ALASKA LEGISLATURE COMMITTEE FILES 1997-1998 8672
9363 HOUSE LABOR & COMMERCE

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 80 psig will not flow 2 gpm at 8 psig.

b. A shower head that flows 2.5 gpm at 80 psig will not flow 3 gpm at 8 psig nor 3.0 gpm at 20 psig.

c. A sink faucet that flows 2.5 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 fixtures and/or fixture fittings.

6-4. **IPC Section 604.4, Maximum flow and water consumption.** This section permits 3.5 gpf water closets in public assembly occupancies and other locations. This is in violation of federal law. Furthermore, the listing of service sinks, clinical sinks, and emergency showers as water closets or urinals as indicated in the text seems confusing.

The UPC addresses this matter m Section 402.0, Water Conserving Fixtures and Fittings.

6-5. 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.

6-6. **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 No. 6-8 below.)

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

6-7. **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.

6-8. **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.

6-9. **IPC Section 604.9, Water hammer.** This section states that "Velocity of the water distribution system shall be controlled to reduce the possibility of water hammer." However, the IPC does not provide a maximum velocity for the various water distribution materials in order to reduce water hammer.

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

6-10. **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.

6-11. **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.

6-12. **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 605.18.3, 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.

6-13. **IPC Section 605.21.1, 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 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 intermembering 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.

The UPC does not require this.

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, SIZES 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.

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 regulating 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 regulating 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 1995 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	
Pasture	100	
Pumphouse floor drain of cast iron draining to ground surface	2	Not included
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 does not specifically address the plumbing uniqueness of health care plumbing, but does cover protection of the water system in their backflow protection section of Chapter 6 and most of the other requirements are carried out by the design professionals designing hospitals and by the state agencies overseeing hospitals.

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 condensate traps in hospitals or health care facilities. However, there is no specific requirement as to how far this water supply shall be from the particular air conditioning unit condensate trap. Furthermore, in many medical facilities the air conditioning unit condensate traps are mounted in the ceiling and it would be highly impractical to have a water connection up at that location for blowing out the condensate line, which is normally done by maintenance people with a compressed air bottle. They then

use a small container to simply pour water down the trap to refill it. This section seems like an excessive code requirement.

The UPC does not require this.

G. CHAPTER 7, SANITARY DRAINAGE

7-1. **IPC Section 702, MATERIALS.** This section allows ABS and PVC drainage, waste and vent systems in all buildings.

UPC Section 701.1.2 currently does not allow ABS and PVC DWV piping in structures of three stories or more above grade. However, there have been numerous code changes proposed to remove this restriction and it is anticipated that in the next code cycle this change will be accomplished.

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. This 1/4" minimum slope assures sufficient flow velocity for the transport of solids. It is particularly important where 1.6 gpf water closets are involved due to the limited waste carry with some ultra 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 for the fixture connections at bases of stacks or stack offsets within a location at least 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 even though Section 206.0 contains a definition of a dead end.

7-5. **IPC Section 705.14.2, 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 708.3.3, Change of direction.** The IPC requires cleanouts every 40 feet and at each change of direction greater than 45 degrees. Therefore, this section requires more cleanouts in drainage piping than UPC 707.0.

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.

7-8. **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.

7-9. **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.

7-10. **IPC Section 708.4, Concealed piping.** 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".

7-11. **IPC Section 708.8, Pipes 8 inches (203 mm) and larger nominal size.** This section requires for building sewers 8" and larger, manholes be located at every change in direction, and at 400-foot maximum spacing.

UPC Section 719.1 permits cleanouts in the building sewer regardless of size at 100-foot intervals and changes in direction greater than 135 degrees. UPC Section 719.6 allows manholes at 300-foot spacing in lieu of cleanouts at 100-foot spacing when first approved by the Administrative Authority.

7-12. **IPC Section 708.9, Clearances.** 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 protection for the building occupant.

7-13. **IPC Table 709.1, DRAINAGE FIXTURE UNITS FOR FIXTURES AND GROUPS.** This table does not consider the frequency of use of the various fixtures except by reference to public or private for water closets. Furthermore, the table does not distinguish between 1.6 gpf water conserving water closets and 3.5 gpf water closets. The drainage fixture units for water closets in the IPC, which are used to size drainage and vent piping, are higher than those in the UPC in many cases.

UPC Table 7-3 includes separate drainage fixture unit (DFU) listings for: (1) Individual Dwellings, (2) Three or More Dwellings, (3) Public General Use, and (4) Public Heavy-Use Assembly. In dwellings, studies have shown that the peak drainage loads are caused by bathtubs or combination bath/showers, clothes washers, and dishwashers. The time duration of these discharges is relatively long and they combine with other fixtures to create the peak load. "General Use" includes fixtures in buildings used by the general public where

each fixtures serves more people and the frequency of use is higher than in a dwelling. "Heavy-Use Assembly" applies where the fixtures are used at the maximum possible frequency and the time between uses is the minimum possible. This applies where queuing occurs, as at stadiums. UPC Table 7-3 also distinguishes between 1.6 gpf water conserving water closets and 3.5 gpf water closets.

UPC Table 7-3 also includes a much greater classification of fixture types for simplicity of use, as shown below.

↓ Arrows indicate IPC Table 709.1 fixture classifications.	UPC Table 7-3 – Individual Fixtures	Uniform Plumbing Code Table 7-3 Drainage Fixture Unit Values (DFU)				International Plumbing Code Table 709.1 Drainage Fixture Units for Fixtures & Groups
		Private		Public		
		Individual Dwelling	3 or More Dwellings	General Use	Heavy-Use Assembly	Drainage Fixture Unit Value as Load Factors
	Bar Sink	1.0	1.0			
	Bar Sink			2.0		
→	Bathroom group consisting of water closet, lavatory, bidet, and bathtub or shower					6.0
→	Bathtub or Combination Bath/Shower	3.0	3.0			2.0
→	Bidet, 1-1/4" trap	1.0	1.0			2.0
	Clinical Sink, 3" Trap			6.0		
→	Clothes Washer, domestic, 2" standpipe[5]	3.0	3.0	3.0		2.0
→	Clothes Washer, commercial					3.0
→	Combination Sink and Tray					2.0
→	Dental Lavatory					1.0
→	Dental Unit, cuspidor			1.0		1.0
→	Dishwasher, domestic, with independent drain	2.0	2.0	2.0		2.0[c]
→	Drinking Fountain or Water Cooler			0.5		0.5
	Food Waste Grinder, commercial			3.0		
→	Floor Drain, emergency			0.0		0.0
→	Floor Drains					2.0
→	Kitchen Sink, domestic					2.0
	Kitchen Sink, domestic, with one 1-1/2" trap	2.0	2.0	2.0		
	Kitchen Sink, domestic, with food waste grinder	2.0	2.0	2.0		2.0
	Kitchen Sink, domestic, with dishwasher	3.0	3.0	3.0		2.0
→	Kitchen Sink, domestic, w/grinder & dishwasher	3.0	3.0	3.0		2.0
→	Laundry sink, one or two compartments	2.0	2.0	2.0		2.0
	Laundry Sink, with discharge from clothes washer	2.0	2.0	2.0		
→	Lavatory, single	1.0	1.0	1.0	1.0	1.0
	Lavatory in sets of two or three	2.0	2.0	2.0	2.0	
	Mobile Home, trap	12.0	12.0			
	Mop Basin, 3" trap			3.0		
	Receptor, indirect waste, 1-1/2" trap [1,3]			(1)		
	Receptor, indirect waste, 2" trap[1,4]			(1)		
	Receptor, indirect waste, 3" trap[1]			(1)		
	Service Sink, 2" trap			3.0		
	Service Sink, 3" trap			3.0		
→	Shower Compartment, domestic					2.0
	Shower Stall, 2" trap	2.0	2.0	2.0		
	Showers, group, per head (continuous use)			5.0		
→	Sink					2.0
	Sink, commercial, 1-1/2" trap, with food waste			3.0		
	Sink, service, flushing rim			6.0		

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	Sink, general, 1-1/2" trap	2.0	2.0	2.0		
	Sink, general, 2" trap	3.0	3.0	3.0		
	Sink, general, 3" trap			5.0		
→	Urinal, 1.0 gpf			4.0	5.0	2.0[e]
→	Urinal, greater than 1.0 gpf			5.0	6.0	4.0
	Urinal, 1-1/2" trap			4.0	5.0	4.0
	Wash Fountain, 1-1/2" trap			2.0		0.5
	Wash Fountain, 2" trap			3.0		
→	Wash Sink, each set of faucets			2.0		2.0
→	Water Closet, flushometer tank, public or private					4.0
→	Water Closet, private installation					4.0
→	Water Closet, public installation					6.0
	Water Closet, 1.6 gpf Gravity Tank[6]	3.0	3.0	4.0	6.0	
	Water Closet, 1.6 gpf Flushometer Tank[6]	3.5	3.5	5.0	8.0	4.0[e]
	Water Closet, 1.6 gpf Flushometer Valve[6]	3.0	3.0	4.0	6.0	
	Water Closet, 3.5 gpf Gravity Tank[6]	4.0	4.0	6.0	8.0	
	Water Closet, 3.5 gpf Flushometer Valve[6]	4.0	4.0	6.0	8.0	
	Whirlpool Bath or Combination Bath/Shower	3.0	3.0			

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 branch drain beyond the trap arm.

[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.

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.

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 Section 709.5, Values for indirect waste receptor, and Table 709.2, DRAINAGE FIXTURES UNITS FOR FIXTURE DRAINS OR TRAPS.** The IPC has fixture drainage unit values that are considerably less for waste receptors than does the UPC. The writers are unaware of the justification of the reduced fixture unit values. The *National Standard Plumbing Code* (NSPC) employs a different method of determining DFU values for indirect waste receptors but the results are similar to the UPC.

IPC TABLE 709.2 DRAINAGE FIXTURE UNITS FOR FIXTURE DRAINS OR 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.

UPC TABLE 702.0 FIXTURE UNIT EQUIVALENTS	
	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 DFU carrying capacity in horizontal drain lines for most installations. See comparisons below.

IPC TABLE 710.1(1) Building Drains and Sewers	
	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]
DIAMETER OF PIPE (INCHES)	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 = 0.08.33 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	
6	
12	
20	
160	
360	
620	
1,400	
2,500	
3,900	
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 (38)	1
2 (51)	8[3]
2-1/2 (64)	14[3]
3 (76)	35[4]
4 (102)	216[5]
5 (127)	428[5]
6 (152)	720[5]
8 (203)	2,640[5]
10 (254)	4,680[5]
12 (305)	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 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.

7-20. **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	(38)	2[2]
2	(51)	16[3]
2-1/2	(64)	32[3]
3	(76)	48[4]
4	(102)	256
5	(127)	600
6	(152)	1,380
8	(203)	3,600
10	(254)	5,600
12	(305)	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.

7-21. **IPC Table 710.1(2), HORIZONTAL FIXTURE BRANCHES AND STACKS.** This table does not restrict the number of water closets on a 3" drainage stack. The IPC table permits as many as twelve (12) bathroom groups (including water closets of any flushing capacity) on a 3" drainage stack. The writers are aware that the *1996 National Standard Plumbing Code* allows 12 water closets on a 3" stack of more than three branch intervals but only if the water closets are 1.6 gpf or less. However, the IPC does not include this restriction.

The UPC restricts 3" stacks to four (4) water closets. Plumbing codes have traditionally restricted the number of water closets on 3" stacks and drains.

7-22. **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 is far less complicated and easier to use than the drainage pipe sizing method in the IPC.

7-23. **IPC Section 712, SUMPS AND EJECTORS.** This section permits the installation of a single sewage ejector pump in commercial and other "public use" occupancies.

UPC Section 710.9 requires dual sewage pumps in "public-use" occupancies and further requires that they operate independently. This assures continued operation of the sanitary drainage system during maintenance or equipment failure and avoids the unsanitary conditions that would result if the sewage ejection system failed.

7-24. **IPC Section 713, HEALTH CARE PLUMBING.** This section 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 vacuum disposal systems in health care facilities are safe and sanitary. These four (4) sections are not correlated with IPC Section 1302.1, which references NFPA 99C-1993 for the design and installation of vacuum systems.

IPC Section 713.7 requires that the waste discharge from collecting tanks in vacuum systems be direct-connected to the sanitary drainage system through a trapped waste. This conforms to the requirements of most health care facilities and NFPA 99-1996. However, IPC Section 713.7 does not describe the depth of trap seals or the extra vents and check valves that are required to prevent the system vacuum from pulling the trap seal under certain conditions.

The UPC covers most of this material in Chapter 7 and Chapter 8. Furthermore, the UPC references NFPA 99-1993 and NFPA 99C-1993 for medical gas and vacuum systems but includes significant additional design and installation information in Chapter 13.

7-25. 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.

7-26. **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 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.

7-27. **IPC Section 715.1, Sewage backflow.** The wording of this section is somewhat confusion in that it says "a backwater valve shall be installed only for plumbing fixtures where the overflow rims of the lowest plumbing fixtures (emphasis added) are below the next upstream manhole in the public sewer." It then goes on to say that "plumbing fixtures with flood rims above the upstream manhole shall not discharge through the backwater valve." It is the writers' opinion that this section means that all of the fixtures that have their overflow rim below the upstream manhole are to drain through the backwater valve and not just the lowest plumbing fixtures.

UPC Section 710.0 requires that "all plumbing fixtures with overflow rims below the next flood level rim of the next manhole shall drain through a backwater valve." (Emphasis added.) This is more understandable code language.

H. CHAPTER 8, INDIRECT/SPECIAL WASTE

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 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.

8-3. **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.

8-4 The IPC does not contain any specific criteria for sizing air conditioning condensate piping.

UPC Section 815.1 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 permits plastic vent piping to be installed in structures exceeding three (3) stories above grade.

UPC Section 903.1.2 prohibits plastic vent piping in structures exceeding three (3) stories above grade. This is based on building code restrictions from 1986. However, changes have been proposed to the UPC to remove these restrictions and it is anticipated that these changes will be accepted at the next conference and included in the 2000 UPC.

9-3. **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.

9-4. **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 906.7 requires 2" minimum vents to prevent frost and snow closure. Furthermore, the UPC requires any installation that has a minimum design temperature below zero degrees Fahrenheit be protected as opposed to the 97.5% design temperature used by the IPC.

9-5. **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.

9-6. **IPC Section 904.5, Location of vent terminal.** This section does not indicate how close a vent termination may be from a lot or property line. The section does say "not within ten (10) feet of an adjacent building" and Section 904.6, Extension through walls, indicates that the vent "shall terminate a minimum of ten (10) feet from the lot line", but this is only where the vent extends through the wall and is not applicable to vents extending through the roof.

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

9-7. **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.

9-8. **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.

9-9. **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 9-4 above.)

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

9-10. **IPC Section 905.1, Connection exception.** This exception allows individual branch and circuit vents to be terminated in air admittance valves in accordance with Section 917. (See comments in Item 9-27 below.)

The UPC does not allow the use of air admittance valves. (For reasons see Item 9-27 below.)

9-11. **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.

9-12. **IPC Section 905.6, Side inlet.** This section permits vented fixtures to connect to the side inlet of a closet bend, thereby wet venting the water closet.

UPC Section 908.0 currently permits only vertical wet venting. However, the writers have participated in a UPC ad hoc wet venting committee which has prepared code changes that will allow properly sized horizontal wet venting. These code changes will be submitted to the next IAPMO confer-

ence and it is anticipated they will be adopted and incorporated in the 2000 UPC.

9-13. **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.

9-14. **IPC Section 908.3, Connection at different levels.** This is simply a vertical wet venting section and Table 908.3, COMMON VENT SIZES, contains somewhat different figures than shown in Table 909.3, WET VENT SIZE. The writers are unaware of why the difference or even how the values in either of these tables were established.

UPC Section 908.0 contains simplified sizing criteria for vertical wet venting.

9-15. **IPC Section 909, WET VENTING.** This section has criteria for horizontal and vertical wet venting up to 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 1995 IPC, it takes one (1) full page of text and eleven (11) diagrams to explain all of the possible conditions that affect the wet vent piping and sizing.

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 overfill the line and interfere with its venting function.

The UPC currently does not permit horizontal wet venting. However, an ad hoc committee in which the writers participated has proposed code changes that would permit properly sized horizontal wet venting bathroom groups under certain described conditions, i.e., only lavatories, bathtubs and showers would be permitted to discharge into a wet vent. This code change will be submitted to the next IAPMO conference and when adopted will be included in the 2000 UPC.

9-16. **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.

9-17. **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 1997 UPC does not currently allow circuit venting. However, an ad hoc venting committee in which the writers participated has reviewed the matter and is proposing a change to the UPC that would permit circuit venting. This proposed code change will be submitted to the next IAPMO conference and when adopted will be included in the 2000 UPC.

9-18. **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.

9-19. **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 combina-

tion 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.

9-20. **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.

9-21. **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.

UPC Section 907.1 requires relief vents (yoke vents) for soil and waste stacks at five (5) story intervals but only requires a stack vent for waste stacks ten (10) stories or greater as opposed to the IPC which requires a vent stack for stacks of five (5) branch intervals.

9-22. **IPC Section 915, VENTS FOR STACK OFFSETS.** This section has requirements for venting all offsets in drainage stacks of five (5) or more branch intervals.

The UPC has no requirements for venting offsets in drainage stacks.

9-23. **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. IPC Section 916.4.1 requires that multiple vents exceeding 40' developed length be increased in size but this table does not refer to this section.

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.

9-24. **IPC Section 916.4.1, Multiple branch vents exceeding 40 feet in developed length.** This section provides a requirement that multiple branches exceeding 40 feet shall be increased by nominal size for the entire developed length of the vent pipe. However, the IPC does not indicate how much the nominal size should be increased nor does this section refer back to Table 916.1.

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.

9-25. **IPC Table 916.5.1, SIZE AND LENGTH OF SUMP VENTS.** This table contains Footnote "a" which addresses fittings and entrance losses to be used in determining developed length. Furthermore, these fittings and entrance losses are not mentioned for use in Table 916.1, SIZE AND DEVELOPED LENGTH OF STACK VENTS AND VENT STACKS.

In UPC Table 7-5 the fitting losses are already included in the developed length in determining size of vents.

9-26. **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. Furthermore, only one vent stack or stack vent in each system must extend outdoors. In the IPC, air admittance valves are prohibited in supply and return air plenums due to the possibility of positive or negative pressures preventing the valve from functioning properly.

Under IPC Section 917.3, relief vents on branch connections to a stack are not required if the branch is not more than five (5) branch intervals from the top of the stack. This is inconsistent with IPC Section 911.4 which requires a relief vent for circuit vented branches whenever there is a branch connection on a floor above the circuit vented branch. The omission of individual vents on circuit vented fixtures creates the need for the relief vent to protect the branch against positive or negative pressures from the stack. The IPC does not provide this same protection for lower floor branches having air admittance valves..

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.

9-27. **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 1995 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.

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 1003.1, Interceptors required.** 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, Efficiency of interceptors.** This section requires that grease traps be rated for efficiency.

The UPC does not require this, as efficiency is not something that appears in manufacturers' published data. Grease trap performance is part of PDI Standard G101, which both the IPC and UPC reference.

10-4. **IPC Section 1003.7, Separation of liquids.** 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).

UPC requires that the roofs be able to withstand the weight of the water only in the specific primary area that might be plugged by that one primary storm drain line serving that area, if all of the primary lines are not connected together.

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 Table 1106.2, SIZE OF VERTICAL CONNECTORS AND LEADERS.** This table lists rainfall rates to 12" per hour for vertical storm drainage leaders, but

Table 1106.3, SIZE OF HORIZONTAL STORM DRAINAGE PIPING, lists rates to only 6" per hour for horizontal storm drainage piping. Thus, Table 1106.3 is not adequate for sizing horizontal piping in secondary roof drainage systems because the secondary rainfall rates in some areas exceed 6" per hour.

UPC Tables 11-1 and 11-2 list rainfall rates to 6" per hour for both vertical and horizontal rainwater piping which is adequate for sizing both primary and secondary piping in the UPC.

11-4. **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.

11-5. **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.

11-6. **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.

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.

11-7. **IPC Section 1108, COMBINED SANITARY AND STORM SYSTEM.** This section has criteria for sizing combined sanitary and storm water drains and sewers.

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.

11-8. **IPC Section 1109, VALUES FOR CONTINUOUS FLOW.** Neither this section nor the 1995 IPC Commentary explain how to correctly convert flows in gpm from sources other than rainfall into square feet of roof for rainfall rates different than 1" per hour. The allowance of 96 square feet per gpm will be proportionally less for rainfall rates greater than 1" 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.

11-9. **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 (16 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.

11-10. **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 1995 IPC Commentary states that many engineers design for a 25-year storm. The intent of the IPC is not clear. The 1995 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.

11-11. **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.

11-12. **IPC Section 1111, SUMPS.** This section covers subsoil drainage. It requires 4" minimum drain size and 18" diameter sump pits.

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, FUEL PIPING.

12-1. **IPC Chapter 12, FUEL PIPING.** This section is very limited and only makes reference to the mechanical or gas code. Furthermore, NFPA 54 - *National Fuel Gas Code*, is not listed as a referenced standard. A complete fuel gas piping section is, however, included in Appendix G.

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.

M. CHAPTER 13, SPECIAL PIPING AND STORAGE SYSTEMS

13-1. **IPC Chapter 13, SPECIAL PIPING AND STORAGE SYSTEMS.** This chapter is very limited, the scope is not clear, and there are several contradictions. For example, Section 1302 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 1302 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.

N. 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 Systems for Non-Residential Buildings, which is specifically mandated as highly treated reclaimed water and not simply a partially treated gray water system. The UPC covers gray water systems for single family dwellings in great detail in Appendix G.

O. IPC APPENDIX D, DEGREE DAY AND DESIGN TEMPERATURES FOR CITIES IN THE UNITED STATES

D-1. This table lists winter heating degree days, 97-1/2% winter design temperature, summer design temperatures, and latitudes for various cities in the United States. The only apparent use for this appendix is in Section 904.2 (Frost Closure of

Vents) and 904.7 (Extension of Vents Outside of Buildings) where they refer to the 97-1/2% outdoor design temperature. There are no references to heating degree days, summer design temperatures, or latitudes.

The UPC does not use this 97-1/2% winter design temperature in that this figure is exceeded a minimum of 54 hours a year and the minimum design temperature is the figure to be used for protection of the plumbing system. (Also see writers' comments concerning IPC Sections 904.2 and 904.7.)

P. IPC APPENDIX E, SIZING OF WATER PIPING SYSTEM

E-1. **IPC Appendix E.** This appendix, because it does not differentiate fixture unit values for different use classifications, results in higher design water flow rates in most typical IPC installations and larger water pipe sizes in many IPC installations when compared to UPC Appendix A.

Example: Public general use toilet room with four (4) 1.6 gpf flush valve water closets and four (4) 1.0 gpf urinals. Lavatories are ignored in this comparison.

From the IPC: 4 Water closets @ 10 WSFU = 40 WSFU
4 Urinals @ 5 WSFU = 20 WSFU
40 + 20 = 60 WSFU = 54 gpm demand
Cold water supply pipe size = 2" "L" copper
2" pipe size required to keep velocity below 8 fps

From the UPC: 4 Water Closets @ 5 WSFU = 20 WSFU
4 Urinals @ 4 WSFU = 16 WSFU
20 + 16 = 36 WSFU = 45 gpm demand
Cold water pipe size = 1-1/2" or 2" "L" copper
Pipe size could be 1-1/2" or 2" depending on desired maximum velocity

The differences in demand gpms between the IPC and UPC increase respectively as the number of fixtures increase, as does the increased pipe sizes. Therefore, the UPC creates less expensive water systems for most installations.

E-2. **IPC Table E102, TABLE FOR ESTIMATING DEMAND.** This table equates water supply fixture units (WSFU) to demand flow. Demand is listed in gallons per minute (gpm) and cubic feet per minute (cfm). The cfm figures extend to six (6) decimal places in some cases. The reason for this high degree of accuracy is not clear since the cfm figures do not appear to be used anywhere in the IPC.

The UPC does not include the cfm equivalent of WSFUs as it is not useful.

Q. IPC APPENDIX F, STRUCTURAL SAFETY

F-1. This appendix lists restrictions on notches and holes in wood joists and rafters, cutting and notching wood studs, and holes in wood studs. There is no apparent reference to this appendix in the IPC. Furthermore, IPC Section 307.2, Cutting, notching, or bored holes refers to the building code for limitations.

The UPC does not have this appendix, but the essence of this appendix is included in the body of the code as UPC Section 313.11.

R. SECTIONS OF THE UPC THAT ARE NOT INCLUDED IN THE IPC.

1. APPENDIX B, EXPLANATORY NOTES ON COMBINATION WASTE AND VENT SYSTEMS.

Combination waste and vent systems are covered by Section 910.0. This appendix further explains the requirements in non-code language.

2. APPENDIX C, ADDITIONAL REFERENCED STANDARDS.

This appendix lists additional standards that are not listed in Table 14-1, MANDATORY REFERENCED STANDARDS. These standards are included for general information.

3. APPENDIX E, MANUFACTURED/MOBILE HOME PARKS AND RECREATIONAL VEHICLE PARKS.

This appendix includes complete information on the design and installation of plumbing systems for mobile vehicle parks.

4. APPENDIX G, GRAY WATER SYSTEMS FOR SINGLE FAMILY DWELLINGS.

This appendix covers gray water systems for underground landscape irrigation at single family dwellings. Untreated waste from bathtubs, showers, bathroom wash basins, clothes washers, and laundry sinks is collected in a holding tank and distributed to an underground irrigation/disposal field as allowed by many health department officials. This is significantly different than the requirements in IPC Appendix C.

5. APPENDIX H, RECOMMENDED PROCEDURES FOR DESIGN, CONSTRUCTION, AND INSTALLATION OF COMMERCIAL KITCHEN GREASE INTERCEPTORS.

This appendix includes complete information on the subject of grease interceptors for commercial kitchens.

6. **APPENDIX I, INSTALLATION STANDARDS.**

This appendix includes seventeen (17) IAPMO Installation Standards for various plumbing materials, systems, and procedures for the benefit of the inspection and installing personnel.

7. **APPENDIX J, RECLAIMED WATER SYSTEMS FOR NON-RESIDENTIAL BUILDINGS** (emphasis added).

This appendix covers treated waste water systems used to supply water closets, urinals, and trap primers in other than residential buildings. The waste water must be treated by a public agency to criteria listed in the appendix and approved by the public health authority. The appendix includes requirements for piping, warning signs, valve seals, inspection, and cross-connection tests. This system is restricted to non-residential buildings because of the health concerns and the potential home handyman interconnecting potable and reclaimed water systems. This criteria is significantly different than the requirements in IPC Appendix C and provides a far greater level of public safety.

8. **APPENDIX K, PRIVATE SEWAGE DISPOSAL SYSTEMS.**

This appendix includes complete information on the design, construction, inspection, and testing of private sewage disposal systems.

9. **APPENDIX L, ALTERNATE PLUMBING SYSTEMS.**

This appendix includes sections on engineered plumbing systems, single-wall heat exchangers, and sizing plumbing piping using bathroom groups in lieu of the individual fixtures.

10. **Useful Tables.**

The tables and charts include inch-pound and metric conversions, properties of circles, and gravity flow in pipes.

— CONCLUSIONS —

We, the authors, having reviewed both the 1997 International Plumbing Code and the 1997 Uniform Plumbing Code, find the following significant differences between the two code documents. The specific items noted in this section, however, only represent a few of all those noted in the main body of our comparison.

1. The IPC preface contains a disclaimer that relieves any liability to the IPC code writing bodies for compliance with the provisions of this code or for the completeness of the text. Any prudent individual would not normally adopt a document which its creators do not stand behind.

2. The UPC is self-contained and incorporates most of the documents that are needed to use or enforce this code and, therefore, is more user friendly. The IPC is not self-contained, it refers to numerous other code documents and, therefore, these other documents must be adopted at the time of adoption of the IPC. This makes the IPC far more difficult to use for the engineer, the plumbing contractor, and the plumbing officials.

3. Being that the UPC is more self-contained, it can be used as a teaching document for the members of the plumbing community, i.e., the inspectors, the designers, and the plumbing contractors. Whereas the IPC does not contain all of this information, but relies on other engineering manuals or other documents and, therefore, it is awkward to utilize.

4. IPC Section 105.4 which permits "alternative engineered design" contradicts Section 105.2, Alternative materials, methods and equipment. Furthermore, the alternative engineered design deletes all requirements for compliance with Code Sections 3 through 13. UPC Section 301.2, Alternate Materials and Methods, allows engineering substitutions without deleting the body of the code.

5. The IPC requires far less fixtures for various types of occupancies than the UPC. This is contrary to the "potty parity" movement which demands more fixtures for women's toilet rooms to avoid the long waiting lines.

6. The IPC does not contain a water heating section or gas piping section except that a gas section is included in the appendix. The UPC provides both sections within the body of the code.

7. The IPC is extremely lax and incomplete in its requirements for water pipe sizing. Its extensive use of 3/8" branch piping is not consistent with accepted practices in the plumbing trade and will produce water distribution systems having significantly reduced and variable water flow rates at the fixtures. The problem is of particular concern in dwellings having well pumps as their source of water pressure or low initial water pressure.

8. The IPC is inconsistent in its requirements as to the degree of regulation that it provides. For example, in the water section it requires two water services for all hospitals, but in the sanitary drainage section only one sewage ejector is required in public buildings. This type of inconsistency exists throughout the IPC.

9. The IPC does not distinguish between new 1.6 gpf water closets and existing 3.5 gpf water closets in either water pipe sizing or drainage pipe sizing. The UPC recognizes both. The lower fixture unit values for water conserving fixtures in the UPC provide for reduced pipe sizes in many cases.

10. The IPC requirements for backflow protection are less than those in the UPC and provide less protection for the public against contamination of their potable water supply.

11. The IPC does not recognize the different use patterns for plumbing fixtures in different occupancies except for the traditional "private" and "public" water closets. The UPC recognizes four (4) different use patterns and has appropriate fixture unit values for both water supply and drainage which allows the water and waste systems to be sized more correctly based on the usage.

12. The IPC horizontal branch drain pipe sizing is more restrictive than the UPC horizontal drain sizing. Therefore, the UPC horizontal drain can carry more DFUs which results in smaller pipe sizing with most UPC installations.

13. The IPC drainage stack sizing is far more liberal than the UPC in one respect. The IPC allows as many as 12 bathroom groups including water closets on a 3" drainage stack. However, the UPC allows more DFUs on vertical stacks having three or less branch intervals than does the IPC which results in smaller UPC sized stacks for most installations.

14. IPC Section 714 allows computerized drainage design which conflicts with IPC Section 105.4, Alternative engineered design, and IPC Section 105.2, Alternative materials, methods and equipment. The UPC requires that all engineered designs be in compliance with UPC Section 301.2, Alternate Materials and Methods.

15. The IPC requires more cleanouts in its drainage piping than does the UPC. Furthermore, these additional cleanouts are of limited value and if used, could contribute to unsanitary conditions within the building.

16. The IPC drainage and vent pipe sizing tables are more difficult to use than those in the UPC.

17. The UPC is more conservative than the IPC in its requirement of when to prevent frost closure of vent terminals. However, the IPC is more conservative than the UPC by requiring 3" IPC minimum vent size rather than 2" UPC minimum to avoid frost closure.

18. The IPC permits sidewall venting, which is less positive than the rooftop venting required by the UPC.

19. The IPC allows the extensive use of mechanical vent devices (air admittance valves). These devices are not universally accepted in the plumbing industry and they are not approved in the UPC.

20. The IPC allows 1/2" and 3/4" vent pipe sizes in engineered vent systems. The UPC requires the traditional 1-1/4" minimum vent pipe size without the need for special engineering and approvals.

21. The UPC does not recognize the single-pipe waste stack vent that the IPC allows. Furthermore, the inherent restrictions on the configuration of the stack limit its practical use.

22. The IPC does not recognize the problem of suds pressure in drainage stacks serving suds-producing fixtures, whereas the UPC does to protect the consumer.

23. The IPC permits horizontal wet venting and also circuit venting. The writers have some concerns about the allowances permitted in IPC Section 909. They have both participated in an IAPMO ad hoc committee which has written proposed UPC changes for the proper allowance for horizontal wet venting and circuit venting. These proposed code changes will be submitted at the next IAPMO conference and, when adopted, will be incorporated into the 2000 UPC.

24. The UPC requires more separation between well locations and potential sources of contamination than does the IPC, thereby providing a higher degree of public safety.

25. IPC Appendix C allows the use of semi-treated waste water for flushing water closets and urinals in all types of applications. The UPC restricts "reclaimed water" (Appendix J) only to commercial buildings and "gray water systems" (Appendix G) to residential units for underground irrigation only. Thus, the UPC provides a higher degree of public safety in the use of recycled water systems.

26. Where controlled flow roof drainage is used, the UPC requires fewer roof drains on roofs between 10,001 square foot area and 20,000 square foot area, but more roof drains on roofs over 30,000 square foot area. Subsequently, the IPC is more conservative than the UPC on small roofs. However, the UPC is more conservative on large roofs because the IPC provides no code criteria for the required number of controlled flow roof drains for large buildings.

27. The IPC requires more engineering input to design, install, and inspect plumbing systems that meet its requirements. The UPC permits engineered systems but employs a more prescriptive format that allows most plumbing systems to be designed, installed, and inspected without the need for special engineering and approvals. Subsequently, any supposed savings created through the use of the IPC will be more than offset by additional engineering cost required. Therefore, what the IPC has done is increased engineering costs for lack of practical code language.

28. The numerous vagaries and inconsistencies in the IPC leave it open to interpretation by the various members of the plumbing and legal professions.

In conclusion, based on all of the items noted in this engineering comparison, it is the writers' professional opinions that the 1997 Uniform Plumbing Code is a far superior and preferable plumbing code than the 1997 International Plumbing Code on technical, practical, economic, public health, and safety matters. Furthermore, the coordinated input from plumbing officials, plumbing engineers, plumbing contractors, and the manufacturers of plumbing materials and

products is far more evident in the UPC than in the IPC. Therefore, plumbing code adopting agencies should be aware of the distinct differences between the IPC and the UPC when considering plumbing code adoption.

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EMPLOYMENT HISTORY:

Dates:	Company	Position/Responsibility/Assignments
12/67 to Present	Edward Saltzberg & Associates. Consulting Mechanical Engineers & predecessors K & S Engineering, and Kushner & Saltzberg, Consulting Mechanical Engineers.	President. Complete responsibility for design of mechanical systems, specifications, client coordination, site observation and cost estimates; designed hospitals, restaurants, schools, churches, commercial, residential, and industrial projects worldwide.

EMPLOYMENT HISTORY: (Continued)

11/61 to 11/67	Michael C. Maroko, Consulting Mechanical Engineers	Associate Engineer. Responsible for operation and organization of office, client coordination and design of mechanical systems and specifications; designed many hospitals, high-rise offices, commercial, residential, and industrial projects throughout the United States.
11/58 to 11/61	Welton Becket & Associates, Architects & Engineers	Project Engineer & Assistant Department Head. Complete responsibility for plumbing design of of major projects. Responsible for coordination of systems and specifications; designed multi-million dollar projects; selected type of system, equipment and materials; organized and supervised plumbing department staff.
2/55 to 11/58	Gilbert J. Comeau, Consulting Mechanical Engineers	Project Engineer. Complete responsibility for design and specifications of plumbing, piping, heating, air conditioning, and fire protection systems for all types of projects such as shopping centers, high-rise projects, apartment buildings, commercial and industrial buildings. Included design calculations, selection of materials & equipment, cost estimates and site observation.
8/53 to 2/55 (Part time)	Los Angeles Dept. of Water & Power	Electrical/Mechanical Draftsman. Converted engineers' sketches into working drawings; worked on power plants, substations, transformer building facilities; completed drawings reviewed by Checking Department.
2/53 to 5/53 (Part time)	Febco, Inc. Manufacturing & Engineering Co.	Draftsman/Designer. Designed lawn sprinkler systems and backflow preventer components; drew assembly and fabrication drawings; did prevention; designed irrigation systems for many large projects such as golf courses, schools, etc.
6/43 to 2/53 (Part time)	Seabreeze Engineering Company Mfr. & Plumbing Contractor	Designed and installed plumbing systems for residential and small commercial buildings; designed components for fans and barbecues; selected materials, fabrication and finishing methods for parts.

I grew up in construction, worked at most construction trades, but worked in my youth primarily as a Journeyman Plumber (apprenticeship served in Plumbers' Union Local 78).

PROFESSIONAL MEMBERSHIPS: Classification and Position Held

Association of Energy Engineers (AEE). Full Member (joined 1982). CEM (1983).

Association for Facilities Engineering (AFE) (formerly American Institute of Plant Engineers (AIPE). Full Member (joined 1974).

American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE). Full member (joined 1970).

American Society of Plumbing Engineers (ASPE). Charter Member and Co-Founder. Past President of Los Angeles Chapter and National Society; Chairman, National Education Committee; Chairman, ASPE-ASHRAE Liaison; Vice President, Legislative, L.A. Chapter. Member Society Chapter Operations Committee and Structure and Governance Committee; and Legislative Committee (Started 1964) California Society of Professional Engineers (CSPE). Member (joined 1984).

International Association of Plumbing & Mechanical Officials (IAPMO). Secretary of So. Calif. Chapter for 37 years; member or past member of Education; Plumbing Code, Spa & Pool Code, & Solar Code; Standards; Research & numerous ad hoc committees. (joined 1958).

Los Angeles City Plumbing Technical Advisory Committee (LAC-PTAC). Member 1987.

Los Angeles County Board of Examiners of Plumbers & Gas Fitters (since 3/92)

Mechanical Engineers Association of California (MEAC). Past President and Secretary and currently Board Member. (Joined 1971).

National Academy of Forensic Engineers (NAFE). Fellow (joined 1984)

National Society of Professional Engineers (NSPE). Member (joined 1984).

Plumbing Engineer Magazine - Editorial Review Board (1981 to present).

Plumbing Engineer Magazine - Board of Review - ASPE Award for Excellence in Design (1986 & 1988)

Plumbing, Heating, Cooling Contractors of Greater Los Angeles (PHCC-GLAA). Honorary Member (since 1964).

Society of Fire Protection Engineers (SFPE). Affiliate Member (joined 1977)

United Plumbing & Piping Association of Long Beach. Honorary Member (since 1977).

MEMBERSHIPS —— SOCIAL, RELIGIOUS, PHILANTHROPIC:

Brandeis-Bardin Institute	—	Member, House of the Book; Member, Board of Directors; Member, Executive Committee; and Chairman, Building and Grounds Committee.
Jewish Federation Council, San Fernando Valley Region	—	Past Member - Community Relations Committee, Past Member Board of Directors, Valley Business & Professions Committee, Real Estate & Construction Division, and United Jewish Fund. Also Past Chairman, Bernard Milken Jewish Community Campus Facilities Committee.
Stephen S. Wise Temple	—	Temple member.
Jewish Community Centers Association - Los Angeles	—	Member, Building Committee.
Valley Jewish Business Leaders Association	—	Member, Board of Directors and Program/Public Affairs Committee.

AWARDS AND HONORS:

AEE - Certificate of Appreciation (January 1997)
ASPE, Los Angeles Chapter - Certificate of Merit- Legislative Committee (July 1996)
ASPE, Los Angeles Chapter - Certificate of Appreciation (June 1996)
VJBLA - Certificate of Appreciation (April 1996)
IAPMO, Southern California Chapter - Plaque for Dedicated Service (April 1995)
PHCC of Greater Los Angeles - Certificate of Appreciation (June 1994)
ASPE, Los Angeles Chapter - Certificate of Appreciation (April 1995)
ASPE, Los Angeles Chapter - Certificate of Appreciation (April 1993)
ASPE, Los Angeles Chapter - Certificate of Merit (December 1992)
ASPE, National Society, Washington, D.C. - First Ever George W. Runkle Jr. Award of Merit (1992)
ASPE, Los Angeles Chapter - Award of Excellence (1992)
ASPE, National Society, Washington, D.C. - Special Certificate of Appreciation (1992)
ASPE, Los Angeles Chapter - Certificate of Merit (December 1991)
ASPE, Los Angeles Chapter - Lifetime Achievement Award (1991)
ASPE, National Society - Numerous Certificates of Appreciation
ASPE, Los Angeles Chapter - Numerous Certificates of Appreciation
ASPE, Los Angeles Chapter - Engineer-of-the-Year Award (1988)
ASPE, Los Angeles Chapter - Award for 1988 Convention Participation (1988)
IAPMO, Southern California Chapter - 25 year Special Service Award (1985)
ASPE, National Society - 1st Honor Roll of ASPE Employers (1984)
IAPMO Conference, Honolulu, Hawaii - Industry man-of-the-Year Award (1983)
Los Angeles Department of Water & Power - Energy Conservation Award (1970)
Los Angeles City College - Familian Scholarship (1954)
United Jewish Welfare Fund - Awards for Special Service (1978-1990)
Los Angeles City Plumbing and Los Angeles Unified School Board - Numerous Oral Interview Boards
Who's Who in California - 13th through 21st Editions
Who's Who in the West - 21st through 23rd Edition

BOOKS, ARTICLES, PAPERS PUBLISHED:

ASPE/ASHRAE - Hot Water Design Manual, Chapter 10. "Recirculating Domestic Hot Water Systems" and Chapter 11, "Electric Cable Heat" (1997).
ASPE National Convention Proceedings, Phoenix, AZ - "The Effects of Hot Water. Maintenance Systems on Hot Water heater Sizing, Piping Systems, and Utility Costs" (March 1997).
Plumbing Engineer Magazine - "Electronic Data Acquisition Improves Hot Water Analysis" (September 1996).
IAPMO - Code Comparison Update of 199 International Plumbing Code and Uniform Plumbing Code (September 1996).
NAFE Journal - "New Approaches for Analyzing Hot Water and Other Systems" (June 1996).
Dawson Company Newsletter - problems in Hot Water Circulation (March/April 1996).
IAPMO - Code Comparison of International Plumbing Code and Uniform Plumbing Code (March 1996).
ASPE Report - "The Plumbing Engineer and Plumbing Noise" (January/February 1996).

BOOKS, ARTICLES, PAPERS PUBLISHED: (Continued)

Plumbing Engineer Magazine - Letter to the Editor on Plumbing Codes (November/ December 1995).
PM Engineer Magazine - Point/Counterpoint - "Will Air Admittance Valves Do The Job?" (February/March 1995).
ASPE - Review of International Plumbing Code (August 1994).
Plumbing Engineer Magazine - "To Combine or Not to Combine: Combined Hydronic Systems and Their Pitfalls" (September 1993).
ASPE - Report on Air Admittance Valves (August 1993).
Los Angeles Times Letter (September 1992).
Plumbing Engineer Magazine, Guest Forum - Research article (December 1991).
Plumbing Engineer Magazine, Engineering article (April 1991).
IAPMO, Southern California Chapter - Monthly Meeting Minutes (March 1960 through present).
United Jewish Fund, San Fernando Valley Real Estate & Construction Division, Newsletter Article - "New Approaches Which Can Be Used in Construction Litigation Concerning Plumbing, Piping, HVAC, and Fire Protection (November 1991).
IAPMO - "Responses to the National Association of Home Builders March 1991 Publication Concerning the CABO Residential Plumbing Code" (September 1991).
IAPMO - "Review of Plumbing Portion of the CABO One and Two Family Dwelling Code and Referenced Documents" (March 1990).
Plumbing Engineer Magazine, Guest Forum - "Who's Watching the Chicken Coop?" (March 1990).
ASPE, 190 Convention Technical Proceedings - "Quality & Ethics in the Construction Industry".
NAFE Journal - "Forensic Plumbing Engineer" (October 1989).
ASPE, 1988 Convention Technical Proceedings - "Plumbing Engineer as a Forensic Engineer".
Indoor Comfort News - "Contractor Pitfalls" (May 1987)
Reeves Journal Magazine - History of ASPE" (February 1987)
Plumbing Engineer Magazine - "Engineers and Contractors Can Effect Change in Plumbing Codes" (May 1986) and "Domestic Engineering" (May 1986).
Uniform Plumbing Code - Illustrated Training Manual - 1985 Edition (Pages 475-498).
Uniform Plumbing Code - Interpretation Manual - 1985 Edition (Appendix A).
Plumbing Engineer Magazine - "Plumbing Codes - ASPE's Role?" (January 1984)
Plumbing Engineer Magazine - "The Role of ASPE With Regard to Codes" (June 1980).
Los Angeles Times - "The Dangers of Performing Surgery in Doctors' Offices" (November 1979)
Contractor Magazine - "Who is Best Able to Provide Competent Design Capability?" (March 1975).
Plumbing Engineer Magazine - "The Value of Engineering" (September 1975).
Western Building Design - "A Mechanical Engineer Can Save You and Your Client Money" (February 1973).
ASPE Data Book - "Cold and Hot Water Pipe Sizing" (Chapter 7) (1971 Edition to present).
Official (IAPMO Magazine) - "Role of the Plumbing Engineer in Modern Construction" (March 1971).
Official (IAPMO Magazine) - Water Pipe Sizing" (October 1967).

LECTURE AND TEACHING EXPERIENCE:

PHCC of Greater Los Angeles Area - "Recurring Plumbing Defects", Part 1 (June 1997)
IAPMO, Orange Empire Chapter - "Recurring Plumbing Defects". Part 1 and 2 (May and June 1997)
AFE, San Fernando Valley Chapter - "Forensic Engineers Advice to Plant Engineers" (April 1997)
IAPMO, Southern California Chapter - "Recurring Plumbing Installation Problems", Part 1 and 2 (March and April 1997)
MEAC, Los Angeles Chapter Meeting - "The Effects of Hot Water Maintenance Systems on Hot Water Heater Sizing, Piping Systems, and Utility Costs" (March 1997)
NAFE, Winter Meeting, Charlotte, NC - "Don't Assume - It Can Cost Your Client Considerable - An Approach to Solving Indoor Air Quality Cases" (January 1997)
AEE, Southern California Chapter - "The Effects of Hot Water Maintenance Systems on Hot Water Heater Sizing, Piping Systems, and Utility Costs" (January 1997)
ASPE, National Convention, Phoenix AZ - Tape recording of presentation "The Effects of Hot Water Maintenance Systems on Hot Water Heater Sizing, Piping Systems, and Utility Costs" (November 1996)
ASPE, Los Angeles Chapter "The Effects of Hot Water Maintenance Systems on Hot Water Heater Sizing and Piping Systems" (June 1996)
AFE Western Region Convention, Anaheim, CA - "New Simplified Approaches for Trying to Keep Building Occupants Happy." (April 1996)
NAFE Winter Meeting, Portland, Oregon - "New Approaches for Analyzing Hot Water Systems" (January 1996)
UPPA of Long Beach - "Recurring Plumbing Defects" (June and July, 1995)
PHCC-GLAA - Panel Discussion, "What Would You Like to Know?" (June 1995)
ASPE 1993 Technical Symposium, Atlanta, Georgia - To Combine or Not? - An In-Depth Review of the Design of the Various Pitfalls With, and the Concerns About Standard and Combined Hydronic heating Systems", repeated twice (October 1993)
Raypak Technical Sales Staff - Hydronic Presentation (August 1993)
NAFE, Pittsburgh, Pennsylvania, "Forensic Review of Hydronic and Combined Hydronic Systems" (July 1993)
Southern California Gas Company, Technical Sales Representatives - Hydronic Presentation (May 1993)
ASPE, Los Angeles Chapter - "To Combine or Not to Combine - An In-Depth Review of Standard and Combined Hydronic heating Systems and Their Various Pitfalls" (April 1993)
ASPE, Los Angeles Chapter - "Failures of Copper Piping" (March 1993)
MEAC - Uniform Plumbing Code Update (February 1993)
ASPE 1992 Convention, Washington, D.C. - Panel on Quality & Ethics in Engineering (November 1992)
City of Los Angeles - Forensic Engineering Presentation (October 1992)
ASPE, Los Angeles Chapter - Code Presentation (July 1991)
ASPE, Los Angeles Chapter - "Are You Qualified to be a Forensic Engineer and the Hidden Pitfalls of This Endeavor" (August 1991).
ASPE, Los Angeles Chapter - "Plumbing Code Interpretations" (July 1991)
ASPE, Cincinnati Convention - "Quality & Ethics in the Construction Industry" - Panel Discussion (November 1991)
IAPMO, Southern California Chapter - "The CABO Residential Plumbing Code"

LECTURE AND TEACHING EXPERIENCE: (Continued)

IAPMO, Southern California Chapter - "Sovent" (January 1990)
Los Angeles City, Low Flow Water Closets (June 1989)
National Academy of Forensic Engineers Conference (NAFE), Atlanta, Georgia - "Forensic Plumbing Engineer" (January 1989)
Plumbing Piping Industry Council, Los Angeles Chapter - "Engineer/Contractor Relations" (November 1988)
United Plumbing & Piping Association of Long Beach (UPPA) - Monthly meeting - "ASPE and the Contractor" (November 1988)
American Society of Plumbing Engineers International Convention, Long Beach, California - "The Plumbing Engineer as a Forensic Engineer" (November 1988)
Association of Energy Engineers (AEE), Los Angeles Chapter Seminar - HVAC Problems (October 1987)
American Society of Plumbing Engineers (ASPE), Los Angeles Chapter - "The Unseen Codes" Seminar (July 1987)
Los Angeles Unified School District, Training Program - "Water Pipe Sizing" (May 1987)
Plumbing Piping Industry Council - Los Angeles, CA (PPIC) - ASPE & the Contractor" (March 1987)
IAPMO, Southern California Chapter - "Water Pipe Sizing" (May and June 1986)
Plumbing Engineer Magazine, Chicago, IL - Construction Round Table Forum (November 1994)
American Society of Plumbing Engineers Convention, Chicago, IL - Code Seminar (November 1984)
Plumbing Piping Industry Council, Los Angeles, CA (PPIC) - Plumbing Seminar (September 1984)
Plumbing Heating Cooling Contractors Conference (PHCC), Long Beach, CA - "Water Pipe Sizing" (May 1984)
American Society of Plumbing Engineers, Los Angeles Chapter - One-day Water Pipe Sizing Engineering Seminar (February 1983)
IAPMO Conference, Honolulu, Hawaii - Water Pipe Sizing Seminar (October 1982)
Reseda High School, Reseda, CA - "Energy Conservation in Restaurants" (June 1982)
Los Angeles School District - Seminar on Energy Conservation (March 1981)
Mechanical Engineers Association of California (MEAC), Los Angeles, CA - HVAC Educational Seminar (April 1980)
Los Angeles School Board - Hearing on Curtailment of Drafting Classes (April 1980)
Unified Plumbing & Piping Association of Long Beach (UPPA) - Monthly meeting (June 1977)
Women in Construction (WICS), Los Angeles, CA - Construction class (May 1977)
American Hospital Association - Annual Meetings (November 1971 & December 1972)
National Bureau of Standards, Washington, D.C. - Opening of Plumbing Test Lab (February 1972)
University of Wisconsin - Engineering Symposium (December 1970)
Plumbing Heating Cooling Contractors of Los Angeles (PHCC-LA) - Monthly meeting (April 1968)
Plumbing Systems Design III - UCLA Extension (sponsored by ASPE) (1968)
IAPMO Annual Conference, San Francisco, CA - Education Seminar (September 1967)
IAPMO, Southern California Chapter - Numerous presentations at monthly meetings
ASPE, Los Angeles Chapter - Panels and seminars (numerous dates).
Jewish Marriage Encounter - National and regional conventions (numerous dates)
Jewish group lectures (various dates)

DESIGN and CONSTRUCTION EXPERIENCE

J. RICHARD WAGNER, PE, CIPE

Principal Engineer

ENVIRONMENTAL ENGINEERING COMPANY

PROFESSIONAL STATUS:

1969 - Registered Professional Engineer, State of Maryland

EDUCATION:

1959 - B.S. Mechanical Engineering - John Hopkins University - Baltimore, MD
1952 - Baltimore Polytechnic Institute - Advanced College Preparatory Course

EMPLOYMENT EXPERIENCE:

1983 - Present	Environmental Engineering Co., - Principal Engineer
1982-1983	Bermuda Air Conditioning Ltd. - Project Engineer/Project Manager
1973-1982	The Poole and Kent Company - Project Engineer
1971-1973	Albert B. Gipe & Associates - Project Engineer
1959-1963	Honeywell Controls Division - Application Engineer
1958-1964	Maryland Air National Guard - Sergeant
1955-1959	Martin Aerospace Division - Design Draftsman
1954-1955	Bendix Radio Division - Draftsman

PROFESSIONAL AFFILIATIONS/TRADE ASSOCIATIONS/CIVIC AFFAIRS:

ASHRAE - American Society of Heating, Refrigerating and Air-Conditioning Engineers
past president - Baltimore Chapter

ASPE - American Society of Plumbing Engineers
certified in plumbing engineering (CIPE)
Charter member, past president - Baltimore Chapter
member ASPE Legislative Advisory Committee
ASPE liaison to the National Standard Plumbing Code
alternate ASPE liaison to the A.40 Plumbing Code
member Maryland Building Performance Standards Advisory Committee
Member Baltimore County Plumbing Code Committee

ASSE - American Society of Sanitary Engineering
working group on Medical Gas Qualification Standards

ASTM - American Society of Testing and Materials

BOCA - Building Officials and Code Administrators International

ESB - Engineering Society of Baltimore

IAPMO - International Association of Plumbing & Mechanical Officials
member Plumbing Code Change Committee

PROFESSIONAL AFFILIATIONS/TRADE ASSOCIATIONS/CIVIC AFFAIRS:
(Continued)

NFPA - National Fire Protection Association
MCAA representative on NFPA 99 Medical Gas Piping Committee

NSPC - National Standard Plumbing Code Committee
ASPE liaison, member plumbing code committee
1977-1998 chairman NSPC committee

NSPE - National Society of Professional Engineers

SBCCI - Southern Building Code Congress International

SB 305

FISCAL NOTE

STATE OF ALASKA
1998 LEGISLATIVE SESSION

Bill Version: CSSB305(L&C)
(S) Publish Date: 3/12/98

Revision Date:
Title: "An Act relating to rehabilitation of injured workers."

Department Affected: Administration
BRU: Risk Management

Component: Risk Management

Sponsor: Senator Duncan
Requestor: (S) L&C

COMPONENT SERIAL NO. 71

EXPENDITURES/REVENUES: (Thousands of Dollars)

OPERATING EXPENDITURES	FY 99	FY 00	FY 01	FY 02	FY 03	FY 04
PERSONAL SERVICES						
TRAVEL						
CONTRACTUAL						
SUPPLIES						
EQUIPMENT						
LAND & STRUCTURES						
GRANTS, CLAIMS						
MISCELLANEOUS						
TOTAL OPERATING	0.0	0.0	0.0	0.0	0.0	0.0
CAPITAL EXPENDITURES	0.0	0.0	0.0	0.0	0.0	0.0
CHANGE IN REVENUES ( )	0.0	0.0	0.0	0.0	0.0	0.0

FUND SOURCE: (Thousands of Dollars)

1002 Federal Receipts						
1003 GF Match						
1004 GF						
1005 GF/Program Receipts						
1006 GF/MHTIA						
OTHER						
TOTAL	0.0	0.0	0.0	0.0	0.0	0.0

Estimate of any current year (FY 97) cost: $ -0-

POSITIONS:

FULL-TIME	0	0	0	0	0	0
PART-TIME	0	0	0	0	0	0
TEMPORARY	0	0	0	0	0	0

Analysis: (Attach a separate page if necessary.)

There is no fiscal impact to the Division of Risk Management.

Prepared by: J. Brad Thomoson, Director
Division: Risk Management

Phone: 465-5723
Date:

Approved by Commissioner: Mark Boyer
Agency: Department of Administration

Date: 3/9/98

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LEG97\FN98SB305

FISCAL NOTE

No. 1
Bill Version: CSSB 305(L&C)
(S) Publish Date: 3/12/98

STATE OF ALASKA
1998 LEGISLATIVE SESSION

Revision Date (Note if correction)
Title: Implementation of Work Comp Edition
Sponsor: Senator Duncan
Requester: Senate L&C

Dept. Affected: Labor
BRU: Workers' Compensation
Component: Workers' Compensation
Component Serial No.: 344

Expenditures/Revenues (Thousands of Dollars)

OPERATING EXPENDITURES	FY 99	FY 00	FY 01	FY 02	FY 03	FY 04
Personal Services						
Travel						
Contractual						
Supplies						
Equipment						
Land & Structures						
Grants & Claims						
Miscellaneous						
TOTAL OPERATING	0.0	0.0	0.0	0.0	0.0	0.0
CAPITAL EXPENDITURES						
CHANGE IN REVENUES ( )						

FUND SOURCE (Thousands of Dollars)

1002 Federal Receipts						
1003 GF Match						
1004 GF						
1005 GF/Program Receipts						
1037 GF/Mental Health						
Other (Specify Type)						
TOTAL	0.0	0.0	0.0	0.0	0.0	0.0

Estimate of any current year (FY98) cost: 0.0

POSITIONS

Full-time						
Part-time						
Temporary						

ANALYSIS: *(Attach a separate page if necessary)*

This bill proposes a provision for an automatic adoption by reference of the United States Department of Labor's "Selected Characteristics of Occupations Defined in the Dictionary of Occupational Titles" to the most recent version. Activity as a result of this proposal can be absorbed into the existing workload.

Prepared by: Paul Grossi, Director — Phone: 465-2790
Division: Workers' Compensation — Date: 3/9/98
Approved by Commissioner: Tom Cashen — Date: 3/9/98
Agency: Department of Labor

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(Rev 9/97) 98fnform xls/OMB

HOUSE COMMITTEE REPORT

(7)
Date Referred to Committee: April 27, 1998 **FURTHER REFERRALS:** **Judiciary**

Date of Committee Action: 5/1/98

The LABOR AND COMMERCE Committee considered: **CSSB 305(L&C)**

CS FOR SENATE BILL NO. 305(L&C) **IMPLEMENTATION OF WORK COMP EDITION**

"An Act establishing a standard for determining when an injured worker is eligible for reemployment benefits and establishing a procedure for adopting a new, revised, or replacement standard for determining when an injured worker is eligible for reemployment benefits."

recommends it be replaced with the following committee substitute _____ [ ] the same title [ ] a new title

[ ] additional referral to _____ Committee
[ ] attached amendment(s)

ADOPTS: _____ Letter of Intent

ATTACHES NEW FISCAL NOTE(s): (Dept) APPROVES PREVIOUS: (Dept/Date)

[ ] fiscal note(s) _____ [ ] fiscal note(s) _____

[ ] zero fiscal note(s) _____ [X] zero fiscal note(s) ADM, Labor

SIGNING WITH RECOMMENDATIONS	DP	DNP	NR	AM
Jackie Jo Cravens	✓			
Jack Hagan			✓	
Bill Hudson			✓	
[illegible]	✓			
Terry Sanders			✓	

CHAIR'S SIGNATURE [illegible] 5-1-98

SENATOR JIM DUNCAN

ALASKA STATE LEGISLATURE

Alaska State Senate

State Capitol • Room 119 • Juneau, Alaska 99801-1182 • (907) 465-4766 • Fax 465-4748

March 9, 1998

SPONSOR STATEMENT - SB 305

When an injured worker suffers diminished physical capacities, vocational rehabilitation services step in. They identify occupations and retrain the worker for a job that will fit within the worker's physical abilities. There is a medical evaluation of whether the worker can perform the job at the level described. The Selected Characteristics of Occupations Defined in the Dictionary of Occupational Titles (SCODDOT) gives the physical demands and environmental conditions for the occupations. The 1993 edition gives frequency standards for physical demands – like the number of times a worker will lift or bend. This information is necessary for proper evaluation.

The Workers' Compensation Division in the Department of Labor was recently informed that it has based decisions on a 1993 edition of SCODDOT which is not in accordance with the law. Under current law, they are required to use a 1981 edition which lacks frequency standards. SB 305 will allow the Department of Labor to adopt revised editions of SCODDOT through regulation. The bill provides for a public meeting to set a date for the adoption of the new standards.

STATE OF ALASKA

DEPARTMENT OF LABOR

WORKERS' COMPENSATION DIVISION

TONY KNOWLES, GOVERNOR

3301 EAGLE STREET, SUITE 304
P.O. BOX 107019
ANCHORAGE, ALASKA 99510-7019
PHONE: (907) 269-4980
FAX: (907) 269-4975

February 3, 1998

1981 SCODDOT ALERT

Dear Alaska Rehabilitation Specialist,

In several recent Decision and Orders, the Board found that we have used the 1993 SCODDOT with frequency standards for physical demands in deciding eligibility for Alaska injured workers. The physical demands in 1981 SCODDOT do not have frequency standards.

You are noticed that you *must* use the 1981 SCODDOT that describes physical demands, (*no frequency standards*) envirnomental conditions and specific vocational preparation level of jobs. The job description must come from the 1977 4th edition of the Dictionary of Occupational Titles.

If you have an older version of the Classification of Jobs, Elliott and Fields, (before 1986) this has the same information as the 1981 SCODDOT. Using these books makes your recommendations and our decision in accordance with law. All eligibility evaluations must follow these standards. The law does not specify SCODDOT for reemployment plans.

Very truly yours,

Douglas J. Saltzman
Reemployment Benefits Administrator

VOCATIONAL OPTIONS
701 West 41st Avenue, Suite 101; Anchorage, AK 99503; (907) 562-4688; Fax (907) 562-4689

April 14, 1998

The Honorable Senator Jim Duncan
Alaska State Legislature
State Capital (MS3100)
Juneau, AK 99801

RE: Senate Bill No. 305

Dear Senator Duncan:

I am writing in support of Senate Bill No. 305. Having worked for Vocational Options, a Rehabilitation Counseling firm, I see the impact of the passing of this Bill. Under the current requirement of using the 1981 "SCODDOT." Rehabilitation Counselors are often forced to use outdated, inadequate job descriptions of their client's positions in determining rehabilitation eligibility. As the country's workforce has evolved in many industries, so has the periodic updating of the SCODDOT. On numerous occasions, I have seen the use of the outdated information in the 1981 SCODDOT impact the accuracy of the rehabilitation eligibility for an injured worker. This bill, which calls for using the current edition of the SCODDOT, I believe, would correct this problem.

This letter also reflects the support of my colleges at Vocational Options, to include John Micks, Ph.D., C.R.C. and Robyn Henry, M.S. C.R.C.

Respectfully,

Kimberly Floyd

Kimberly Floyd
Rehabilitation Clerk

TOTAL P.02

SB 305 — Senator Duncan

The Selected Characteristics of Occupations Defined in the Dictionary of Occupational Titles (SCODDOT) gives the physical demands and environmental conditions for occupations. This document provides, in a single volume, a wide range of occupational information.

USES:-job placement
-career guidance
-labor market information
-long range job planning
-curricula development
-determining the potential for an impaired or disabled person to transfer from one occupation to another
-help determine new careers for displaced workers

The 1993 edition gives frequency standards for physical demands – like the number of times a worker will lift or bend. Older editions did not include frequency standards. This information is necessary for proper evaluation.

The Workers' Compensation Division in the Department of Labor was recently informed that it has based decisions on a 1993 edition of SCODDOT which is not in accordance with the law. Under current law, they are required to use a 1981 edition, which lacks frequency standards. SB 305 will allow the Department of Labor to adopt revised editions of SCODDOT through regulation.

Section 1 -- allows immediate use of the 1993 edition. Without this change, the earlier edition would have to be used until the 1993 edition could be adopted.

Section 2 -- provides for a process to adopt the new edition, revision or replacement. There is provision for a public meeting to set a date for the adoption of the new standards.

Page 1 line 3 (and page 2 line 11, 12 and 13) **replacement standard** – We're on our way into the next century, and the US Dept of Labor is developing a new system. Sometime in the future, the US Dept of Labor will replace the Dictionary of Occupational Titles with a database on an Occupational Information Network (O*NET). Including the word 'replacement' will allow the Alaska Department of Labor to adopt the US Dept of Labor O*NET when it comes on line.

FROM THE DOT TO O*NET ⇨ ⇨
TAKING OCCUPATIONAL INFORMATION INTO THE NEXT CENTURY

DOT (Dictionary of Occupational Titles)	O*NET (Occupational Information Network)
Developed in 1938 to help the new public Employment Service improve linkages between labor supply and demand.	Developed out of 1993 recommendations by an Advisory Panel for a new occupational system integrating technology, skills and modern workplace structures.
View of work reflected mechanistic, hierarchal structure of workplace, with predominance of blue-collar occupations.	View of work reflects restructured occupations and actual composition of today's labor market, with the need for multi-skilled people.
Book format, with its own distinct system for classifying the "dictionary" listings of occupations.	Database offering new paradigm for occupational identification and description, with classification system linked to Labor Market Information.
Task-based approach, describing workers' functions in relation to data, people, products, and things.	Skills-based structure with over 300 descriptors that cover job requirements, worker attributes and the content and context of work.
Used nine-digit codes unique to DOT, requiring complex crosswalks for linkages to other systems.	Uses standardized occupational coding system as primary classification method, facilitating direct linkages to other systems.
Dissemination through book/fixed format did not allow users to cluster, combine or easily extract data according to their particular needs.	Dissemination through an electronic data network system allows multiple users to make the data configurations that address their particular needs.
Offered no information on skills transferability, making it difficult to create job families or clusters or use to explore career paths.	Includes empirically-based data that identify skills' portability, making it easy to create job clusters and explore career paths across job families.

Recognizing the workplace has changed since DOT defined it 60 years ago

SB 330

FISCAL NOT No. 2

STATE OF ALASKA
1998 LEGISLATIVE SESSION

Bill Version: CSSB 330 (RES)
(S) Publish Date: 4-8-98

Revision Date (Note if correction) _____ Dept. Affected Commerce
Title CSSB 330 (Res) BRU APUC
Locations of underground facilities Component APUC Operations
Sponsor Labor & Commerce
Requester _____ Component Serial No. 364

Expenditures/Revenues (Thousands of Dollars)

OPERATING EXPENDITURES	FY 99	FY 00	FY 01	FY 02	FY 03	FY 04
Personal Services	0.0	0.0	0.0	0.0	0.0	0.0
Travel	0.0	0.0	0.0	0.0	0.0	0.0
Contractual	0.0	0.0	0.0	0.0	0.0	0.0
Supplies	0.0	0.0	0.0	0.0	0.0	0.0
Equipment	0.0	0.0	0.0	0.0	0.0	0.0
Land & Structures	0.0	0.0	0.0	0.0	0.0	0.0
Grants & Claims	0.0	0.0	0.0	0.0	0.0	0.0
Miscellaneous	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL OPERATING	0.0	0.0	0.0	0.0	0.0	0.0
CAPITAL EXPENDITURES	0.0	0.0	0.0	0.0	0.0	0.0
CHANGE IN REVENUES ( )	0.0	0.0	0.0	0.0	0.0	0.0

FUND SOURCE (Thousands of Dollars)

1002 Federal Receipts						
1003 GF Match						
1004 GF						
1005 GF/Program Receipts						
1037 GF/Mental Health						
1100 APUC Receipts	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	0.0	0.0	0.0	0.0	0.0	0.0

Estimate of any current year (FY98) cost: 0.0

POSITIONS

Full-time	0	0	0	0	0	0
Part-time	0	0	0	0	0	0
Temporary	0	0	0	0	0	0

ANALYSIS: *(Attach a separate page if necessary)*

This bill assigns no role to the Alaska Public Utilities Commission. It does not mention utilities or public utilities at all.

Prepared by Robert A. Lohr Phone 276-6222
Division APUC Date 4/7/98
Approved by Commissioner _____ Date 4/7/98
Agency _____

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(Rev 9/97) 98fnform xls 04/8

FISCAL NOTE

STATE OF ALASKA
1998 LEGISLATIVE SESSION

BILL No. 1
Bill Version: CSSB 330(L&C)
(S) Publish Date: 3-23-98

Revision Date (Note if correction) _____
Dept. Affected None
Title Underground utilities
BRU _____
Component _____
Sponsor Senate L+C Committee
Requester Senate L+C Committee
Component Serial No. _____

Expenditures/Revenues (Thousands of Dollars)

OPERATING EXPENDITURES	FY 99	FY 00	FY 01	FY 02	FY 03	FY 04
Personal Services						
Travel						
Contractual						
Supplies						
Equipment						
Land & Structures						
Grants & Claims						
Miscellaneous						
TOTAL OPERATING	0.0	0.0	0.0	0.0	0.0	0.0
CAPITAL EXPENDITURES						
CHANGE IN REVENUES ( )						

FUND SOURCE (Thousands of Dollars)

1002 Federal Receipts						
1003 GF Match						
1004 GF						
1005 GF/Program Receipts						
1037 GF/Mental Health						
Other (Specify Type)						
TOTAL	0.0	0.0	0.0	0.0	0.0	0.0

Estimate of any current year (FY98) cost: Ø

POSITIONS

Full-time						
Part-time						
Temporary						

ANALYSIS: *(Attach a separate page if necessary)*

There is no fiscal impact on any state department.

Prepared by A. Kreitzer, Committee Aide
Phone 465-3844
Division _____
Date 3-13-98
Approved by Senator Loren Leman, Chairman
Date _____
Agency (S) Labor and Commerce Committee

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HOUSE COMMITTEE REPORT

(7)
Date Referred to Committee: April 24, 1998 **FURTHER REFERRALS:**

Date of Committee Action: 5/1/98

The LABOR AND COMMERCE Committee considered: **CSSB 330(RES)**

CS FOR SENATE BILL NO. 330(RES) **LOCATING UNDERGROUND FACILITIES**

"An Act relating to locations of underground facilities and excavations in the area of underground facilities."

recommends it be replaced with the following committee substitute _____ [ ] the same title [ ] a new title

[ ] additional referral to _____ Committee
[ ] attached amendment(s)

ADOPTS: _____ Letter of Intent

ATTACHES NEW FISCAL NOTE(s): (Dept) APPROVES PREVIOUS: (Dept/Date)

[ ] fiscal note(s) _____ [ ] fiscal note(s) _____

[ ] zero fiscal note(s) _____ [X] zero fiscal note(s) DOED

SIGNING WITH RECOMMENDATIONS	DP	DNP	NR	AM
John Cowdery	✓			
Joe Ryan	✓			
Vern Kotsky			✓	
Gary Sandlin			✓	

CHAIR'S SIGNATURE Vern Kotsky 5-1-98

Alaska State Legislature
SENATE

Official Business

State Capitol
Juneau, AK 99801-1182

Senate Labor & Commerce Committee

Sponsor Statement
SB 330: Underground Locate Standards

Senate Bill 330 was introduced at the request of the Alaska Telephone Association to provide an understanding of the standards and responsibilities for locating and excavating underground facilities throughout the state for utilities and contractors. Requests for review were sent to:

- ARECA (Alaska Rural Electric Cooperative Association)
- AGC (Associated General Contractors)
- APUC (Alaska Public Utilities Commission)
- Anchorage Homebuilders Association

SB 330 amends AS 42.30 to set out responsibilities for excavators, construction project owners and underground facility owners when a locate is requested. It provides for a penalty if an excavator intentionally damages a located underground facility.

Currently, there are some national standards related to the issue of locating and uncovering underground utilities, but nothing as comprehensive as SB 330.

Senate Labor & Commerce Committee
Section by Section
CS SB 300(RES): Underground Facility Locates

Section 42.30.400:

Excavator gives notice to each underground facility operator and requests location of underground facility:

- at least two, but not more than 15 days before excavation (for other than remote/unstaffed location
- at least 10, but not more than 20 days before excavation (for remote/unstaffed location)
- for emergency locates - immediate notification and request for prompt locate

If facility subscribes to one-call locate, excavator may call that number to give notice (for other than emergency locates).

Sec. 42.30.410:

Operator accepts requests to locate during regular business hours and keeps requests for one year.

Operator responds within two working days after receiving the request; as long as response happens before excavation.

Operator field marks its underground facilities with reasonable accuracy; or provides excavator with best information available about location.

If facilities cannot be field marked with reasonable accuracy, facility provides on-site assistance until excavator no longer needs assistance locating facility.

Field marks for facilities buried less than 10 feet:

located within 24 horizontal inches of the outside dimensions of the facility

Field marks for facilities buried greater than 10 feet:

located within 30 horizontal inches of the outside dimensions of the facility

Excavator must stop excavating if he discovers an underground facility not marked or inaccurately marked. Excavator not held liable for inadvertent damage in this case.

Facility has right to receive compensation in responding to a request received outside of minimum notice requirement.

Sec. 42.30.420

Construction project owner indicates in bid documents the existence of underground facilities.

Sec. 42.30.430

Excavator has duty to avoid damage to underground facilities.

Sec. 42.30.440

Penalty: $50 - $1,000/offense if contributes to damage of facility

Court may grant injunctive relief to facility operator under finding of threatened damage.

Sec. 42.30.450

Operator and excavator may waive requirements of this bill, but on a geographic area.

Sec. 42.30.460

Allows for notice to be given to operator of a facility if owner cannot be found.

Sec. 42.30.490

Definitions

LOCATE CALL CENTER OF ALASKA, INC.

2221 E. Northern Lights Blvd. Suite 136
Anchorage, Alaska 99508
(907) 279-1122 FAX (907) 278-0696

February 6, 1996

James Rowe
Executive Director
Alaska Telephone Association
4341 B Street, Suite 304
Anchorage, Alaska 99503

Dear Mr. Rowe:

Thank you for sending me the draft of the proposed underground utilities legislation.

I am familiar with the Washington legislation and know it has been well received by the underground utility community in that state.

From a "one-call" standpoint, the only suggestion I have is to change the reference to a "one-number locator service" (on pages 3, 5, and 6) to a "one-number locate notification service." The Alaska one-call center (as with all other centers of this type) receive locate information and transmit this information to other entities who actually perform the locate. By calling this a "locator service" there may be some misunderstanding as to who is actually doing the locate.

The Anchorage Area Utility Association has discussed pursuing this type of legislation for years. Your organization is to be congratulated for taking the steps to move forward.

Please call me if I can be of further assistance.

Sincerely,

Sandy McWilliams

Sandy McWilliams
President

Municipality of Anchorage
Rick Mystrom, Mayor

Municipal Light & Power
1200 East First Avenue
Anchorage, Alaska 99501-1685
Telephone: (907) 279-7671, Telecopiers: (907) 263-5804, 277-9272

10 March 1997

James Rowe, Executive Director
Alaska Telephone Association
4341 "B" Street, Suite 304
Anchorage, AK 99503

Dear Mr. Rowe,

ML& P is supportive of the Alaska Telephone Association's efforts to enact State legislation pertain to underground locates. When the Anchorage utilities initiated the formation of a One-Call within the Municipality in 1986 we opted for a municipal ordinance because we couldn't find a legislator willing to carry the banner to the legislature. ATA's attempt for state legislation is timely since there is a current movement for federal legislation that would dictate to states without such legislation.

The Locate Center of Alaska has worked out well for its 26 members which are primarily located in the Anchorage area, Kenai Peninsula, and Mananuska-Susinta Borough and some rural utilities. It has virtually eliminated dig-ins caused by excavators that didn't call for locates (historically the largest group of offenders).

Attached is ML&P's detailed analysis of ATA's proposed bill. The language of the proposed bill is in the left hand column and our suggested changes and comments in the right hand column. The portions of the text that is in bold in the right hand column emphasize the changes in intent from the proposed bill. Also attached is a copy of Anchorage's current ordinance.

It would be to ATA's advantage to obtain input from the Anchorage Area Utility Association: they worked closely with the Utility Contractors Association in gaining their support for the Anchorage ordinance.

Sincerely,

Thomas R Stahr
General Manager

Attachments: ML&P Comments on propos[illegible] legislation

Alaska Telephone Association
4341 B Street, Suite 304
Anchorage, AK 99503
(907)563-4000
FAX (907)562-3776

Duane C. Durand
President

James Rowe
Executive Director

February 3, 1997

Bob Yivisaker
President
Anchorage Area Utility Association
P.O. Box 2929
Palmer, AK 99645

Dear Mr. Yivisaker:

The Alaska Telephone Association is interested in establishing minimum statewide standards to reduce damages to underground facilities as well as above ground facilities; thereby promoting safety and protecting the public interest. To that end we have produced the enclosed draft legislation -- modeled after legislation in Washington -- and we would appreciate your review and comments.

Sincerely,

James Rowe

enc.

Alaska Telephone Association

JAMES ROWE
Executive Director

201 E. 56th, Suite 114
Anchorage, AK 99518

907-563-4000
Fax 907-562-3776
e-mail: jrowe@ptialaska.net

elephone Association

201 E. 56th, Suite 114
Anchorage, AK 99518
(907) 563-4000
FAX (907) 562-3776

James Rowe
Executive Director

November 24, 1997

Kimberly Crisafulli
ENSTAR
3000 Spenard Road
Anchorage, AK 99503

Dear Ms. Crisafulli:

Thank you for your help with the number of locates earlier today. I look forward to receiving your year end compilation when it is available.

Enclosed is a draft of the proposed locate legislation we expect to have introduced in January. It has been shared with utilities and contractors and I encourage widespread distribution. Over the past year I have made a number of changes in response to suggestions. I welcome your input.

Sincerely,

James Rowe

Alaska Telephone Association
201 E. 56th, Suite 114
Anchorage, AK 99518
(907) 563-4000
FAX (907) 562-3776

David Fauske
President

James Rowe
Executive Director

December 23, 1997

Pat Wolfe
Alaska Building Contractors
720 W. 58th Avenue
Anchorage, AK 99518

Dear Pat,

The enclosed state locate standards draft has been submitted to the chairs of the Senate and House Labor and Commerce Committees for consideration for introduction during the next session. It's been circulated for comment and modification among a number of utilities and the Associated General Contractors of Alaska. I think it fairly spells out the responsibilities of all parties involved in locating and excavation of underground utilities.

Based on a Washington statute, this draft was initiated by the Alaska Telephone Association's Engineering and Planning Committee which, recognizing that there are stricter municipal standards, believed that a minimum statewide standard for locates would be beneficial for utilities, contractors and the public. As I'm sure you're aware, the telephone industry is experiencing new entities placing facilities in the ground. Timely and accurate locates will only become more important as the building continues.

I'd be pleased to hear any comments or suggestions you have regarding this draft and I expect the respective chairs of the committees, Sen. Loren Leman and Rep. Norman Rokeberg, would also welcome your thoughts. If you'd like to get together to discuss this, please call me at 563-4000.

Happy holidays.

Sincerely,

James Rowe

Alaska Telephone Association
201 E. 56th, Suite 114
Anchorage, AK 99518
(907) 563-4000
FAX (907) 562-3776

David Fauske
President

James Rowe
Executive Director

December 23, 1997

Henry Springer
Executive Director
Associated General Contractors of Alaska
4041 B Street
Anchorage, AK 99503

Dear Mr. Springer:

Last August I sent you a copy of the enclosed state locate standards draft and solicited your comments. After you distributed it, Ken Smith of Wire Communications and Electrical, Inc. called me with concern regarding the treble damages paragraph (page 7), but he didn't offer any suggestions. I'd think the "willful and malicious" intent that triggers the treble damages would be deemed a benefit by most contractors.

Since (other than Mr. Smith's comment) I've received no adverse reaction, I submitted it without change to the chairs of the Senate and House Labor and Commerce Committees for consideration for introduction during the next session. I think it fairly spells out the responsibilities of all parties involved in locating and excavation of underground utilities.

Based on a Washington statute, this draft was initiated by the Alaska Telephone Association's Engineering and Planning Committee which, recognizing that there are stricter municipal standards, believed that a minimum statewide standard for locates would be beneficial for utilities, contractors and the public. As I'm sure you're aware, the telephone industry is experiencing new entities placing facilities in the ground. Timely and accurate locates will only become more important as the building continues.

I'd still welcome any suggestions you have regarding this draft and I expect the respective chairs of the committees, Sen. Loren Leman and Rep. Norman Rokeberg, would also welcome your thoughts. If you'd like to get together to discuss this, please call me at 563-4000.

Happy holidays.

Sincerely,

James Rowe

Alaska Telephone Association
201 E. 56th, Suite 114
Anchorage, AK 99518
(907) 563-4000
FAX (907) 562-3776

David Fauske
President

James Rowe
Executive Director

December 23, 1997

Doug Askerman
Anchorage Home Builders Association, Inc.
8301 Schoon Street, Suite 200
Anchorage, AK 99518

Dear Mr. Askerman:

The enclosed state locate standards draft has been submitted to the chairs of the Senate and House Labor and Commerce Committees for consideration for introduction during the next session. It's been circulated for comment and modification among a number of utilities and the Associated General Contractors of Alaska. I think it fairly spells out the responsibilities of all parties involved in locating and excavation of underground utilities.

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Happy holidays.

Sincerely,

James Rowe

LOCATE CALL CENTER OF ALASKA

OPERATING GUIDELINES

The Locate Call Center of Alaska and the utilities participating in this Call Center have established the following guidelines for operation:

1. All marking shall be in accordance with the American Public Works Association Uniform Color Codes of:

   Red electric power lines, conduit, cables and lighting cables.

   Yellow gas, oil, steam, petroleum and gaseous materials.

   Orange communication, alarm or signal lines, cables or conduit. (some local TV companies use pink)

   Blue water, slurry and irrigation lines.

   Green sewers and drain lines.

2. Some utilities choose to mark their lines using the following abbreviations:

S	sanitary sewer	E	electric power
ST	storm sewer	TV	television
W	water	T	telephone
G	gas	POL	petroleum oil line

3. A circle will be drawn around pedestals and poles to allow for any loops that might be buried. Hand digging is required within this circle.

4. Hand digging is required within 2 feet of either side of outside dimensions of the underground facility.

5. Clear, visible marks with white paint or staking may be used by the party requesting a locate to denote the area of excavation.

6. After a locate has been performed in an area, it is the responsibility of the party requesting the locate to reference or maintain the locate marks during the construction period. The utilities may charge for lines that need to be remarked.

7. Directions given for locating will be stated as north, south, east, or west, if possible.

8. Site meets are required by Anchorage Water & Wastewater and are available with other utilities, but must be requested at the time of the locate request. Site meets will be scheduled by each utility.

9. The standard locate time for each utility varies from 15-45 minutes of locating per site visit. Addition locating time per site visit may be requested, but must me scheduled in advance by each utility.

10. A utility shall provide a surface mark at the location requested, showing the location of it's underground facilities within the excavation site on or before the time of excavation. Anchorage Municipal Ordinance requires the notification of excavation be at least two business days before excavation.

    If a utility fails to provide a requested surface mark by the excavation date, the excavator may proceed. If the excavator reveals that a surface mark has been incorrectly provided, or if an

underground facility is found in an unmarked excavation site, the excavator may proceed but only in a manner which avoids damage to such underground facility and must immediately notify the affected utility. (AMO 26.90)

11. Anytime a utility is cut, pulled, or even scraped slightly, the excavator is to call the Locate Call Center and report the incident. The Locate Call Center will then give the excavator further information on reporting this damage. A facility may be damaged when contact is made even though external damage is not visible.

12. Even though a request is made for a specific utility locate, the Call Center will still notify all utilities in the area. The caller will be asked to explain why they requested only a specific utility.

13. If a party requests an emergency locate, states it meets the definition of threat to life and property, and must be located in less than the minimum of two business days required period, and the locator determines this was not so, there may be a charge for this locate.

14. If a short notice or urgent locate request is made (requesting a locate in less than the minimum two business days notification period), the utilities will be notified, but immediate response in not guaranteed. If the requestor is willing to pay the utility standard rates, and if the utility can provide the locate, the locate may be performed prior to the standard time requirements.

15. Lower priority will be given to any request for design purposes. Whenever possible, it is suggested that these requests be made during the "off" (winter) season.

•••••

THINK SAFETY,
CALL FIRST !!!!

LOCATE CALL CENTER
OF ALASKA

•••••

LOCATE CALL CENTER OF ALASKA, INC.

OPERATING GUIDELINES

BEFORE YOU DIG...

Call to Request an
Underground Utility Locate!

•••••

Anchorage Bowl Area
278-3121

Statewide Toll Free
800-478-3121

Alaska Telephone Association
201 E. 56th, Suite 114
Anchorage, AK 99518
(907) 563-4000
FAX (907) 562-3776

David Fauske
President

James Rowe
Executive Director

State Underground Locate Standards

Purpose of the Proposed Locate Legislation

The purpose of this proposed legislation is to provide an understanding of the standards and responsibilities of the locate and excavation of underground utilities throughout the state for utilities and contractors. Adherence to these standards will reduce damage to utilities, decrease outages to customers, promote safety for industry employees and the public, and serve the public interest.

With an ever increasing profusion of utilities being placed underground, the need for cooperation and coordination among contractors and utilities is escalating. This draft assigns accountability in a fair manner to facilitate efficient and safe construction and maintenance of utilities, minimize monetary loss and avoid hazardous conditions.