

**Appendix B –  
Proposed Revisions to Policy C – Product Family Table, prepared by Mike Keilty,  
Attachment to 2009 Agenda (Agenda Item 1)**

**C. Product Families for Meters**

When submitting a meter for evaluation, the manufacturer must specify the product family and critical parameters for which the meter is being submitted.

The product family and the specific product subgroup covered by the Certificate are to be identified on Page 1 of the Certificate of Conformance. More detailed information, including the typical product types found in the subgroup, is to be included in the application section of the Certificate.

<b>Table C.1. Tests to be Conducted</b>
<p>Test A – Products must be individually tested and noted on the Certificate of Conformance.</p> <p>Test B - To obtain coverage for a range of products within a family: Test with one product having a low specific gravity; test with a second product having a high specific gravity. The Certificate of Conformance will cover all products in the product family within the specific gravity range tested.</p> <p>Test C - To obtain coverage for a range of products within a family: Test with one product having a low viscosity; test with a second product having a high viscosity. The Certificate of Conformance will cover all products in the product family within the viscosity range tested.</p> <p>Test D – To obtain coverage for a product family: Test with one product in the product family. The Certificate of Conformance will cover all products in the family.</p> <p>Test E – To obtain coverage for a range of products within a family: Test with one product having a low kinematic viscosity; test with a second product having a high kinematic viscosity. The Certificate of Conformance will note coverage for all products in the family within the kinematic viscosity range tested.</p> <p>Test F – To obtain coverage for a range of products within a family: Test with one product having a specified conductivity. The Certificate of Conformance will note coverage for all products in both of the families with conductivity equal to or above the conductivity of the tested liquid.</p>

<b>Table C.2. Product Family Test Table</b>			
<b>Mass Meter Product Family &amp; Test Requirements</b>	<b>Magnetic Flow Meter Product Family &amp; Test Requirements</b>	<b>Positive Displacement Flow Meter Product Family &amp; Test Requirements</b>	<b>Turbine Flow Meter Product Family &amp; Test Requirements</b>
<p style="text-align: center;"><b>Test B</b></p> <p>Normal Liquids Includes the following for Mass Flow Meters:</p> <p>Fuels, Lubricants, Industrial and Food Grade Liquid Oils, Solvents General, Solvents Chlorinated, Pure Alcohols &amp; Glycols, Water (De-mineralized &amp; de-ionized), Heated Products (above 50 °C)*</p>	<b>Test F</b> Fuels, Lubricants, Industrial and Food Grade Liquid Oils, Solvents General, Solvents Chlorinated, Pure Alcohols & Glycols, Water (De-mineralized & de-ionized), Heated Products (above 50 °C)*	<b>Test C</b> Fuels, Lubricants, Industrial and Food Grade Liquid Oils	<b>Test E</b> Fuels, Lubricants, Industrial and Food Grade Liquid Oils
		<b>Test C</b> Solvents General	<b>Test E</b> Solvents General
		<b>Test C</b> Solvents Chlorinated	<b>Test A</b> Solvents Chlorinated
	<b>Test D</b> Water (Tap, Potable & Nonpotable), Water Mixes		<b>Test C</b> Alcohols, Glycols, & Water Mixes Thereof

<b>Table C.2. Product Family Test Table</b>			
<b>Mass Meter Product Family &amp; Test Requirements</b>	<b>Magnetic Flow Meter Product Family &amp; Test Requirements</b>	<b>Positive Displacement Flow Meter Product Family &amp; Test Requirements</b>	<b>Turbine Flow Meter Product Family &amp; Test Requirements</b>
<p style="text-align: center;">50 °C)*</p> Water (Tap, Potable & Nonpotable), Water Mixes of Alcohols & Glycols, Juices, Beverages, Clear Liquid and Suspensions Fertilizers, Crop Chemicals, Liquid Feeds, Chemicals	of Alcohols & Glycols, Juices, Beverages, Clear Liquid and Suspensions Fertilizers, Crop Chemicals, Liquid Feeds, Chemicals	<b>Test D</b> Water	<b>Test D</b> Water
		<b>Test C</b> Clear Liquid Fertilizers	<b>Test A</b> Clear Liquid Fertilizers
		<b>Test C</b> Crop Chemicals ( <i>Type A</i> )	<b>Test A</b> Crop Chemicals ( <i>Type A</i> )
		<b>Test C</b> Crop Chemicals ( <i>Type B</i> )	<b>Test A</b> Crop Chemicals ( <i>Type B</i> )
		<b>Test C</b> Flowables	<b>Test A</b> Flowables
		<b>Test C</b> Crop Chemicals ( <i>Type C</i> )	<b>Test A</b> Crop Chemicals ( <i>Type C</i> )
		<b>Test C</b> Crop Chemicals ( <i>Type D</i> )	<b>Test A</b> Crop Chemicals ( <i>Type D</i> )
		<b>Test C</b> Suspension Fertilizers	<b>Test A</b> Suspension Fertilizers
		<b>Test C</b> Liquid Feeds	<b>Test A</b> Liquid Feeds
		<b>Test C</b> Chemicals	<b>Test A</b> Chemicals
<b>Test B</b> Heated Products (above 50 °C)	*See above	<b>Test C</b> Heated Products (above 50 °C)	<b>Test A</b> Heated Products (above 50 °C)
<b>Test D</b> Compressed Liquids	Not Applicable (conductivity too low)	<b>Test C</b> Fuels and Refrigerants	<b>Test E</b> Fuels and Refrigerants
		<b>Test C</b> NH <sub>3</sub>	<b>Test A</b> NH <sub>3</sub>
<b>Test D</b> Compressed Gases	<i>Note: CNG is only included in Section 3.37 Mass Flow Meters of Handbook 44</i>		CNG
<b>Test D</b> Cryogenic Liquids and Liquefied Natural Gas	Not Applicable (conductivity too low)	<b>Test A</b> Cryogenic Liquids and Liquefied Natural Gas –	<b>Test D</b> Cryogenic Liquids and Liquefied Natural Gas –

<sup>1</sup>Note: The Typical Products listed in this table are not limiting or all-inclusive; there may be other products and product trade names, which fall into a product family. Water and a product such as stoddard solvent or mineral spirits may be used as test products in the fuels, lubricants, industrial, and food- grade liquid oils product family.

<sup>2</sup> The specific gravity of a liquid is the ratio of its density to that of water at standard conditions, usually 4 °C (or 40 °F) and 1 atm. The density of water at standard conditions is approximately 1000 kg/m<sup>3</sup> (or 998 kg/m<sup>3</sup>)

<sup>3</sup> Diesel fuel blends (biodiesel) with up to 20 % vegetable or animal fat/oil.

<sup>4</sup> Gasoline includes oxygenated fuel blends with up to 15 % oxygenate.

$$\text{Centistokes} = \frac{\text{Centipoise}}{\text{Specific Gravity}}$$

<sup>5</sup> Kinematic viscosity is measured in centistokes.

Source for some of the viscosity value information is in the Industry Canada - Measurement Canada "Liquid Products Group, Bulletin V-16-E (rev. 1), August 3, 1999."

<b>Table C.3. Typical Product Family Characteristics</b>			
Product Families	Typical Products	Reference Viscosity* (60 F) Centipoise (cP)	Reference Specific Gravity* (60 F)
<b>Normal Liquids</b> Fuels, Lubricants, Industrial and Food Grade Liquid Oils	Diesel Fuel	10	0.72
	Gasoline	0.28	0.72
	Fuel Oil (#1, #2, #3, #4)	8 to 88	0.9
	Kerosene	1.94	0.75
	Light Oil	13.47	0.86
	Spindle Oil		
	Lubricating Oils	20 to 1000	0.80-0.90
	SAE Grades	192-3626	0.9
	Bunker Oil	11,200	0.99
	6 Oil (#5, #6)	66-13,000	0.9
	Crude Oil	3-1783	0.79-0.97
	Asphalt	100 – 5000	
	Vegetable Oil	133	0.92
	Biodiesel above B20	10.12	0.86
	Avgas	1.5 to 6	
	Jet A	1.5 to 6	
	Jet A-1	1.36	0.76
	Jet B	1.5 to 6	
	JP4	1.02	0.76
	JP5	1.94	0.76
	JP7 JP8	1.82	0.76
	Cooking Oils	9.93	0.92
	Sunflower Oil	90.1	0.93
Soy Oil	90.6	0.93	
Peanut Oil	11 to 110	0.9-1.0	
Olive Oil	116.8	0.92	
Corn Oil	4.0	0.91	
<b>Normal Liquids</b> Solvents General	Acetates	0.44	0.93
	Acetone	0.34	0.8
	Ethylacetate	1.36	0.96
	Hexane	0.34	0.66
	MEK	0.45	0.81
	Toluene	0.62	0.87
	Xylene	0.86	0.89
<b>Normal Liquids</b> Solvents Chlorinated	Carbon Tetra-Chloride	0.99	1.6
	Methylene-Chloride	0.46	1.34
	Perchloro-Ethylene	1	1.6
	Trichloro-Ethylene	0.6	1.47
<b>Normal Liquids</b> Alcohols, Glycols & Water Mixes thereof	Ethanol	1.29	0.79
	Methanol	0.64	0.80
	Butanol	3.34	0.81
	Isopropyl	2.78	0.79
	Isobutyl	4.54	0.81
	Ethylene glycol	25.5	1.19
	Propylene glycol	54	1.04

Product Families	Typical Products	Reference Viscosity* (60F) Centipoise (cP)	Reference Specific Gravity* (60 F)
<u>Normal Liquids</u> Water	Tap Water	1.0	1.0
	Deionized	1.0	1.0
	Demineralized	1.0	1.0
	Potable	1.0	1.0
	Nonpotable	1.0	1.0
	Juices	1.0	1.0
	Beverages	1.0	1.0
	Milk	1.0	1.0
<u>Normal Liquids</u> Fertilizers	Clear Liquid Fertilizers	31 - 110	1.17 – 1.44
	Nitrogen Solution	31 - 110	1.17 – 1.44
	28%, 30% or 32%	31 - 110	1.28 – 1.32
	20% Aqua-Ammonia	1.1 – 1.3	0.89
	Urea	1.0	1.89
	Ammonia Nitrate	11.22	1.16-1.37
	N-P-K solutions		1.2 – 1.4
	10-34-0	48	1.39
9-18-9		1.32	
<u>Normal Liquids</u> Crop Chemicals (Type A)	Herbicides	4 – 400	0.7 - 1.2
	Round-up		
	Touchdown		
	Banvel		
	Treflan		
	Paraquat		
	Prowl		
<u>Normal Liquids</u> Crop Chemicals (Type B)	Fungicides	0.7 – 100	0.7 - 1.2
	Insecticides		
	Adjuvants		
	Fumigants		
<u>Normal Liquids</u> Flowables	Dual	20 – 900	1 – 1.2
	Bicep		
	Marksman		
	Broadstrike		
	Doubleplay		
	Topnotch		
	Guardsman		
	Harness		
<u>Normal Liquids</u> Crop Chemicals (Type C)	Fungicides	20 – 900	1 – 1.2
<u>Normal Liquids</u> Crop Chemicals (Type D)	Micronutrients	20 – 1000	0.9 – 1.65
<u>Normal Liquids</u> Suspension Fertilizers	3-10-30	100 – 1000	0.9 – 1.65
	4-4-27	20 - 215	0.9 – 1.65
<u>Normal Liquids</u> Liquid Feeds	Liquid Molasses	8640	1.25
	Molasses plus Phos Acid and/or Urea (Treacle)	2882	1.1 to 1.3
<u>Normal Liquids</u>	Sulfuric Acid	1.49	1.83

Appendix B –2009 Measuring Sector Summary  
Proposed Revisions to Policy C-Product Family Tables-Keilty-9-09  
Attachment to 2009 Sector Agenda Item 1

Product Families	Typical Products	Reference Viscosity* (60F) Centipoise (cP)	Reference Specific Gravity* (60 F)
Chemicals	Hydrochloric Acid	0.80 – 1.0	1.1
	Phosphoric Acid	161	1.87
Heated Products	Bunker C	11,200	1.99
	Asphalt	100 – 5000	
<u>Compressed Liquids</u> Fuels and Refrigerants NH <sub>3</sub>	LPG		
	Propane	0.098	0.504
	Butane	0.19	0.595
	Ethane		
	Freon 11	0.313	1.49
	Freon 12	0.359	1.33
	Freon 22	1.99	1.37
	Anhydrous Ammonia	0.188	0.61
<u>Compressed Gases</u>	Compressed Natural Gas (CNG)		0.6 to 0.8 (1=Air)
<u>Cryogenic Liquids and Liquefied Natural Gas</u>	Liquefied Oxygen	0.038	0.66
	Nitrogen	1.07	0.31
	Liquefied Natural Gas		

\*Reference fluid properties are not all inclusive and are representative examples only.