-5. **IPC Section 904.2, Frost closure.** This section requires 3" minimum size vents to prevent frost closure. Furthermore, the IPC requires enlargement where the 97.5 percent value (ASHRAE) for outside design temperature is less than zero degrees Fahrenheit (-18 degrees C.) This temperature, however, is not the minimum winter design temperature but is the normal winter heating design temperature for buildings. Normally in the middle of the night the heating system may or may not be at maximum capacity, but the plumbing system would still be exposed to the colder minimum temperature. Also from the *ASHRAE Design Manual*, the 97.5% value is exceeded in a normal year by at least 54 hours. Therefore, this 97.5% temperature is not the appropriate temperature to use to protect a plumbing vent terminal from freezing. The edition of the *ASHRAE Fundamentals Handbook* from which Appendix D was extracted also listed 99% temperature values. In addition, the more recent *ASHRAE Fundamentals Handbook* edition lists the mean of the annual daily minimum extremes which is the more appropriate temperature to be used for freeze protection.

UPC Section 904.7 requires 2" minimum vents to prevent frost and snow closure. The 2" size has proven to be adequate. Also, the UPC requires that any installation that has a minimum design temperature below zero degrees F. be so protected, as opposed to the 97.5% design temperature used by the IPC.

- 9-6. **IPC Section 904.5, Location of vent terminal.** This section allows that vent terminals may be two (2) feet above any opening and within ten (10) feet horizontally of an opening.

UPC Section 906.2 requires that vent terminals be at least three (3) feet above any opening within ten (10) feet horizontally. The three-foot dimension is derived from the BMS 66, the basis of most modern plumbing codes.

- 9-7. **IPC Section 904.5, Location of vent terminal.** This section does not indicate how close a vent termination can be to a lot line or property line. It refers only to openings in buildings. Section 904.6 requires that a vent extension through a wall must be 10 feet from a lot line and 10 feet above grade, but this only applies to sidewall vents.

UPC Section 906.2, Vent Terminations, requires that vents terminate not less than three (3) feet in any direction from any lot line; alleys and streets excepted.

- 9-8. **IPC Section 904.6, Extension through the wall.** This section permits sidewall vent terminals. It does not require that the vent terminal be turned up or down. Furthermore, sidewall vents that terminate horizontally are subject to direct wind loads. A 45 mile per hour wind produces a pressure of 1" wg, which when added to the 1" wg design basis for the vent piping, could blow a 2" trap seal and create an unsanitary condition. In addition, sidewall vent terminals must be protected (by screens?) against the entrance of birds or rodents. This creates a maintenance problem and the potential for the vent becoming blocked and ineffective.

The UPC does not allow side wall vents but requires all vents to terminate above the roof.

- 9-9. **IPC Section 904.6, Extension through the wall.** This section does not indicate how far the vent line has to terminate from the wall. Therefore, wind blowing against the wall could create additional pressure even if the pipe is turned down or up, as the wall acts as a wind break. Furthermore, this section indicates that vents shall not be installed below a roof extension if they have soffit vents. However, one could have a roof extension without soffit vents and then sewer gas could be trapped underneath the roof extension and could migrate over to openable windows that are located ten feet away. This would allow sewer gas into the building and there is no prohibition against this condition in the IPC.

The UPC does not allow sidewall vents and also requires in Section 906.1 that the vent terminate not less than one foot from any vertical surface.

- 9-10. **IPC Section 904.7, Extension outside a structure.** This section again uses the 97.5 percent design temperature value for requirements for protection of vents outside the structure from freezing by insulation, heat or both. This is the wrong outside temperature to use. (See Item 9-5 above.)

UPC Section 906.7 requires the use of the minimum design temperature instead of the 97.5% design temperature figure.

- 9-11. **IPC Section 905.1, Connection.** This section has been changed so that air admittance valves are no longer considered as exceptions to extending vents to the outdoor air. However, as now written, it permits any [emphasis added] individual, branch, or circuit vent to connect to an air admittance valve, without reference to Section 917, which has limitations on where air admittance valves can be used.

The UPC does not permit air admittance valves. (For reasons see Item 9-28 below.)

- 9-12. **IPC Section 905.2, Grade.** This section indicates that all vent pipes be so graded (emphasis added) and connected as to drain back to the drainage pipe by gravity.

UPC Section 905.1 indicates that "all vents shall be free from drops or sags and such vents shall be level or shall be graded and connected as to drip back by gravity to the drainage pipes." Therefore, it is not required to grade vents. This simplifies the installation of vent piping by not having to grade them.

- 9-13. **IPC Section 905.6, Side inlet.** This section has been deleted in the 2000 IPC. It permitted wet vents to connect to a side inlet on a closet bend. It is not clear now whether side inlet closet bends are prohibited or not.

The UPC now includes wet venting of water closets in Appendix L 6.2 and 6.3 for those jurisdictions who permit this method of venting. However, whether or not side inlets are permitted is a matter of interpretation. Section L 6.2.1 prohibits wet vent openings below the weir of the trap that they are venting, but Section 905.5 exempts water closets from that requirement.

- 9-14. **IPC Section 906.1, Distance of trap from vent, and Table 906.1, MAXIMUM DISTANCE OF FIXTURE TRAP FROM VENT.** This section and table establish the allowable distances between traps and their protecting vents to prevent self-siphonage. The purpose is to keep the vent pipe opening at the end of the trap arm above the overflow weir of the trap.

UPC Table 10-1 has allowable trap arm lengths that are less than those shown in IPC Table 906.1. The shorter distances between the trap and its vent allows for the longer sweep of some fittings, such as combination wyes and 1/8th bends.

- 9-15. **IPC Section 908.3, Connection at different levels.** This section is confusing. It sizes the vertical drain between the two fixtures using Table 908.3 – Common Vent Sizes. However, Table 908.3 sizes the piping according to the DFU value for the upper fixture only, without regard for the lower fixture. According to Table 908.3, a 1-1/2" pipe could serve as a wet vent for a water closet. But Table 909.3 – Wet Vent Size requires a 2" wet vent from a lavatory to a water closet.

UPC Section 908.0 – Vertical Wet Venting requires that the wet vented section be at least one size larger than the minimum size waste for the upper fixture or one size larger than required to drain and vent both fixtures, whichever is larger. It also requires that the pipe be 2" minimum size.

- 9-16. **IPC Section 909, WET VENTING.** This section has criteria for horizontal and vertical wet venting two bathroom groups on the same floor. However, the code

does not fully describe how to determine the DFU load in the various portions of the wet vent piping. In the Commentary of the 1997 IPC, it takes one (1) full page of text and eleven (11) diagrams to explain all of the possible conditions that affect the arrangement of the wet vent piping and its sizing. This section specifically addresses two bathroom groups. It is not clear whether wet venting is permitted in a single bathroom group.

IPC Section 909.1, Wet vent permitted. This section allows the fixtures to be connected in any combination and permits water closets to discharge into the wet vent piping. IPC Table 704.1 permits 3" drain piping to be sloped at only 1/8" per foot. Thus, the discharge of one or two water closets into a 3" wet vent sloped at 1/8" per foot will overflow the line and interfere with its venting function.

The UPC now includes wet venting of single and back-to-back bathroom groups in Appendix L 6.2 and 6.3 for those jurisdictions who permit this method of venting.

- 9-17. **IPC Section 910, WASTE STACK VENT.** This section permits waste stacks to vertically wet vent limited numbers of drainage fixture units (DFU) in a single stack concept. The DFUs are limited to 1/3 to 1/20 the maximum allowed DFUs for waste stacks with vented fixtures. However, the single stack concept has been discontinued and unused for a number of years because of the high failures of fixtures installed on this system concept. Furthermore, the origin of the IPC sizing data is unknown to the writers.

The UPC does not recognize waste stack venting other than vertical wet venting as allowed in Section 908.0.

- 9-18. **IPC Section 911, CIRCUIT VENTING.** This section permits circuit venting of up to eight (8) fixtures on a horizontal branch drain without venting the individual fixtures. This practice is common in large toilet rooms having rows of fixtures.

The UPC now includes battery venting (circuit venting) in Appendix L 6.1 for those jurisdictions who permit this method of venting. The UPC does not allow the battery vents and relief vents to be used at wet vents. The IPC permits up to four (4) DFU to discharge into a relief vent.

- 9-19. **IPC Section 912, COMBINATION DRAIN AND VENT SYSTEM.** This section permits a combination waste and vent system where conventional venting is not practical. Examples are floor drains in large warehouses, markets, and service outlet drains in exhibition halls. The drain pipes are sized per Table 912.3 to presumably oversize them to lower the depth of flow and thereby providing free movement of air to avoid disturbing the trap seals in the fixtures being drained. Water closets and urinals cannot be connected to a combination waste and vent system.

UPC Section 910.0 permits combination waste and vent systems. The pipes must be increased two sizes and branch lengths are limited to fifteen (15) feet of unvented length. Plans must be approved by the Administrative Authority before installation.

- 9-20. **IPC Table 912.3, SIZE OF COMBINATION DRAIN AND VENT PIPE.** This table has two columns which are both under the title Maximum Number of Drainage Fixture Units. The first column is "Connecting to a Horizontal Branch or Stack" and the second is "Connecting to a Building Drain or Building Subdrain." The first column increases the pipes one size compared to Table 710.1(2) for horizontal fixture branches. The second column increases the pipes one size, except for 1-1/2", compared to Table 710.1(1) for building drains and sewers at 1/2" slope, which is the maximum allowable slope for combination waste and vent piping. The writers are unaware of what the second column is actually based on since the IPC permits combination waste and vent piping to be sloped less than 1/2" and also why there is a difference in the allowable DFUs based on what the combination waste and vent piping connects to. The IPC sizing method does not consider the slope of the piping.

The UPC simply increases the combination piping two sizes larger than conventionally vented drain piping.

- 9-21. **IPC Section 913, ISLAND FIXTURE VENTING.** This section permits island fixture venting with the vent pipe at the sink permitted to be below the flood level rim of the sink, then turned down and connected to the horizontal drain beneath the floor. This is similar to UPC Section 909.0.
- 9-22. **IPC Section 914.1, Relief vents - stacks of more than 10 branch intervals, where required.** This section requires relief vents for soil and waste stacks at intervals of ten (10) branch intervals. This is inconsistent with Section 903.2, which requires a vent stack for drainage stacks that are five branch intervals.

UPC Section 907.1 requires a vent stack for drainage stacks that are ten (10) or more stories high. It then requires that a relief vent (yoke vent) be connected to the vent stack at five-story intervals starting from the top down.

- 9-23. **IPC Section 915, VENTS FOR STACK OFFSETS.** This section has requirements for venting horizontal offsets in stacks having five (5) branch intervals or more.

The UPC has no specific requirements for venting horizontal offsets in drainage stacks, but the upper and lower portions of the stack should be considered as separate stacks and vented accordingly.

- 9-24. **IPC Table 916.1, SIZE AND DEVELOPED LENGTH OF STACK VENTS AND VENT STACKS.** IPC Table 916.1 determines maximum developed length of vents from three factors: Fixture units being vented, size of waste stacks, and size of the vent. This table is a far more complex chart to use than UPC Table 7-5 which gives maximum length of feet and maximum vent size based solely on fixture unit loading. Furthermore, the IPC does not have any restrictions on the horizontal length limitation on the vent piping. Therefore, the entire developed length could be horizontal according to this table. The table has a larger range of pipe sizes (15" drain stack and 12" vent) and allowable DFU loadings per vent pipe size than UPC Table 7-5.

UPC Table 7-5 is much easier to use and provides a note that only one-third of the total developed length of the vent may be installed horizontally without increasing size. The UPC uses Table 7-5, which is limited to 12" drains and 8" vents, to size all vent piping.

- 9-25. **IPC Section 916.2, Vents other than stack vents or vent stacks.** This section requires that vents, other than stack vents or vent stacks, be one-half the pipe size of the equivalent drain(s) that it is venting. This method requires sizing drains that do not exist in order to size the various sections of vent piping. Vent piping exceeding 40 feet in developed length must be increased one pipe size.

The UPC uses Table 7-5 to size drain and vent piping. It permits up to one-third of the maximum listed developed length of the various vent pipe sizes to be horizontal. The required vent pipe sizes in Table 7-5 are generally larger than those required by IPC Section 916.2.

- 9-26. **IPC Section 916.4.1, Multiple branch vents exceeding 40 feet in developed length.** Section 916.4 has sizing requirements for common branch vents that have multiple branch vents connected to them. It appears that Section 916.4.1 should be referring to the common branch vent rather than the multiple branch vents. The use of the term "multiple branch vents" is confusing.

This is far more confusing than UPC Table 7-5 in which the venting is simply sized on the fixture units and the length of the pipe and not whether it is a multiple branch. Furthermore, the UPC permits up to one-third of the maximum allowable length of a vent pipe to be horizontal. There are no limits on length if the vent is increased one pipe size.

- 9-27. **IPC Table 916.5.1, SIZE AND LENGTH OF SUMP VENTS.** This table sizes vents for sewage sumps, based on the discharge capacity (GPM) of the pump and the maximum allowable developed length of the vent. Footnote "a" requires that an allowance of 50% be made for fittings and other losses. Table 916.1 **SIZE AND DEVELOPED LENGTH OF STACK VENTS AND VENT STACKS** does not have a similar requirement. This seems inconsistent.

UPC Section 710.10 sizes sewage sump vents based on the fixture unit load served by the sump, using Table 7-5. An allowance for fittings and other losses is included in the maximum allowable lengths in the table.

- 9-28. **IPC Section 917, AIR ADMITTANCE VALVES.** The IPC permits the use of fixture or branch type air admittance valves in lieu of vents to the outdoor air. Section 917.7 requires that only one stack vent or vent stack be extended to the open air outdoors, but it has no sizing requirements for that vent, compared to the overall size of the drainage and vent system. Section 917.8 prohibits the installation of air admittance valves in HVAC supply or return air plenums because the valves require neutral surrounding air pressure to operate as designed.

Section 917.3 permits air admittance valves to be installed for horizontal branch drains up to four branch intervals from the top of a stack without relief vents. This provides no means to relieve positive pressures or permit air to circulate and equalize within the drain and vent piping.

The UPC does not allow the use of air admittance valves as they are mechanical and subject to malfunction in the field, they are affected by pressures within the building, they do not prevent or relieve over-pressurization in the drain and vent system, they can become fouled with backflow of waste and sewage, and they are an ongoing maintenance consideration for the building owner. Although the IPC prohibits air admittance valves in supply and return air plenums, it is not uncommon for entire buildings to be pressurized (positive and negative) by the HVAC system or by vertical "stack effect". The writers of the UPC prefer the peace of mind that vents to the outdoors provide.

- 9-29. **IPC Section 918, ENGINEERED VENT SYSTEMS.** The IPC allows engineered small size vent piping. This is an example of decimal point engineering that does not provide sufficient margin of safety for varying field conditions, both at the time of installation and throughout the life of the system. Furthermore, a 1/2" or 3/4" size vent can be easily closed by any obstruction getting into the end of the vent or by a kink in the vent tubing, thereby destroying the beneficial effect of the venting system. In addition, the sizing concept is dependent upon the precise "design discharge load" of the fixture which is questionable if ever known initially. Furthermore, if a homeowner or occupant changes out a fixture and the flow rate becomes somewhat greater, the venting system may not function properly.

IPC Table 918.2 is based on "smooth pipe". In Appendix E, copper tube is referred to as smooth pipe. However, Section 918 does not indicate what piping materials are permissible for "engineered vent systems", therefore, any material could be used and the required correction factors for the calculations are not provided in the IPC. Lastly, using copper tubing for the venting system creates as

great an expense as a conventional venting system. Therefore, there is no significant savings in using the reduced size venting system.

IPC Section 918 does not appear to include sufficient data to design reduced-size vents. The IPC concept is completely different from the relatively simple procedure in Chapter 17 of the *ASPE Data Book* which includes all necessary data and limitations. ASPE also restricts reduced-size vents to residential fixtures in low rise (1 - 2 story) residential buildings and requires that some listed 1/2" and 3/4" vent sizes be increased in two-story buildings. Furthermore, ASPE does not permit reduced-size vents where the fixture is more than 15 feet above the building drain or its branches. ASPE additionally requires that vents not be reduced until 6" above the flood level rim of the fixture served. The 1997 IPC Commentary "suggests" the same thing, but vents can be reduced below the fixture overflow in the IPC. There are not the required restrictions on reduced-size venting in the IPC.

The UPC does not include reduced-size venting because it has not proven itself in the field and it does not provide sufficient margin of safety for dependable operation. However, reduced-size venting with appropriate restrictions could be submitted as an alternate method under Section 301.2 or as an engineered plumbing system under Section L 2.0.

- 9-30. **IPC Section 919, Computerized Vent Design.** This section is new in the 2000 IPC. It is not clear why this section is necessary in the code. It simply says that vent systems can be sized and designed using a computer program and that the design be based on the peak load on the drainage system. Section 919.1 requires that the computer program be approved, but it does not say what the basis of approval is. It does not require that the design and sizing comply with the other requirements of IPC Chapter 9.

The IPC has similar provisions for designing drainage systems using a computer program, but not water distribution piping or storm drainage piping.

The UPC does not prohibit using computer programs or any other means to design plumbing systems, so long as the results meet the requirements of the code.

J. CHAPTER 10, TRAPS

- 10-1. **IPC Section 1003, INTERCEPTORS AND SEPARATORS.** This section has specific requirements for where interceptors, separators, and grease traps are required.

UPC Sections 1009.1 and 1014.1 give the Administrative Authority more discretion in determining the need for interceptors and grease traps, based on the particular application.

- 10-2. **IPC Section 1003.3.2, Food waste grinders.** This section permits food waste grinders to discharge through grease traps, if the grease trap is rated for the flow capacity of the grinder.

UPC Section 1015.0 prohibits food waste grinders to discharge through grease traps unless specifically required or permitted by the Administrative Authority. Manufacturers of most grease traps recommend that food particles not be allowed to enter grease traps. The food particles become trapped with the grease and decompose, causing foul odors. Furthermore, the "contaminated" grease cannot be sold to renderers due to the food particles from the waste grinder in the grease.

- 10-3. **IPC Section 1003.4, Oil separators required.** This section includes very limited criteria for the design of oil and flammable liquid separators.

UPC Section 1017.0 has detailed requirements for the design and construction of oil and flammable liquid interceptors, including venting, line sizes, cleanouts, waste oil tanks, and pump-out connections.

K. CHAPTER 11, STORM DRAINAGE

- 11-1. **IPC Section 1101.7, Roof design.** This section requires that the roof be designed to withstand the level of the water based on the height of the overflows or scuppers assuming that all of the primary roof drains are blocked [emphasis added].

The UPC has requirements for primary and secondary roof drainage that are based on the roof design, but the UPC does not have requirements for the roof design itself, since it is not regulated by the plumbing code.

- 11-2. The IPC does not specifically address thermal expansion in storm drain piping.

UPC Section 1101.4., Expansion Joints Required, specifically requires expansion joints where there are temperature variations or physical conditions that would warrant the use of expansion joints.

- 11-3. **IPC Tables 1106.2, SIZE OF VERTICAL CONNECTORS AND LEADERS, and 1106.3, SIZE OF HORIZONTAL STORM DRAINAGE PIPING.** These tables need to be interpolated for the rainfall rates in Appendix B that fall between the listed whole numbers.

UPC Tables 11-1 and 11-2 list gallons per minute (gpm) of flow associated with the vertical piping and the sloped horizontal piping. Table D-1 lists rainfalls for cities in inches per hour and gpm per square foot of roof (gpm/sf). The roof area being drained (sf) can be multiplied by the gpm/sf to determine the required gpm of drainage. The pipe size can then be selected directly from Table 11-1 or 11-2 without interpolation.

- 11-4. **IPC Section 1106.4, Vertical walls.** This section adds 50% of the area of walls that drain rainwater onto roofs to the area of the roof to allow for wind-driven rain in sizing roof drainage systems.

UPC Section 1106.4 lists six (6) different orientations of walls and the various allowances for more accurately determining the adjusted roof area for rainfall. The highest added allowance is 50%. Some allowances are zero.

- 11-5. **IPC Section 1107.3, Sizing of secondary drains.** This section requires that secondary (emergency) roof drainage be sized for twice the primary rate and that the primary system be considered to be blocked. The primary rainfall rates are based on a 100-year, 60-minute storm. Using twice that rate is comparable to a 100-year, 15-minute storm.

This section is revised in the 2000 IPC, but it appears that some needed language was deleted. The section no longer says to divide the values for horizontally projected roof area (square feet) that were used for the primary drains by two (2) in order to size the secondary drains. It now says to double the primary rainfall rate, rather than half the allowable roof area. The secondary rainfall rates could exceed the rates listed in Tables 1106.3 and 1106.6 and there is no clear direction on how to determine the allowable secondary roof area. This approach to sizing the secondary drainage system is confusing and could be easily misinterpreted.

UPC Section 1101.11.2.1 permits the secondary roof drainage system to be sized for the same rainfall rates as the primary system. The primary system handles the 60-minute storms and the two systems together handle the more severe 15-minute storms.

Both the IPC and the UPC require that the secondary roof drainage system be piped independently from the primary system and discharge at grade.

- 11-6. **IPC Section 1108, COMBINED SANITARY AND STORM SYSTEM.** This section has criteria for sizing combined sanitary and storm water drains and sewers. It converts the sanitary fixture unit (DFU) load into equivalent square feet of roof, based on a rainfall rate of one inch per hour. However, the section does not indicate how to adjust the DFU equivalent roof area for the actual local rainfall rate used in the system design. It is necessary to refer to the 1997 IPC Commen-

tary for an explanation of how to convert the DFU load for rainfall rates other than one inch per hour.

The UPC does not include sizing of combined sewers. It addresses requirements where combined sewers exist, but does not encourage their use by providing sizing data, as combined sanitary and storm systems are no longer looked on with favor due to federal clean water laws and the impact on the sizing of sewer systems and the capacity of sewage treatment plants.

- 11-7. **IPC Section 1109, VALUES FOR CONTINUOUS FLOW.** This section equates gpm of flow from sources other than rainfall to square feet of roof based on a rainfall rate of one inch per hour. It is necessary to refer to the 1997 Commentary for an explanation of how to convert the gpm flows for rainfall rates other than one inch per hour.

UPC Chapter 11 and Appendix D provide means of sizing storm drainage piping on the basis of gpm, which simply allows gpm flows from sources other than rainwater to be added directly to the gpm of rainwater flow without conversion to equivalent square feet of roof for a particular rainfall rate.

- 11-8. **IPC Section 1110, CONTROLLED FLOW ROOF DRAIN SYSTEMS.** This section covers controlled flow roof drainage systems. The rainfall rate used is the same as a primary roof drain system (100-year, 60-minute storm). However, there is no reference to the requirement of a secondary drainage system as mandated under IPC Section 1107.

UPC Section 1108.0 covers controlled flow roof drainage in detail (14 paragraphs). It requires scuppers for emergency drainage. Furthermore, Tables 11-4 and 11-5 also dictate height of water and scuppers above the roof for controlled flow roof drains and the slope of the roof.

- 11-9. **IPC Section 1110, CONTROLLED FLOW ROOF DRAIN SYSTEMS.** This section requires that a controlled flow roof drainage system be considered as an "engineered plumbing system" with associated submittals, approvals, inspections, and testing. Furthermore, IPC Section 1110.1 requires that the rainfall rate used for design be in accordance with Section 1106.1, which is a 100-year, 60-minute storm. However, the 1997 IPC Commentary states that many engineers design for the total rainfall for the duration of a 25-year storm, which is not listed in the IPC. The intent of the IPC is not clear. The 1997 IPC Commentary also states that the purpose of controlled flow roof drainage is to cool the roof, whereas the primary intent is to reduce the peak flows in storm sewers.

The UPC does not require that controlled flow roof drainage systems be "engineered" and includes sufficient data for their design, construction, and

inspection without the need for extra engineering. The UPC requires that the calculations merely need to be submitted with the plans.

- 11-10. **IPC Section 1110.4, Minimum number of roof drains.** The IPC requires, "for controlled flow systems, not less than two roof drains to be installed in a roof area of 10,000 square feet or less and not less than four roof drains to be installed in roofs over 10,000 square feet." This means for a roof area of 10,001 square feet the number of required controlled flow roof drains jumps from two to four. Furthermore, the IPC does not provide information on the required number of controlled flow roof drains for roof areas over, say, 20,000 square feet. Therefore, a building of 100,000 square feet could, per code, only have four controlled flow roof drains installed. This does not seem prudent to the writers.

UPC Section 1108.1(3) requires that two roof drains shall be provided for each 10,000 square feet and no less than one additional roof drain for each additional 10,000 square feet over 10,000 square feet, which is a more accurate way of providing the number of roof drains required.

- 11-11. **IPC Section 1111, Subsoil drains.** This section covers subsoil drainage. It requires 4" minimum drain size.

IPC Section 1113.1.1, Pump capacity and head. This section requires that the sump pump have "capacity and head appropriate for the anticipated use requirements". It has no minimum requirements.

IPC Section 1113.1.2, Construction. This section requires that sump pits be not less than 18' in diameter.

IPC Section 1113.1.4, Piping. This section requires that pipe and fittings be equal to or larger than the pump discharge tapping.

UPC Section 1101.5 covers subsoil drainage in greater detail than the IPC. It requires 3" minimum drains and sump pits that are 15" in diameter by 18" deep. Minimum pump flow rates are 15 gpm and the minimum discharge pipe size is 1-1/2". Furthermore, UPC Sections 1101.7 and 1101.8 cover areaway drains and window well drains, which are not addressed in the IPC.

L. CHAPTER 12, SPECIAL PIPING AND STORAGE SYSTEMS.

- 12-1. **IPC Chapter 12, SPECIAL PIPING AND STORAGE SYSTEMS.** This chapter was formerly for fuel gas piping. The IPC presently does not include requirements for fuel gas piping.

UPC Chapter 12, Fuel Piping, covers the sizing and installation of fuel gas piping in complete detail. In addition, Table 14-1 lists NFPA 54 as a referenced standard.

- 12-2. **IPC Chapter 12, SPECIAL PIPING AND STORAGE SYSTEMS.** This chapter is very limited, the scope is not clear, and there are several contradictions. For example, Section 1202 references NFPA 99C for medical gas and vacuum piping systems. However, it also references the mechanical code for vacuum system exhaust, even though vacuum piping and exhaust is included in the scope of NFPA 99C. In addition, it references NFPA 50 - *Standard for Bulk Oxygen Systems at Consumer Sites* and NFPA 51 - *Oxygen-Fuel Gas Systems for Welding, Cutting, and Allied Processes* for non-medical oxygen systems. However, non-medical oxygen systems and other compressed gas systems do not appear to be within the scope of the IPC. Also, NFPA 50 is referenced in NFPA 99C for medical bulk oxygen systems.

IPC Section 1202 also excludes cylinder storage, even though NFPA 99C includes cylinder storage for nitrogen and nitrous oxide systems.

The IPC does not reference NFPA 99 - *Health Care Facilities*, which is the parent document of NFPA 99C - *Gas and Vacuum Systems*. Although NFPA 99 covers more than medical gas and vacuum piping, it is a legally acceptable alternative to NFPA 99C for gas and vacuum piping systems.

UPC Chapter 13 includes detailed requirements for the design, installation, inspection, testing, and certification of medical gas and vacuum piping systems. In addition, the UPC references both NFPA 99 and NFPA 99C. It does not include references to non-medical oxygen systems or other special compressed gas piping or storage systems that are not within the scope of the UPC.

M. IPC APPENDIX C, GRAY WATER RECYCLING SYSTEMS

- C-1. The gray water systems covered by this appendix are not the same as the gray water systems covered by UPC Appendix G. The IPC gray water system permits recycled waste water from bathtubs, showers, and lavatories to be used for flushing water closets and urinals within the same building. Also, Appendix C includes very general requirements for filtering and disinfection.

The UPC does not permit this type of gray water recycling system which is essentially "reclaimed water" and most health departments do not allow this type of untreated water to be utilized for flushing toilets in residential installations in the event that a child or pet might drink the "gray water" from the water closet. Therefore, this subject is covered in the UPC in Section 601.2.3, Reclaimed Water, and thoroughly in Appendix J, Reclaimed Water

Sec. 08.40.210. Purpose of AS 08.40.210 - 08.40.490.

The purpose of AS 08.40.210 - 08.40.490 is to protect the safety of people and property in the state from the danger of improperly installed or modified mechanical systems by providing a procedure to assure

(1) the public that persons responsible for making mechanical installations in this state are qualified; and

(2) that a sufficient number of persons are so qualified.

Sec. 08.40.270. Examination of applicant.

(a) Each applicant shall be examined to determine the applicant's

(1) ability to understand plans, design specifications, and engineering terms commonly used in the mechanical field;

(2) knowledge of mechanical installations and piping;

(3) familiarity with the requirements of the Uniform Plumbing Code, Uniform Swimming Pool, Spa, and Hot Tub Code, Uniform Solar Energy Code, and the Uniform Mechanical Code currently in effect in the state;

Sec. 08.40.490. Definitions.

3) "mechanical administrator" means a person who is responsible for

(A) installing or modifying mechanical piping and systems, devices, fixtures, equipment, or other mechanical materials subject to the Uniform Plumbing Code, Uniform Swimming Pool, Spa, and Hot Tub Code, Uniform Solar Energy Code, and the Uniform Mechanical Code as published by the International Association of Plumbing and Mechanical Officials and the International Conference of Building Officials; or

(B) certifying that an installation or modification described in (A) of this paragraph complies with the applicable codes;

Sec. 08.18.171. Definitions.

(7) "mechanical contractor" means a contractor whose business operations involve plumbing, pipe fitting, sheet metal, heating, air conditioning, ventilating, or sprinkler and dry chemical fire protection trades in order to install or modify mechanical piping and systems, devices, fixtures, and equipment or other mechanical materials subject to the following codes as published by the International Association of Plumbing and Mechanical Officials or the International Conference of Building Officials:

- (A) Uniform Plumbing Code;**
- (B) Uniform Swimming Pool, Spa, and Hot Tub Code;**
- (C) Uniform Solar Energy Code; and**
- (D) Uniform Mechanical Code;**

**A COMPARISON
BETWEEN THE
2000 UNIFORM
MECHANICAL CODE™
AND THE
2000 INTERNATIONAL
MECHANICAL CODE™**



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Preface

This document is an attempt to highlight the differences between the 2000 editions of the Uniform Mechanical Code (UMC) published by the International Association of the Plumbing and Mechanical Officials (IAPMO) and the International Mechanical Code published by the International Code Council. It consists of an executive summary followed by a chapter by chapter cross-reference. Each chapter also has a brief summary. When there are differences, comments are included in the analysis column. This study is provided for the benefit of those entities contemplating the issue of mechanical code adoption. IAPMO welcomes your comments and observations on this document. For additional copies please contact IAPMO at 909-595-8449 x149.

DIFFERENCES BETWEEN THE 2000 UMC AND THE 2000 IMC

Executive Summary

Background:

Until 1991 the Uniform Mechanical Code (UMC) was cosponsored by the International Association of Plumbing and Mechanical Officials (IAPMO) and the International Conference of Building Officials (ICBO) with each organization owning the copyright to the document. That situation changed in 1994, and again in 1997, when each of the two model code bodies published a separate UMC. Currently only IAPMO publishes a 2000 edition of the UMC with ICBO discontinuing publication of their Uniform Codes set. The 1994 versions of the UMC were similar but that was not the case in the 1997 editions of the document. Chapters 3, 4, and 11 of the ICBO UMC were rewritten in their entirety. At that point the documents had diverged. That trend has continued with the 2000 International Mechanical Code (IMC). The 2000 UMC is significantly different from the 2000 IMC in style, philosophy and technical content. The IMC is a publication of the International Code Council (ICC) and sponsored by ICBO.

Technical Content:

Some of the significant technical differences between the 2000 UMC and the 2000 IMC are outlined below:

1. **Unvented Room Heaters:** The IMC allows for the use of unvented room heaters by reference to the International Fuel Gas Code (IFGC) in Section 301.3. Unvented fuel burning room heaters are specifically prohibited under Section 916.3 of the 2000 UMC
2. **LPG Facilities** are prohibited in pits or basements and other specific locations by Section 1313.5. The 2000 IMC or the 2000 IFGC do not contain any such restriction.
3. **Unlisted Equipment:** Table 3-1 provides for clearances for different types of unlisted appliances. There is no equivalent table in the IMC.
4. **Referenced Standards:** Appendix A contains 7 UMC standards. These standards based on nationally recognized standards are reproduced in their entirety in the UMC. The IMC does not have any standards in it and only mentions them by reference.
5. **Fuel Gas provisions:** Chapter 13 of the UMC by reference to Appendix B contains these provisions. The IMC refers you to a different document; i.e. the International Fuel Gas Code for these provisions.

6. Text from other codes: The IMC reproduces text from other codes. As an example refer to Section 513 for Smoke Control systems. The UMC does not use this approach. This factor needs to be considered when jurisdictions are considering adopting one document over another.
7. Commercial Cooking Equipment (Chapter 5): There are significant differences between the two codes in this area. The requirements for duct enclosures for Type I Hoods are different; clearances are different with the UMC being more restrictive. The cleanout requirements are different as well.
8. Refrigeration (Chapter 11): Table 1103.1 on the IMC is different from Table 11-1 of the UMC. The refrigerant list in the IMC is more in keeping with ASHRAE 34. There is no comparable table in the IMC for Table 11-2 in the UMC. Part II of Chapter 11 deals with cooling towers; there is no equivalent provision in the IMC. Additionally, Section 1101.8 requires prior approval from the Administrative Authority for change of refrigerant. The UMC has no similar provision.

Conclusion:

As indicated above there are several major differences between the 2000 UMC and the 2000 IMC. Those code users currently using the 1997 UMC (either one) will find it a relatively smooth transition to the 2000 UMC in comparison to adopting the IMC. It is clear from comparing the size of the two books that the UMC 2000 is significantly more prescriptive in its approach, a philosophy that been utilized in the development of the Uniform codes. This philosophy is evident in the fact that the 2000 UMC reproduces important standards in the code for ease of use while the IMC only references them. Jurisdictions considering adoption of one or the other document need to examine these differences and consider their impact on the health and safety of the communities that they serve.

IAPMO - UMC/IMC Code Comparisons

Page 1 of 1

YEAR 2000 MECHANICAL CODE COMPARISON JUST COMPLETED

WALNUT, Calif., August 18, 2000 - In a continuing effort to provide the public with the most up to date detailed analysis of the two leading mechanical codes in the industry, IAPMO has completed A Comparison Between the 2000 Uniform Mechanical Code and the 2000 International Mechanical Code. This study was performed by Hari Ramanathan, who was previously employed by the International Conference of Building Officials (ICBO) as a staff engineer chiefly responsible for support of the International Plumbing Code (IPC) and International Mechanical Code (IMC). After leaving ICBO, Mr. Ramanathan assumed the position of Director of Code Services with IAPMO and is primarily responsible for supporting the 2000 UMC. As a member of the IAPMO family, Mr. Ramanathan decided that it was important to inform the public of the relative advantages of one mechanical code over another, thus he developed a comprehensive analysis of the 2000 UMC and IMC. If you wish to review this comparison, download a copy from IAPMO's [document download page](#). For multiple copies of the comparison, please contact Mr. Ramanathan at (909) 595-8449 Ext. 149.

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Chapter 1

2000 UMC	2000 IMC	Analysis
101.0 Title	101.1 Title	IMC refers to ICC Fuel Gas Code for fuel gas provisions.
102.0 Purpose 103.0 Scope	101.2 Scope	
104 Application to Existing Mech. Provisions	102 Applicability	Similar language except IMC has a section dealing with referenced standards.
105.0 Alternate Materials and Methods of Const.	105.2 Alt. Materials	UMC language more detailed on this issue.
106.0 Modification	105.1 Modification	Almost identical.
107.0 Tests	107.2 Testing	
Part II 108.0 Powers and Duties of the Admin. Authority	104.1 Duties and Powers of the Code Official	UMC uses 'Admin Authority'; IMC uses 'Code Official'. UMC more detailed in this area.
110.0 Board of Appeals	109 Means of Appeal	IMC spells out the makeup of the Board of Appeal UMC does not.
Part III 112.0 Permits	106 Permits	Exempt work similar.
113.2 Plans and Specifications	106.3.1 Construction Documents	
114.1 Permit Issuance	106.4 Permit Issuance	
115 .0 Fees	106.5 Fees	UMC has Table 1-1 at the end of the chapter; IMC has a permit fees table in the appendix. UMC fee table is broken down in greater detail than the IMC appendix.
116.0 Inspections	107 Inspections and Testing	Similar.

Chapter 1 (Continued)

Summary:

The major difference is that the IMC creates a department of mechanical inspections while the UMC does not specifically require it. The members of the Appeals Board are spelled out as far as qualifications in the IMC but not in the UMC. All aspects of the administrative process for a mechanical code are covered in both documents though the UMC is more prescriptive.

Chapter 2

2000 UMC	2000 IMC	Analysis
201.0 General	201.1 Scope 201.2 Interchangeability	
202.0 Accepted meanings		No specific reference to a dictionary found in the IMC.
203.0 (A thru Z) Definitions	Section 202 Definitions	Definitions in the two documents are varied. Even for the same terms, the definitions are not always identical. The UPC is generic in its building code reference and, therefore, can be used with any building code.

Summary:

The definitions in the two documents have similarities as well as significant differences. There are several terms defined in the UMC 2000 that are not defined at all in the IMC 2000. Examples would be Assembly Building, Cooling Unit/System, Heating degree-day, and Vented Appliance categories among others.

The UMC makes reference to a generic building in the definitions so as to be used with a building code adopted by the jurisdictions. For words not defined at all the UMC refers the user to a specific dictionary.

Chapter 3

2000 UMC	2000 IMC	Analysis
301.0 Scope	301.1 Scope	301.4 /301.5 Similar except the UMC has additional language on BTU ratings at altitude. Though both sections have the title, the provisions in each are different. Some of the material in this section of the IMC is covered.
302.0 Approval		Not covered in this chapter.
303.0 Type of Fuel and Fuel Connections	No comparable provision.	
304.0 Installation	304.0 Installation	
305.0 Access	306 Access and Service Space	The IMC is a combination of UMC 304 and 305. The requirements for clearances are not identical.
306.0 Automatic Control Devices	No such provision in this chapter.	
307.0 Labeling	301.4 Listed and Labeled	The approach to the topic is different. The UMC deals with the marking issue while the IMC goes into the specifics of the listing process.
308.0 Location	304.3 Elevation of Ignition Sources	Similar provisions.
309.0 Electrical Connections	301.7 Electrical	IMC refers to the ICC Electrical Code for all electrical provisions while the UMC spells out the provisions for mechanical equipment.
310.0 Condensate Wastes and Control	307 Condensate Disposal	Provisions are similar except the UMC has a table to size condensate piping based on equipment capacity and specific atmospheric conditions.
311.0 Personnel Protection	304.9 Guards	
312 Air Filters	No comparable provision.	

Chapter 3 (Continued)

2000 UMC	2000 IMC	Analysis
Table 3-1	No comparable table.	
Table 3-2	Table 308.6	Similar though not identical.
Table 3-3 Table 3-4 Table 3-5	No similar tables.	

Summary:

There are some significant differences between the two chapters. The IMC chapter does not contain tables needed to clearances for unlisted appliances. The IMC defers to the listing of the equipment for information pertaining to installations.

UMC has sizing tables for condensate piping while IMC does not. The IMC refers to the ICC electrical code for all electrical provisions while they are spelled out in the UMC 2000.

Chapter 4

2000 UMC	2000 IMC	Analysis
401.0 General	401 General	The scopes of the two chapters are very different. Chapter 4 of the UMC deals with ventilation requirements of direct gas-fired heaters by reference. It has the requirements for evaporative coolers.
402.0 Makeup Air	No comparable provision.	
403.0 Evaporative Cooling Systems	No comparable provision.	
404.0 Location	No comparable provision.	
405.0 Access Inspection and Repair	No comparable provision.	
406.0 Installation	No comparable provision.	

Summary:

Chapter 4 of the UMC 2000 is a brief chapter dealing mainly with evaporative coolers. Chapter 4 of the IMC 200 deals extensively with the issue of ventilation. Some of the issues in the IMC are mechanical ventilation, requirements for outdoor ventilation for different occupancies, ventilation for parking garages. The UMC defers to the building code on many of these issues.

Chapter 5

2000 UMC	2000 IMC	Analysis
501.0 Scope	401.1 Scope	The UMC chapter is divided into two parts with Part I dealing with Environmental Air ducts/product conveying ducts and Part II dealing with commercial hoods and kitchen ventilation. The IMC is laid out differently and has significant portions from the ICC Fire Code and ICC Building Code reproduced in this chapter.
502.0 Definitions	No comparable provision.	
503.0 Motors, Fan and Filters	503 Motors and Fans	Air filter requirements only found in UMC.
504.0 Environmental Air Ducts	508 Commercial Kitchen Makeup Air 504 Clothes Dryer Exhaust Ducts	Maximum length limitation for clothes dryer exhaust is 14 ft under the UMC and 25 feet. IMC allows use of manufacturer installation instructions to reduce this length. UMC does not. Both reduce distance for use of elbows though not identical.
504.3.3 Commercial Clothes Dryers	504.7 Commercial Clothes dryers	Both sections are similar in that they refer to the listing requirements. The UMC refers to manufacturer's installation for ducts while the IMC has specific duct installation provisions.

Chapter 5 (Continued)

2000 UMC	2000 IMC	Analysis
504.5 Termination of Environmental Air Ducts	502.6.3.6 Termination Point	IMC deals with both product conveying and environmental duct termination in this section.
505.0 Design of Product Conveying Ventilation Systems	502 Required Systems	The approach to this subject is different within the two documents. The UMC has the provisions in the chapter while the IMC reproduces whole sections of the ICC Fire Code.
Table 501 Minimum Conveying Velocities	No comparable table.	
506.0 Product Conveying Ducts	511 Dust, Stock and Refuse Conveying Systems	Some of the material covered is the same though they are by no means identical. 506.9 and 511.2 IMC are almost identical.
Part II- Commercial Hoods and Kitchen Ventilation	507 Commercial Kitchen Hoods	
507.0 Definitions	No comparable section.	
508.0 Kitchen Ventilation Systems	507 Commercial Kitchen Hoods	Requirements for the joints and seams for hoods are different The UMC requires all joints and seams to welded or brazed where the IMC provides exceptions under Sec. 507.1.1.
508.2 Prevention of Grease Accumulation	506.3.8 Prevention of Grease Accumulation	The sections are identical except that the UMC has additional language specific to using a centrifugal fan with a bottom horizontal discharge.

Chapter 5 (Continued)

2000 UMC	2000 IMC	Analysis
508.3 Cleanouts and Other Openings	506.3.9 Cleanouts and Other Openings	Identical except for reference to listed door assemblies in the IMC.
508.4 Duct Enclosure	506.3.11 Duct Enclosure	<p>There are major differences. UMC requires a one-hour duct enclosure for a Type I hood. IMC provides for exceptions to this rule.</p> <p>Minimum clearances from the duct to the enclosure are 3" in the UMC and 6" for the IMC.</p>
508.6 Air Velocity	No similar provision.	
508.8 Clearances	No similar provision.	<p>The UMC calls for specific clearance of eighteen inches from combustible construction for a duct for a Type I hood. IMC has no similar provision.</p>
508.9 Exhaust Outlets	506.3.13 Type I Exhaust Outlets	<p>Similar with two differences. Vertical distance above the roof surface is 2 ft. for the UMC and 40 inches for the IMC.</p> <p>Also IMC specifies a minimum horizontal distance from vertical discharge fan and a parapet. UMC does not have a similar provision.</p>
508.10 Fuel Burning Appliances	507.3 Fuel Burning Appliances	Identical.
509.0 Hoods	507 Commercial Kitchen Hoods	

Chapter 5 (Continued)

2000 UMC	2000 IMC	Analysis
509.1 Where Required	507.2 Where Required	Similar in scope except UMC spells out different types of appliances for which a hood is required
509.2 Materials and Installation	507.4 Type I Materials 507.5 Type II Materials	Type II Hoods: 24 gauge UMC 22 gauge IMC.
509.4 Clearances for a Type I Hood	507.9 Clearances for a Type I Hood	UMC is more restrictive. Allows for a 3-inch clearance if combustibles are protected by one hr. fire resistive material. Under IMC, clearance is not required under similar conditions
509.5 Grease Filters	509.5 Grease Filters	Identical except for minimum distance between lowest edge of filter and cooking surface without exposed flame is 2 ft. under the UMC and 0.5 ft. under the IMC.
509.7 Capacity of Hoods	507.13 Capacity of Hoods	Identical.
509.9 Make-up Air	508 Commercial Kitchen Makeup Air	Similar with the following differences:
509.10 Exhaust Outlets	507.16 Exhaust Outlets	Similar except UMC has an exception for listed exhaust hoods.
509.11 Performance Tests	507.17 Performance Tests	Identical.
510.0 Motors Fans and Safety Devices	No comparable provisions.	Major difference; IMC refers to the IBC and IFC. UMC has provisions describing the type of fire protection needed.

Summary:

There are significant differences between the two chapters. The UMC requires a duct enclosure for Type I Hoods while this is not the case with IMC which provides for exceptions. The clearances from ducts serving Type I Hoods are also different. The clothes dryer length provisions are different.

Chapter 6

2000 UMC	2000 IMC	Analysis
Scope 601.0	Scope 601.0	The scope of the two documents is slightly different. Some of the material covered is the same but the UMC has Tables 6-1 thru 6-8 dealing with ducts. The IMC does not have similar tables.
602.1 General	602.1 General	UMC section deals with a reference to tables and prohibition on the use of rated corridors for conveying air to and from rooms. This subject is covered in Section 601.2 IMC. IMC is less restrictive.
602.2 Combustibles within Ducts or Plenums	602.2.1 Materials Exposed within Plenums	Provisions are similar. UMC has one or two more exceptions. IMC specifically mentions requirements for pneumatic tubing.
602.3 Factory-Made Air-Ducts	603 Duct Construction and Installation	There are significant differences in which duct construction is handled within the two chapters. The UMC is very prescriptive giving specifics about joints, seams and installation. References are made to UMC 6-1, 6-2, and 6-3 that are found in the code. The IMC simply references SMACNA standards.

Chapter 6 (Continued)

2000 UMC	2000 IMC	Analysis
605.0 Insulation	604 Insulation	The IMC refers the user to the ICC energy code. The UMC refers to Table 6-4 for minimum R-values.
606.0 Smoke Dampers Fire Dampers and Ceiling Dampers	607 Ducts and Air Transfer Openings	The IMC reproduces this section from the ICC Building Code with the building code regulating these provisions. The UMC only the requirement for dampers while IMC deals with other issues as well.
607.0 Ventilating Ceilings	No similar provision.	
608.0 Use of Under- Floor Space as Supply Plenum	No similar provision.	
610.0 Product- Conveying Ducts	511 Dust Stock and Refuse Conveying Systems	
Table 6-1 thru Table 6-7	No comparable tables.	

Summary:

There are similarities in some of the provisions of the two chapters. However, the UMC does not allow air to be conveyed between rated corridors and adjoining rooms. The IMC refers the reader to the ICC Building Code on this issue. UMC refers to the UMC standard 6-2 for duct construction that is printed in the code. IMC reproduces text from the ICC Building pertaining to smoke control. Tables 6 -1, 6-2 and 6- 3 deal with duct details. IMC has no similar tables.

Chapter 7

2000 UMC	2000 IMC	Analysis
701.1 Air Supply	701.1 Scope 701.2 Combustion and Dilution Air Required	UMC does not use the term "dilution" air. Also for buildings of ordinary tightness, UMC requires 50 cu. ft. per 1000 BTU appliance rating for combustion air allowance. This is handled in the IMC through the definition of unconfined space.
701.2 Existing Buildings	No comparable provision.	
702.0 Combustion Air Openings	702 Inside Air 703 Outdoor Air	
702.2 Dampers Prohibited	709.2 Damper Openings	UMC requires prior approval.
702.3 Louvers Grills and Screens	No comparable provision.	
703.0 Sources of Combustion Air		This subject matter is scattered throughout the IMC chapter.
703.3 Prohibited Sources	701.5 Prohibited Sources	
703.4 Interior Space	702 Inside Air	Similar
704.0 Combustion Air Ducts	708 Combustion Air Ducts	Similar
705.0 Gravity type Warm Air Furnace	No similar language.	
706.0 Special Conditions Created by Mechanical Exhausts or Fireplaces		Similar, though no specific reference to mechanical exhausts
707.0 Area of Combustion Air Openings		The UMC refers to Table 7-1. The IMC has no such table. The size of combustion openings must be gleaned from code text. This is a significant difference in the

Chapter 7 (Continued)

2000 UMC	2000 IMC	Analysis
		manner. The information is presented in the two chapters.
707.2 Designed Installations		There is no specific provision for alternate design for combustion air in the IMC.

Summary:

The subject matter covered in Chapter 7 of each book is fairly similar. The difference arises in how the information is presented. As an example, Table 7-1 provides you with required combustion air requirements broken down into buildings of ordinary tightness and those of unusually tight construction. This information is contained within the IMC chapter but not in tabular form. The UMC tends to be a little more prescriptive in some areas than the IMC.

Chapter 8

2000 UMC	2000 IMC	Analysis
801.0 General	801.1 Scope 801.2 General	IMC refers to ICC Fuel Gas for Venting of gas fired appliances. Though there are some similarities, they are mostly different with the IMC getting into specifics. UMC mentions Category I through IV appliances.
802.0 Types of Venting Systems Required		802.4 UMC and 801.11 IMC are similar. Other than that, no comparable provisions in IMC.
803.0 Install and Const Rqmts	802.1 General 801.8 Abandoned Openings 803.5 Manual Dampers	Similar elements found scattered in the IMC chapter.
804.0 Location and Support of Venting Systems	802.7 Support of Vents	UMC more prescriptive.
805.0 Length Pitch and Clearances	No comparable provision.	
806.0 Vent Termination	804	Different requirements; UMC has Table 8-1. No similar table in IMC. IMC has requirements for horizontal terminations.
807.0 Vents for Wall Furnaces Requiring a Type BW Gas Vent	No similar provision.	
808.0 Size of Gravity System	No similar provision.	
809.0 Multiple Appliance Venting Systems	803.7 Connectors Serving Two or More Appliances	The UMC provides some level of detail on this issue.
810.0 Existing Systems	801.18 Existing Chimneys and Vents	

Chapter 8 (Continued)

2000 UMC	2000 IMC	Analysis
811.0 Draft Hoods	No similar provision.	
812.0 Types of Chimneys	805 Factory Built Chimneys	UMC requires spark arrestor for solid/liquid fuel appl. unless excepted. No such requirement in IMC.
813.0 Masonry Chimneys	No comparable provisions.	
815.0 Connectors 815.2 Chimney Connector 815.3 Vent Connector	803 Connectors	Significant difference; UMC provisions are extremely prescriptive in this area. UMC breaks it down into chimney connectors and vent connectors.
Table 8-2 Chimney Selection Chart	No comparable table.	
Table 8-3 Vent Selection Chart	No comparable table.	
Table 8-4 Vent Selection Chart	No comparable table.	
Table 8-5 Clearances to Combustibles	No comparable table.	

Summary:

There are significant differences in the provisions for chimneys and vents between the UMC and the IMC. The UMC chapter is highly detailed and has three tables at the end of the chapter. By contrast, the IMC chapter refers to the listing or the standard. For fuel gas provisions, IMC refers user to the ICC Fuel Gas Code.

Chapter 9

2000 UMC	2000 IMC	Analysis
901.0 Scope	901.0 Scope	UMC scope is different from IMC. IMC refers to ICC Fuel Gas Code. UMC section specifically refers to warm air heating systems, vented decorative appliances, floor furnaces, unit heaters and room heaters.
Part I-Warm-Air Heating Systems		No comparable provision in IMC.
904.0 Prohibited Installations	303 Equipment and Appliance Location 306 Access and Service Space	Similar - not identical. UMC more prescriptive.
906.0 Return and Outside Air	918 Forced-Air Warm Air Furnace	These are similar with some differences. Section 906.2, which calls for a separation only, appears in the UMC chapter.
907.1 Duct Size		Same as in 918 IMC.
907.2 Surgical Rooms		No comparable provision in IMC.
908.0 Attic Furnaces	"	No comparable provision.
909.0 Warm Air		No comparable provision.
910 Furnaces in Roofs or Exterior of Buildings		No comparable provision.
Part II Vented Decorative Appliances, Floor Furnaces, Vented Wall Furnaces, Unit Heaters and Room Heaters		Unvented fuel burning heaters are prohibited by the UMC and allowed by the IMC. This is a significant difference.
914.0 Vented Wall Furnace		IMC refers code user to listing.
915.0 Unit Heaters		
916.0 Room Heaters		

Chapter 9 (Continued)

2000 UMC	2000 IMC	Analysis
Part III 917.0 Ranges 918.0 Open top Broiler 919.0 Direct Gas-Fired Make-up Heaters and Industrial Air Heaters		
920.0 Ceramic Kilns	923 Small Ceramic Kilns	UMC details clearances, hood requirements and exterior installations. IMC refers to manufacturer's instructions.
Part IV Incinerators	907 Incinerators and Crematories	IMC refers to the listing while UMC is extremely descriptive providing detailed provisions.

Summary:

Though the titles of the two chapters are the same, the content is hardly the same. In most instances, in the IMC chapter the standard for the equipment is referenced without any further details. The UMC has additional prescriptive provisions. This is true for floor furnaces, vented wall furnaces, unit heaters and room heaters. The UMC prohibits the use of unvented heaters. The IMC allows them.

UMC contains clearances for cooking ranges and requirements for open top broiler units. The IMC relies on this information coming from the listing and the manufacturer's instructions.

Chapter 10

2000 UMC	2000 IMC	Analysis
1001.1 Scope	1002.0 Scope	Similar except UMC specifically excludes water heaters under 120 gallons and less than 200,000 BTU rating from this chapter.
1004.0 Definitions	No comparable provision.	
1006.0 Detailed Requirements	1003 Pressure Vessels	UMC sections deals with boilers and pressure vessels. UMC provides detail on stack dampers.
1007. Expansion Tanks	1009 Hot Water Boiler Expansion Tank	Similar. Provisions for open and closed type systems are different.
1008.0 Relief Valve Discharge	1006.6 Safety and Relief Valve Discharge	UMC section more detailed. IMC refers to ICC Plumbing Code for low-pressure systems.
1009.0 Shutoff Valves	No similar provision.	
1010.0 Gas Pressure Regulator	No similar provision.	
1011 Low Water Cutoff	1007 Boiler Low Water Cutoff	UMC section more detailed and allows for an exception when serving 6 or less dwelling units.
1012.0 Combustion Regulators-safety valves	No comparable section.	
1013 Automatic Boilers	No comparable provision.	No comparable table for Table 10-3 in the IMC.
1014 Clearance for Access	No comparable provision.	
1015 Boiler Rooms and Enclosures		
1015 Boiler Rooms and Enclosures		

CORRECTION

THE FOLLOWING DOCUMENT(S)
HAVE BEEN REFILMED TO
ASSURE LEGIBILITY OR PAGINATION



Central Microfilm Services
Department of Education & Early Development
State of Alaska

Chapter 10

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Chapter 10 (Continued)

2000 UMC	2000 IMC	Analysis
1017.0 Floors		
1018 Chimney and Vents	No comparable provision.	
1019.0 Drainage		
1020.0 Fuel Piping		
1022.0 Operating Adjustments and Instruction		
1023.0 Inspections and Tests		UMC requires a warning notice before testing is completed. UMC also allows a registered professional engineer to do the testing. IMC simply refers you to the standard.
1024 Operating Permit	No comparable provision.	
1025 Maintenance Inspection	No comparable provision.	
1026.0 Operation and Maintenance of Boilers	No comparable provision.	

Summary:

The two chapters are similar. However the UMC contains a definitions section. UMC has Tables 10-1, 10-2, and 10-3 dealing with expansion tank capabilities and controls for automatic boilers. The IMC has no comparable tables. The UMC has additional provisions dealing with maintenance and operation of boilers.

Chapter 11

2000 UMC	2000 IMC	Analysis
1101.0 Scope	1101 General	UMC has two parts Part I deals with refrigeration systems, etc. Part II is Cooling Towers. The IMC chapter is formatted differently using standard references.
1102.0 Refrigerants	1102.1 General Systems Requirements	
1103 Refrigerant Classification	1103.1 Refrigerant Classification	Both refer to ASHRAE 34; IMC in the code, UMC in Chapter 16.
1104.0 Classification of Refrigeration Systems	1103.2 Occupancy Classification	Significant differences UMC classifies in table 11-2 into high and low probability systems.
1105.0 Requirements for Refrigerant and Refrigerant Use		No comparable provision.
1105.1 System Selection		No comparable provision.
1105.2 Volume of Occupied Space	1102.1/3 IMC	UMC refers to 11-1 IMC to Table 1103.1 (governed by the ICC Fire Code) UMC has 2 exceptions.
1105.3 Refrigerated Process and storage Areas	1104.2.2 Industrial Occ. and Refrig. Rooms	
1105.4 Refrigerant Purity	1102.2.2 Purity	Similar.
1106.2 Supports and Anchorage	No comparable provision.	
1106.3 Access through Condensate Disposal	No comparable provisions.	
1107.0 Refrigeration Machinery Rooms	1105 Machinery Room General Rqmts.	UMC is specific within code text as to when a refrigeration machinery room is required. The requirements are different.

Chapter 11 (Continued)

2000 UMC	2000 IMC	Analysis
1107.2 Dimensions	No comparable provisions.	
1107.4 Refrigeration Vapor Alarms	1105.3 Refrig. Detector (governed by ICC Fire Code)	UMC has the provisions in the code; IMC refers user to ICC Fire Code.
1107.7 Special Requirements	1106.2 Elevated Temp	Similar though UMC has two exceptions.
1108.0 Refrigeration Mach. Rm. Ventilation	1105.6.3 Qty-Normal Ventilation	Some of provisions are similar but UMC provides additional formulae to calculate minimum airflows and max. temp. increases.
1108.3 Distribution of Ventilation 1108.4 Intermittent Control of the Ventilation System 1108.5 Emergency Control of the Ventilation Systems 1108.6 Central Control of Ventilation Systems 1108.7 Vent Discharge 1108.8 Fans 1108.9 Ventl. Intake		No comparable provisions in this chapter of the IMC.
1109.0 Refrigeration Machinery Room Equipment and Controls		No comparable provisions.
1110.0 Refrigerant Piping Containers Valves		UMC divides into ferrous and non-ferrous materials IMC deals with type of piping material individually. UMC does not mention aluminum.

Chapter 11 (Continued)

2000 UMC	2000 IMC	Analysis
1111.0 Erection of Refrigerant Piping 1112.0 Refrigerant Control Valves 1113.0 Pressure Limiting Devices 1114.0 Pressure Relief Devices 1115 Pressure Relief Device Settings 1116.0 Marking of Pressure Relief Devices 1117.0 Over Pressure Protection 1118.0 Discharge Piping 1119.0 Special Discharge Requirements		There are no provisions that directly compare in IMC.
Table 11-1	Table 1103.1	Tables are different. IMC has an expanded list based on ASHRAE 34.
Table 11-2 Table 11-3	No similar tables.	
Part II-Cooling Towers	No comparable provisions in IMC.	

Summary:

There are several differences in the chapter. In size alone, the UMC chapter is about double the size of the IMC chapter. The reason being that the UMC in keeping with its philosophy has several prescriptive provisions so as to allow the user to have all the information needed in the chapter. The IMC refers to both the ICC Building and Fire Code extensively and defers to standards for requirements such as refrigerant control valves. Table 11-1 and Table 1103.1 are the not same-the IMC refrigerant list being longer. The IMC chapter requires access to several other documents.

Chapter 12

2000 UMC	2000 IMC	Analysis
1201.0 Scope	1201.1 Scope	UMC specifies scope as piping where pressure /temperature in excess of 160 psig and 250°F.
1201.2.1 Materials and Construction	1202 Material	UMC is more prescriptive in this section specifying permissible materials in code text. IMC has materials and standards in tabular form. IMC allows PEX, PEX-AL-PEX. No specific mention in UMC of these materials.
1201.2.2 Fabrication of Joints	1203 Joints and Connections	Similar though UMC provides additional information. Joints for plastic piping in IMC.
1201.2.4 Changes in Direction	No comparable provision.	
1201.2.6 Hangers and Supports	No comparable provision.	
1201.2.7 Installation	No comparable provision.	
1201.2.8 Pressure Testing	1208 Tests	Similar requirements except IMC contains requirements for ground source heat pump loop systems.
Part II- Hydronic Panels	No comparable provision.	There are multiple sections in the UMC dealing with the installation of hydronic piping, including requirements for underground and outside of buildings and trenching.

Chapter 12 (Continued)

Summary:

The material in both chapters is presented differently. The IMC allows for the use of more kinds of plastic for hydronic systems. Hydronic panels are included in the UMC. Overall the UMC chapter is more detailed. The differing philosophies in the formulation of codes are reflected in this chapter.

Chapter 13

Summary:

Chapter 13 of the 2000 UMC refers the user to Appendix B, Chapter 13 of the 2000 UMC where fuel gas provisions (reproduced from the 2000 Uniform Plumbing Code) can be found. The IMC references the ICC Fuel Gas Code, a separate document.

Chapter 14

Summary:

Chapter 14 of the 2000 UMC is process piping. There is no equivalent chapter in the 2000 IMC.

Chapter 15

Summary:

This chapter references Section 1206.0 Heat Sources of the 2000 UMC and the Uniform Solar Energy Code. IMC has a short chapter containing solar provisions.

Chapter 16

Summary:

UMC 2000 has two parts. Part I has standards adopted as part of the code (8 in all). Part II lists other referenced standards that are listed alphabetically by title. IMC 2000 in its chapter lists standards by promulgating agency.

Appendices

Summary:

The UMC 2000 has Appendix A, B, C and D. Appendix A contains 8 standards. Appendix B contains Fuel Gas Piping, Installation and Testing of Gas or Fuel Fired Equipment, Installation and testing of Oil (liquid) Fuel Fired Equipment. Appendix C has sizing tables for venting systems. IMC has 2 appendices - one for combustion air openings and one for chimney connector pass throughs.



MECHANICAL CONTRACTORS
of Alaska, Inc.



July 30, 2001

Subject: Reason the State of Alaska Should Continue With
The Uniform Mechanical Code.

Dear

There is a controversy in our State surrounding the adoption of the mechanical code, and a good chance that this controversy will be a topic for legislation in the 2002 session. The purpose of this letter is to provide some background and information from the perspective of the Mechanical Contractors and Mechanical Administrators who are licensed under State Statutes 08.40.210, 08.40.270 (3), 08.40.320 (a) (2), 08.40.490 (3) (A) (B) and 08.18.171 (7).

As enacted by the legislature, these statutes require mechanical contractors to install or modify their work in accordance with a family of Uniform Codes, specifically Uniform Plumbing Code, Uniform Swimming Pool, Spa and Hot Tub Code, Uniform Solar Energy Code and the Uniform Mechanical Code.

The State Fire Marshal without coordinating with other agencies has proposed repeal of the Uniform Mechanical Code and instead seeks to adopt the International Mechanical Code. This was done despite strenuous objections from these mechanical professionals licensed under the Uniform Mechanical Code per statute.

The basic problem, as we see it, is one agency seeks to adopt a new substantive code while another agency can only license mechanical contractors under a different code. We also think the proposed new code will not serve the public and our members. We are opposed to this method of repealing the Uniform Mechanical Code and will continue to fight this repeal until such time as the Legislature clears up the chaos created by the Fire Marshal and the Dept. of Public Safety.

In the Department of Public Safety budget request "Change Record Detail With Description" dated 12/17/1999 the DPS asked for \$98,100.00 for

"Extensive Code/Regulation Project". At the date of this budget request the codes DPS proposed to adopt had not yet been published. According to the fly/leaf in the front of these codes they are published as follows;

- 2000 International Residential Code - Published Jan. 2000
- 2000 International Fire Code - Published Dec. 1999
- 2000 International Building Code - Published March 2000
- 2000 International Mechanical Code - Published Dec. 1999

The DPS did not proceed to adopt the International Residential Code.

We are puzzled how the DPS could consider adopting codes before they are published. The Budget Request goes on to conclude that other model codes are no longer available. This is incorrect. The Uniform Plumbing Code, Uniform Mechanical Code, Uniform Swimming Pool, Spa and Hot Tub Code and the Uniform Solar Energy Code are still being published by the International Association of Plumbing and Mechanical Officials (IAPMO) as they have always published these codes. Also, the Uniform Fire Code was developed and is published by the Western Fire Chiefs Association (WFC). A 2000 edition has been published.

In summary, the 2000 edition of the family of Uniform Codes listed above are in use across the United States. They are still available despite what DPS states in their Budget Request.

Based on the information we have to date, the only code body to pull out of the Uniform family was the International Conference of Building Officials (ICBO), the organization of which the Fire Marshal is a member. What we have in this situation is one splinter group seeking to adopt a new and untested code. Frankly, our members and the public should not be required to participate in this experiment.

The DPS statement that FEMA will not fully fund disasters in our state unless we adopt the International Codes is wrong! The State of California recently re-adopted the Uniform Codes after a review process that lasted more than a year. They would not have taken that action if it would risk losing FEMA disaster funding.

The DPS statement that failure to adopt the International Codes will make it more costly for companies to build in Alaska is puzzling. How does the DPS know the new code will reduce the cost of building in Alaska? Where is the documentation? Common sense suggests the adoption of any new regulatory code will increase building costs, at least initially.

The DPS statement that the major cities in Alaska (all of whose chief building officials are ICBO members) plan to adopt the new codes is true. But those chief building officials point to the State's plan to adopt the new

International Codes as their justification to adopt these codes. This kind of bureaucratic self justification is driving the adoption of the International Codes.

It is clear that the DPS manufactured an artificial crises and rammed through this regulation project to fix a phony problem. This "fix" has and will cost hundreds of mechanical contractors and the public thousands of hours of time and hundreds of thousands of dollars. We ask for what purpose? To those of us caught in the middle of this bureaucratic turf fight, there is no a valid reason to adopt a new , untested code. .

At the next code cycle, 2003, there will be a new integrated family of model consensus codes, NFPA 5000, the full Consensus Code Set. This family of codes will contain the NFPA Building Code, a joint NFPA/WFCA Fire Code, Uniform Mechanical Code, Uniform Plumbing Code, Uniform Swimming Pool, Spa & Hot Tub Code, Uniform Solar Energy Code and the National Electric Code. The last four of these codes will still be in effect in our State at that time because statutes require the Dept. of Labor to adopt those specific codes. Let us take our time and fairly examine both code sets before we rush to judgement. This is what California and Oregon are doing. It makes no sense to adopt new codes piecemeal, particularly where the statutes governing testing and licensing are at odds with the new proposed International Codes.

At the Federal level the government agencies are encouraging the development of model consensus building codes. Consensus is defined in OMB A-119 by the attributes of Openness, Balance of interest, Due process and an Appeals process. The International Codes do not meet these criteria in my opinion.

Please use your good offices to make sure the regulation adoption process works as the Legislature intended, and the interests of all stakeholders are considered, not just the interest of a few building officials more concerned with their own "turf" than the interests of the public..

Sincerely,

Eugene R. Rutland
Executive Director

LEGAL SERVICES

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MEMORANDUM

July 12, 2001

SUBJECT: Regulatory adoption of International Mechanical Code
(Work Order No. 22-LS1056)

TO: Representative Jeannette James
Attn: Barbara

FROM:  Theresa L. Barnister
Legislative Counsel

You have asked whether The Department of Public Safety may amend its regulations to replace the Uniform Mechanical Code ("UMC") with the International Mechanical Code ("IMC"). On June 25, 2001 the Lieutenant Governor's office filed regulations of the Department of Public Safety ("Department") that adopt, with some Alaska variations, the International Mechanical Code and certain other international codes. The International Mechanical Code replaces the Uniform Mechanical Code in those regulations. The relevant changes in the regulations occur at 13 AAC 50.023 (adoption of the International Mechanical Code) and 13 AAC 55.150(a)(19) (repeal of the definition of "U.M.C." for 13 AAC 50 - 13 AAC 55). The regulation changes take effect September 15, 2001.

You are asking whether these regulatory changes are valid. First of all, keep in mind that amended regulations that are filed by the lieutenant governor raise the rebuttable presumption that the amended regulations are valid. AS 44.62.100, and see O'Callaghan v. Rue, 996 P.2d 88, 95 (Alaska 2000). However, to uphold this presumption, the amended regulations must be consistent with and reasonably necessary to implement the statutes authorizing their adoption. See AS 44.62.030 and State Bd. of Marine Pilots v. Renwick, 936 P.2d 526, 531 (Alaska 1997), cited by Interior Alaska Airboat Association v. State, 18 P.3d 686, 689 (Alaska 2001). Where a regulation is adopted in accordance with the Administrative Procedures Act (AS 44.62), and the legislature intended to give the agency discretion, the court applies this test by reviewing first whether the regulation is consistent with the statutory provisions that authorize it and second by determining whether the regulation is reasonable and not arbitrary. See Interior Alaska Airboat Association, 18 P.3d at 689 - 690. Finally, to be valid, an administrative regulation must not violate existing state statutes or constitutional provisions. See O'Callaghan v. Rue, 996 P.2d at 98.

The information that I have received does not disclose the complete process that preceded the filing of the regulations. Therefore, I will assume for the purposes of this memo that the regulation changes were adopted in accordance with the Administrative Procedures

Representative Jeannette James
July 12, 2001
Page 2

Act. The authority cited for the repeal and reenactment of 13 AAC 50.023 and for the repeal of 13 AAC 55.150(a)(19) is AS 18.70.080. In addition, AS 18.70.010 is also cited for the repeal of 13 AAC 55.150(a)(19). AS 18.70.080(a) expressly authorizes the Department of Public Safety to promulgate regulations for the purpose of protecting life and property from fire and explosion by establishing minimum standards for certain listed items. These items include, among other things, minimum standards for "fire and life safety criteria in commercial, industrial, business, institutional, or other public buildings, and buildings used for residential purposes containing four or more dwelling units...." AS 18.70.080(a)(2). This is a very broad delegation of authority by the legislature and gives the Department much discretion. AS 18.70.010 describes the general function of the Department with regard to fire protection and states that the Department "shall foster, promote, regulate, and develop ways and means of protecting life and property against fire, explosion, and panic."

The adoption of a code to regulate the mechanical systems of certain structures appears to be consistent with AS 18.70.080 because it establishes standards for the installation and operation of mechanical systems in buildings, and the mechanical systems appear to directly affect fire in and explosions of structures. It is my understanding that mechanical codes cover air flow systems (heating, cooling, and ventilation systems) and that air flow systems are significant in fire protection matters because air is one of the elements that are needed for a fire. The authorization for adoption of a mechanical code is reinforced by AS 18.56.300(e)(3), which defines "state building code" for the section to include the mechanical standards adopted by the Department under AS 18.70.080.

However, AS 18.56.300(e)(3) expressly refers to the Department's adoption under AS 18.70.080 of a version of the UMC for these standards. Although this reference does not appear in the Department's grant of authority under AS 18.70.080, it appears to indicate that the legislature intended that the UMC be the mechanical code adopted under AS 18.70.080. Since this language is so clear, it is likely to be read to limit the Department's discretion under AS 18.70.080 when adopting a code for mechanical standards. If AS 18.70.080 and AS 18.56.300 are read together, the adoption of the IMC would not be consistent with AS 18.70.080. On the other hand, it is possible that AS 18.56.300 might be read as limited to the mechanical code to be adopted for the structures covered by that section. However, even in that case, it would seem to require that the Department adopt the UMC at least for the purposes of AS 18.56.300, which the regulation changes do not appear to do.

When considering consistency, the purposes of the grant of regulation-making authority may be considered. See Interior Alaska Airboat Association, 18 P.3d. at 690. In this regard, adoption of the IMC may not actually promote the protection of life and property from fire and explosion because mechanical administrators, the persons who install and modify mechanical systems, are required to be trained in the UMC, not the IMC. See AS 08.40.270(a)(3). The training requirements of licensing provisions generally are to insure that the licensees can implement the standards they are required to apply. The purpose of the licensing provisions for mechanical administrators is to protect the safety