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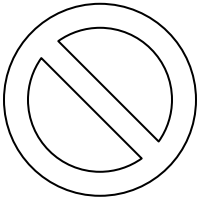
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*In the Community to Serve®*

January 17, 2019

Public Utility Commission of Oregon  
Attn: Filing Center  
P.O. Box 1088  
Salem, OR 97308-1088

**RE: RG-65(5), Cascade's Gas Meter Statistical Sampling Program, 2018 Results**

Enclosed is Cascade Natural Gas Corporation's (Cascade's or Company's) Gas Meter Statistical Sampling Program for all residential and small commercial meters in service as of December 31, 2018. These meters fall within the scope of the Company's Statistical Sampling Program as established in Rule 8, Meter Testing in the Company's Tariff.

All larger meters were tested according to their required periodic schedule. The total number of meters Cascade had in service in Oregon at the end of 2018 was 76,293.

If you have any questions, please call me at (509) 734-4573.

Sincerely,

*/s/ Brett Hudson*

Brett Hudson  
Manager, Measurement

*In the Community to Serve®*

CASCADE NATURAL GAS

**GAS METER  
STATISTICAL SAMPLING  
PROGRAM**

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2018 RESULTS

# GAS METER STATISTICAL SAMPLING PROGRAM

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**GAS METER PERFORMANCE FOR THE PERIOD JANUARY 1, 2018 – DECEMBER 31, 2018**

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**SCOPE**

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This report covers the methodology, test results, and proceedings of Cascade Natural Gas Company gas meter statistical sampling program for residential and small commercial meters in the states of Washington and Oregon for the period of January 1, 2018 through December 31, 2018.

**Sampling Summary**

Meters in the program for the plan year	<i>291,422</i>
Meters in the program at the end of the plan year	<i>281,199</i>
Total meters removed during the year	<i>10,223</i>
Meters qualifying for analysis (not uniquely defective)	<i>8,740</i>
Uniquely defective meters	<i>1,483</i>

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## GENERAL

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### COMPLIANCE

Gas meter testing requirements for Cascade Natural Gas are promulgated by the Washington Administrative Code (WAC), Chapter 480-90, Section 348 “Frequency of Periodic Meter Tests” and by the Oregon Administrative Rules (OAR), Chapter 860, Division 023 “Service Standards”, Section 0015 (Testing Gas and Electric Meters). Cascade’s sampling program complies with Part IV (‘In Service Performance”) of the 1992 version of ANSI standard B109.1 and B109.2 as specified in its Tariff Rule No. 7, part B filed in the state of Washington and Tariff Rule No. 6, part 1 filed in the state of Oregon. Cascade’s plan also conforms to generally accepted statistical methods within the industry for predicting the sampling distribution of the proportion of a population with a 90% degree of confidence.

### TESTING METHODOLOGY

Cascade Natural Gas current random meter measurement performance program is in accordance with its plan document entitled “Statistical Sample Program” dated August 18, 1995 (appendix). Random sampling and testing is conducted for all domestic meters rated at 1000 CFH and smaller.

### METER PERFORMANCE REQUIREMENTS

**Random Sampling** – Meters in this program are randomly selected for inspection by attribute per the plan document. Conforming meters are found to register accurately with a tolerance of  $\pm 2.0\%$ . The intent of the testing standard is to verify the following two parameters:

**Overall Performance** – Verify with approximately 90% certainty, that the portion of non-conforming meters does not exceed 20% of any installed meter population. For overall performance, equal weight is given to both the upper and lower specification limit (i.e. check and open reads are equally weighted and are averaged).

**Fast Direction Performance** – Verify with approximately 90% certainty that the portion of non-conforming fast meters (i.e. meters that register in excess of 102% of accuracy) does not exceed 10% of any installed meter population. For testing, equal weight is given to both the upper and lower specification limit (i.e. check and open reads are equally weighted and are averaged).

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## DEFINITIONS

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**Meter Population (Meter Family)** – Grouping of meters as defined by each company, may include reference to sub families as allowed by ANSI B109.1 and B109.2

**Open Test** – Meter proof test completed between 80 and 100 % of meter rated capacity or the maximum rated capacity of the test equipment.

**Check Test** – Meter proof test completed at approximately 20% of the meter rated capacity.

**Size / Class** – Grouping of meters, based on capacity, that display similar performance characteristics for all meters within the grouping. Size/Class may, at the company's discretion, include multiple-sized meters within the same size class as long as the meter performance testing of the individual meters is consistent with all meter in the size class.

**Random Meters** – Meters that are a selected at random to provide a statistically representative sample of a meter family.

### **Beginning of Report Year 2018, In-Service Meters on 1/1/18**

Total Number of Meters For Random Sampling	<i>291,422</i>
Total Number of Test Families <sup>(a)</sup>	<i>168</i>
Number of Test Families $\geq$ 10 yrs old <sup>(b)</sup>	<i>94</i>

### **End of Report Year 2018 Meter Testing Quantities & Results**

Number of Meters Tested	<i>8,740</i>
Number of Meters Passed, (+/-) 2%	<i>8,345</i>
Number of Meters Failed, (+/-) 2%	<i>395</i>
Number of Meters, Uniquely Defective Test Result, (+/-) 10%	<i>1,483</i>
Meter Families With an Overall Fail Result	<i>3</i>
Meter Families With a Fast Fail Result	<i>3</i>
Meter Families Removed/Depleted During Report Year <sup>(c)</sup>	<i>26</i>

### **Transition to 2018 Test Year**

Total Number of Meters For Random Sampling	<i>307,816</i>
Total Number of Test Families <sup>(a)</sup>	<i>150</i>
Number of Test Families $\geq$ 10 yrs old <sup>(b)</sup>	<i>87</i>

- a) Total number of meter populations includes meter test families that are less than 10 years old and are not yet subject to test requirements.
  
- b) Number of Meter Test Populations  $\geq$  10 years old (i.e. includes meters manufactured in the year 2009 and earlier for the 2019 test year). Small populations less than 20 years old are tested but with the restriction that a meter will not be retested within five (5) years.
  
- c) Total number of meter families depleted during the report year including those removed for administrative purposes.



**Cascade Natural Gas Corp.**  
**2018 METER SAMPLING PROGRAM**  
**YEAR-END STATUS REPORT**

FAMILY STATISTICS				SAMPLE STATISTICS			'ACCURACY' TEST RESULTS					NOT FAST' TEST RESULTS					FURTHER ACTION OR STATUS	
YEAR	MAKE	CLS	SIZE	MAX. SAMP	NO. RMVD	SAMP. CNT	OK. CNT	PCT. OK	OK. LMT	MIN. SAMP	CTL. RGN	NF. CNT	PCT. NF	NF. LMT	MIN. SAMP	CTL. RGN	ADD. REQ	DISP. OF FAMILY
1986	ROCKW	1	1335	100	117	102	95	93	6	25	I	98	96	5	64	I	0	ACCEPTABLE
1986	SPRAG	1	849	90	83	73	71	97	7	15	I	73	100	6	24	I	0	ACCEPTABLE
1987	AMERI	1	2150	100	83	66	64	96	8	17	I	64	96	6	66	I	0	ACCEPTABLE
1987	ROCKW	1	2422	100	121	101	96	95	6	19	I	96	95	5	94	I	0	ACCEPTABLE
1987	SPRAG	1	992	90	98	84	81	96	7	17	I	84	100	5	24	I	0	ACCEPTABLE
1988	AMERI	1	3016	100	108	92	90	97	7	15	I	90	97	5	49	I	0	ACCEPTABLE
1988	ROCKW	1	2054	100	138	114	101	88	6	66	I	103	90	4	100	IIa	0	ACCEPTABLE
1988	SPRAG	1	1655	100	134	111	108	97	6	15	I	111	100	5	24	I	0	ACCEPTABLE
1989	AMERI	1	4896	125	126	107	103	96	6	17	I	103	96	5	67	I	0	ACCEPTABLE
1989	ROCKW	1	4531	125	183	153	139	90	5	43	I	141	92	4	125	IIa	0	ACCEPTABLE
1989	SPRAG	1	2767	100	179	144	139	96	5	17	I	143	99	4	30	I	0	ACCEPTABLE
1990	AMERI	1	3597	125	98	84	82	97	7	15	I	82	97	5	49	I	0	ACCEPTABLE
1990	ROCKW	1	5152	125	129	89	88	98	7	13	I	89	100	5	24	I	0	ACCEPTABLE
1990	SPRAG	1	2363	100	164	129	121	93	6	25	I	129	100	4	24	I	0	ACCEPTABLE

1991	AMERI	1	4320	125	106	88	87	98	7	13	I	88	100	5	24	I	0	ACCEPTABLE
1991	ROCKW	1	2933	100	146	111	103	92	6	30	I	111	100	5	24	I	0	ACCEPTABLE
1991	SPRAG	1	1765	100	109	89	85	95	7	19	I	89	100	5	24	I	0	ACCEPTABLE
1992	AMERI	1	2739	100	129	111	104	93	6	25	I	105	94	5	100	IIa	0	ACCEPTABLE
1992	ROCKW	1	7666	125	132	108	108	100	6	11	I	108	100	5	24	I	0	ACCEPTABLE
1992	SPRAG	1	1441	100	181	152	142	93	5	25	I	152	100	4	24	I	0	ACCEPTABLE
1993	AMERI	1	3155	100	87	75	74	98	8	13	I	75	100	6	24	I	0	ACCEPTABLE
1993	ROCKW	1	5375	125	129	100	96	96	7	17	I	99	98	5	38	I	0	ACCEPTABLE
1993	SPRAG	1	5509	125	230	189	185	97	5	15	I	189	100	4	24	I	0	ACCEPTABLE
1994	AMERI	1	5103	125	178	159	143	89	5	53	I	145	91	4	125	IIa	0	ACCEPTABLE
1994	ROCKW	1	3704	125	118	84	82	97	7	15	I	83	98	5	38	I	0	ACCEPTABLE
1994	SPRAG	1	5537	125	279	221	213	96	4	17	I	220	99	3	30	I	0	ACCEPTABLE
1995	AMERI	1	3002	100	87	77	74	96	7	17	I	74	96	6	66	I	0	ACCEPTABLE
1995	ROCKW	1	2159	100	93	72	68	94	8	22	I	70	97	6	49	I	0	ACCEPTABLE
1995	SPRAG	1	9972	125	247	201	196	97	5	15	I	200	99	3	30	I	0	ACCEPTABLE
1996	AMERI	1	227	70	76	68	63	92	7	27	I	65	95	5	68	I	0	ACCEPTABLE
1996	ROCKW	1	709	90	55	48	47	97	9	15	I	47	97	7	47	I	0	ACCEPTABLE
1996	SPRAG	1	4188	125	139	106	104	98	6	13	I	106	100	5	24	I	0	ACCEPTABLE
1997	AMERI	1	5	5	5	5	5	100	0	5	I	5	100	0	5	I	0	FAMILY DEPLETED
1997	ROCKW	1	252	70	48	42	41	97	9	14	I	41	97	7	42	I	0	ACCEPTABLE
1997	SPRAG	1	6740	125	206	169	168	99	5	12	I	169	100	4	24	I	0	ACCEPTABLE
1998	AMERI	1	340	80	53	43	42	97	9	14	I	42	97	7	43	I	0	ACCEPTABLE
1998	ROCKW	1	7067	125	169	140	123	87	6	87	I	123	87	4	125	IIb	0	MONITOR IN 2019
1998	SPRAG	1	641	90	57	47	46	97	9	15	I	46	97	7	46	I	0	ACCEPTABLE

1999	AMERI	1	6855	125	119	94	91	96	7	17	I	91	96	5	67	I	0	ACCEPTABLE
1999	AMERI	3	21	21	21	20	17	84	3	20	I	17	84	2	16	III	0	FAMILY DEPLETED
1999	ROCKW	1	351	80	87	81	77	95	6	18	I	78	96	5	57	I	0	ACCEPTABLE
1999	SPRAG	1	368	80	47	42	40	95	10	18	I	42	100	7	23	I	0	ACCEPTABLE
2000	AMERI	1	8077	125	123	90	90	100	7	11	I	90	100	5	24	I	0	ACCEPTABLE
2000	AMERI	3	14	14	13	13	10	76	5	13	IIb	10	76	4	7	III	0	FAMILY DEPLETED
2000	ROCKW	1	785	90	103	93	82	88	6	62	I	82	88	5	90	IIb	0	MONITOR IN 2019
2000	SPRAG	1	11	11	11	10	9	90	0	9	I	10	100	0	8	I	0	FAMILY DEPLETED
2001	AMERI	1	6447	125	187	163	162	99	5	12	I	162	99	4	30	I	0	ACCEPTABLE
2001	AMERI	3	74	50	52	50	47	94	5	17	I	47	94	4	50	I	0	ACCEPTABLE
2001	ROCKW	1	73	50	27	26	26	100	10	10	I	26	100	8	18	I	0	ACCEPTABLE
2001	ROCKW	2	75	50	51	48	46	95	6	15	I	46	95	4	43	I	0	ACCEPTABLE
2001	SPRAG	1	1060	90	65	56	54	96	9	17	I	55	98	6	37	I	0	ACCEPTABLE
2002	ACTAR	1	775	90	779	763	748	98	0	13	I	753	98	0	36	I	0	FAMILY DEPLETED
2002	AMERI	1	7479	125	187	155	140	90	5	43	I	140	90	4	125	IIa	0	ACCEPTABLE
2002	AMERI	3	11	11	10	10	8	80	7	11	IV	8	80	5	8	III	0	FAMILY DEPLETED
2002	ROCKW	1	551	90	46	43	43	100	10	11	I	43	100	7	23	I	0	ACCEPTABLE
2002	ROCKW	2	282	80	85	81	76	93	6	24	I	76	93	5	80	IIa	0	ACCEPTABLE
2002	SPRAG	1	324	80	45	39	39	100	10	11	I	39	100	7	23	I	0	ACCEPTABLE
2003	AMERI	1	722	90	91	83	81	97	7	15	I	81	97	5	47	I	0	ACCEPTABLE
2003	ROCKW	1	166	70	74	71	67	94	6	20	I	67	94	4	70	I	0	ACCEPTABLE
2003	ROCKW	2	94	50	54	51	45	88	6	40	I	46	90	5	50	IIa	0	ACCEPTABLE
2003	SPRAG	1	568	90	59	55	51	92	8	29	I	54	98	6	36	I	0	ACCEPTABLE
2004	AMERI	1	759	90	50	45	45	100	10	11	I	45	100	7	24	I	0	ACCEPTABLE

2004	AMERI	3	200	70	73	71	64	90	6	36	I	64	90	5	70	IIa	0	ACCEPTABLE
2004	ROCKW	1	178	70	41	39	38	97	9	14	I	38	97	7	39	I	0	ACCEPTABLE
2004	ROCKW	2	148	60	67	62	50	80	6	60	IIa	52	83	5	37	III	0	RECALL FAMILY
2004	SPRAG	1	25	25	13	13	13	100	13	8	I	13	100	10	13	I	0	ACCEPTABLE
2004	SPRAG	3	11	11	12	10	9	90	0	9	I	10	100	0	8	I	0	FAMILY DEPLETED
2005	AMERI	1	13078	200	296	228	207	90	4	43	I	207	90	3	200	IIa	0	ACCEPTABLE
2005	AMERI	3	85	50	53	50	44	88	6	38	I	44	88	5	50	IIb	0	RECALL FAMILY
2005	ROCKW	1	121	60	33	29	29	100	11	10	I	29	100	8	20	I	0	ACCEPTABLE
2005	ROCKW	2	317	80	88	84	68	80	6	80	IIa	69	82	5	34	III	0	RECALL FAMILY
2005	SPRAG	1	158	70	37	36	36	100	10	10	I	36	100	7	21	I	0	ACCEPTABLE
2006	AMERI	1	13004	200	184	139	138	99	6	12	I	138	99	4	30	I	0	ACCEPTABLE
2006	AMERI	3	358	80	87	84	76	90	6	39	I	76	90	5	80	IIa	0	ACCEPTABLE
2006	ROCKW	1	60	40	20	19	19	100	13	9	I	19	100	9	18	I	0	ACCEPTABLE
2006	ROCKW	2	321	80	85	82	77	93	6	24	I	78	95	5	75	I	0	ACCEPTABLE
2006	SPRAG	1	115	60	34	30	30	100	10	10	I	30	100	8	20	I	0	ACCEPTABLE
2006	SPRAG	3	106	60	106	91	87	95	0	16	I	90	98	0	28	I	0	FAMILY DEPLETED
2007	ACTAR	1	6	6	6	6	6	100	0	6	I	6	100	0	6	I	0	FAMILY DEPLETED
2007	AMERI	1	2575	100	72	63	63	100	8	11	I	63	100	6	24	I	0	ACCEPTABLE
2007	AMERI	3	180	70	71	71	69	97	6	14	I	69	97	5	39	I	0	ACCEPTABLE
2007	ROCKW	1	284	80	42	41	41	100	10	10	I	41	100	7	23	I	0	ACCEPTABLE
2007	ROCKW	2	275	70	73	70	63	90	7	38	I	65	92	5	70	IIa	0	ACCEPTABLE
2007	SPRAG	1	263	70	36	35	34	97	10	14	I	35	100	8	22	I	0	ACCEPTABLE
2007	SPRAG	2	6	6	6	5	5	100	0	6	I	5	100	0	6	I	0	FAMILY DEPLETED
2007	SPRAG	3	11	11	11	9	9	100	0	6	I	9	100	0	8	I	0	FAMILY DEPLETED

2008	ACTAR	1	2	2	2	2	2	100	0	2	I	2	100	0	2	I	0	FAMILY DEPLETED
2008	AMERI	1	11992	200	252	225	211	93	4	26	I	211	93	3	200	I	0	ACCEPTABLE
2008	AMERI	3	587	90	94	92	85	92	6	29	I	85	92	5	90	Ila	0	ACCEPTABLE
2008	ROCKW	1	238	70	37	36	35	97	10	14	I	36	100	8	22	I	0	ACCEPTABLE
2008	ROCKW	2	648	90	88	88	83	94	7	21	I	85	96	5	61	I	0	ACCEPTABLE
2008	SPRAG	1	86	50	26	25	25	100	11	10	I	25	100	8	19	I	0	ACCEPTABLE
2008	SPRAG	2	22	22	13	12	12	100	13	7	I	12	100	10	12	I	0	ACCEPTABLE
2008	SPRAG	3	35	35	35	33	33	100	0	8	I	33	100	0	15	I	0	FAMILY DEPLETED
2009	ACTAR	1	15	15	15	15	15	100	0	7	I	15	100	0	10	I	0	FAMILY DEPLETED
2009	AMERI	1	4806	125	28	11	11	100	20	11	I	11	100	<<>>	24	IV	0	ACCEPTABLE
2009	AMERI	3	366	80	9	7	7	100	<<>>	11	IV	7	100	<<>>	23	IV	0	ACCEPTABLE
2009	ROCKW	1	491	80	3	3	3	100	<<>>	11	IV	3	100	<<>>	23	IV	0	ACCEPTABLE
2009	ROCKW	2	539	90	8	2	2	100	<<>>	11	IV	2	100	<<>>	23	IV	0	ACCEPTABLE
2009	SPRAG	1	459	80	3	0	0	NaN	N/A	40	IV	0	NaN	N/A	40	IV	0	ACCEPTABLE
2009	SPRAG	2	15	15	0	0	0	NaN	N/A	8	IV	0	NaN	N/A	8	IV	0	ACCEPTABLE
2009	SPRAG	3	34	34	34	31	30	96	0	12	I	31	100	0	14	I	0	FAMILY DEPLETED
2010	ACTAR	1	3	3	3	3	3	100	0	3	I	3	100	0	3	I	0	FAMILY DEPLETED
2010	AMERI	1	3478	125	22	12	12	100	19	11	I	12	100	<<>>	24	IV	0	ACCEPTABLE
2010	AMERI	3	466	80	7	6	5	83	<<>>	80	IV	5	83	<<>>	45	IV	0	ACCEPTABLE
2010	ROCKW	1	241	70	1	1	1	100	<<>>	10	IV	1	100	<<>>	22	IV	0	ACCEPTABLE
2010	ROCKW	2	213	70	1	1	0	0	66	1	III	0	0	49	0	III	0	ACCEPTABLE
2010	SPRAG	1	323	80	5	3	3	100	<<>>	11	IV	3	100	<<>>	23	IV	0	ACCEPTABLE
2010	SPRAG	2	12	12	0	0	0	NaN	N/A	6	IV	0	NaN	N/A	6	IV	0	ACCEPTABLE
2010	SPRAG	3	132	60	132	110	109	99	0	11	I	109	99	0	25	I	0	FAMILY DEPLETED

2011	ACTAR	1	5	5	5	5	5	100	0	5	I	5	100	0	5	I	0	FAMILY DEPLETED
2011	AMERI	1	4670	125	21	15	15	100	17	11	I	15	100	<<>>	24	IV	0	ACCEPTABLE
2011	AMERI	3	360	80	2	1	1	100	<<>>	11	IV	1	100	<<>>	23	IV	0	ACCEPTABLE
2011	ROCKW	1	227	70	0	0	0	NaN	N/A	35	IV	0	NaN	N/A	35	IV	0	ACCEPTABLE
2011	ROCKW	2	669	90	12	7	7	100	<<>>	11	IV	7	100	<<>>	24	IV	0	ACCEPTABLE
2011	SPRAG	1	240	70	5	3	3	100	<<>>	10	IV	3	100	<<>>	22	IV	0	ACCEPTABLE
2011	SPRAG	2	23	23	4	3	3	100	<<>>	8	IV	3	100	<<>>	12	IV	0	ACCEPTABLE
2011	SPRAG	3	23	23	24	19	19	100	0	8	I	19	100	0	12	I	0	FAMILY DEPLETED
2012	ACTAR	1	21	21	21	21	19	90	0	14	I	20	95	0	17	I	0	FAMILY DEPLETED
2012	AMERI	1	3751	125	11	7	7	100	<<>>	11	IV	7	100	<<>>	24	IV	0	ACCEPTABLE
2012	AMERI	3	216	70	1	0	0	NaN	N/A	35	IV	0	NaN	N/A	35	IV	0	ACCEPTABLE
2012	ROCKW	1	223	70	0	0	0	NaN	N/A	35	IV	0	NaN	N/A	35	IV	0	ACCEPTABLE
2012	ROCKW	2	516	90	9	5	5	100	<<>>	11	IV	5	100	<<>>	23	IV	0	ACCEPTABLE
2012	SPRAG	1	223	70	6	5	5	100	<<>>	10	IV	5	100	<<>>	22	IV	0	ACCEPTABLE
2012	SPRAG	2	21	21	0	0	0	NaN	N/A	11	IV	0	NaN	N/A	11	IV	0	ACCEPTABLE
2012	SPRAG	3	35	35	37	32	32	100	0	8	I	32	100	0	15	I	0	FAMILY DEPLETED
2013	ACTAR	1	22	22	21	21	21	100	3	7	I	21	100	2	12	I	0	ACCEPTABLE
2013	AMERI	1	5628	125	19	13	13	100	18	11	I	13	100	<<>>	24	IV	0	ACCEPTABLE
2013	AMERI	2	196	70	2	1	1	100	<<>>	10	IV	1	100	<<>>	22	IV	0	ACCEPTABLE
2013	AMERI	3	480	80	8	7	6	85	<<>>	80	IV	6	85	<<>>	80	IV	0	ACCEPTABLE
2013	ROCKW	1	245	70	4	3	3	100	<<>>	10	IV	3	100	<<>>	22	IV	0	ACCEPTABLE
2013	ROCKW	2	200	70	5	2	2	100	<<>>	10	IV	2	100	<<>>	22	IV	0	ACCEPTABLE
2013	SPRAG	1	203	70	0	0	0	NaN	N/A	35	IV	0	NaN	N/A	35	IV	0	ACCEPTABLE
2013	SPRAG	2	20	20	0	0	0	NaN	N/A	10	IV	0	NaN	N/A	10	IV	0	ACCEPTABLE

2013	SPRAG	3	69	50	71	59	59	100	0	9	I	59	100	0	18	I	0	FAMILY DEPLETED
2014	ACTAR	1	32	32	32	32	31	96	0	11	I	32	100	0	14	I	0	FAMILY DEPLETED
2014	AMERI	1	662	90	9	4	4	100	<<>>	11	IV	4	100	<<>>	24	IV	0	ACCEPTABLE
2014	AMERI	2	412	80	5	5	5	100	<<>>	11	IV	5	100	<<>>	23	IV	0	ACCEPTABLE
2014	AMERI	3	501	90	2	2	2	100	<<>>	11	IV	2	100	<<>>	23	IV	0	ACCEPTABLE
2014	ROCKW	1	8205	125	19	14	14	100	18	11	I	14	100	<<>>	24	IV	0	ACCEPTABLE
2014	ROCKW	2	272	70	3	3	3	100	<<>>	10	IV	3	100	<<>>	22	IV	0	ACCEPTABLE
2014	SPRAG	1	227	70	5	5	5	100	<<>>	10	IV	5	100	<<>>	22	IV	0	ACCEPTABLE
2014	SPRAG	2	10	10	0	0	0	NaN	N/A	5	IV	0	NaN	N/A	5	IV	0	ACCEPTABLE
2015	ACTAR	1	33	33	33	33	33	100	0	8	I	33	100	0	14	I	0	FAMILY DEPLETED
2015	AMERI	1	764	90	5	1	1	100	<<>>	11	IV	1	100	<<>>	24	IV	0	ACCEPTABLE
2015	AMERI	2	749	90	2	2	2	100	<<>>	11	IV	2	100	<<>>	24	IV	0	ACCEPTABLE
2015	AMERI	3	745	90	7	4	4	100	<<>>	11	IV	4	100	<<>>	24	IV	0	ACCEPTABLE
2015	ROCKW	1	449	80	2	2	2	100	<<>>	11	IV	2	100	<<>>	23	IV	0	ACCEPTABLE
2015	ROCKW	2	421	80	1	1	1	100	<<>>	11	IV	1	100	<<>>	23	IV	0	ACCEPTABLE
2015	SPRAG	1	6535	125	20	16	16	100	16	11	I	16	100	<<>>	24	IV	0	ACCEPTABLE
2015	SPRAG	2	20	20	0	0	0	NaN	N/A	10	IV	0	NaN	N/A	10	IV	0	ACCEPTABLE
2015	SPRAG	3	1	1	0	0	0	NaN	N/A	1	N/A	0	NaN	N/A	1	N/A	0	ACCEPTABLE
2016	ACTAR	1	22	22	22	22	22	100	0	7	I	22	100	0	12	I	0	FAMILY DEPLETED
2016	AMERI	1	1144	90	10	5	5	100	<<>>	11	IV	5	100	<<>>	24	IV	0	ACCEPTABLE
2016	AMERI	2	951	90	5	4	4	100	<<>>	11	IV	4	100	<<>>	24	IV	0	ACCEPTABLE
2016	AMERI	3	960	90	12	10	10	100	<<>>	11	IV	10	100	<<>>	24	IV	0	ACCEPTABLE
2016	ROCKW	1	591	90	2	1	1	100	<<>>	11	IV	1	100	<<>>	23	IV	0	ACCEPTABLE
2016	ROCKW	2	590	90	8	4	3	74	<<>>	90	IV	3	74	<<>>	9	IV	0	ACCEPTABLE

2016	SPRAG	1	24174	200	59	42	42	100	10	11	I	42	100	8	24	I	0	ACCEPTABLE
2016	SPRAG	2	3	3	0	0	0	NaN	N/A	2	N/A	0	NaN	N/A	2	N/A	0	ACCEPTABLE
2017	ACTAR	1	7	7	9	9	9	100	N/A	7	N/A	9	100	N/A	7	N/A	0	FAMILY DEPLETED
2017	AMERI	1	472	80	17	7	7	100	<<>>	11	IV	7	100	<<>>	23	IV	0	ACCEPTABLE
2017	AMERI	2	40	40	2	2	2	100	<<>>	9	IV	2	100	<<>>	15	IV	0	ACCEPTABLE
2017	AMERI	3	343	80	11	10	10	100	<<>>	11	IV	10	100	<<>>	23	IV	0	ACCEPTABLE
2017	ROCKW	1	434	80	3	2	2	100	<<>>	11	IV	2	100	<<>>	23	IV	0	ACCEPTABLE
2017	ROCKW	2	145	60	3	2	0	0	46	1	III	0	0	35	0	III	0	ACCEPTABLE
2017	SPRAG	1	7769	125	56	45	45	100	10	11	I	45	100	7	24	I	0	ACCEPTABLE
2017	SPRAG	2	115	60	2	1	1	100	<<>>	10	IV	1	100	<<>>	20	IV	0	ACCEPTABLE
GRAND TOTALS			291442		10223	8740	8345					8457					0	



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## RANDOM SAMPLING METER PERFORMANCE DATA

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### DOMESTIC METERS 1000 CFH AND SMALLER STATUS REPORT NOTES

#### Notes to Year-End Status Report:

#### **1) TEST FAMILY : Naming designation of each family.**

- a) **YEAR/MAKE/(SIZE) CLASS:** Components of the family designation or name.
- b) **FAMILY SIZE:** Count of number of meters in test family at the start of the test year being reported.

#### **2) SAMPLE STATISTICS: Statistics pertaining to representative sample taken from each family.**

- a) **MAX.SAMP:** Maximum number of meters that would be required in a sample in order to make a valid determination of the family's future disposition.
- b) **NO.RMVD:** Number of meters in each family removed during the course of the plan year.
- c) **SAMP.CNT:** Total number of meters qualified for use in each sample. Meters determined to be uniquely defective are excluded from the sample count and any sample determination.

#### **3) OVERALL "ACCURACY" TEST RESULTS: Compilation of test results to determine the proportion of the sample meeting the "accuracy" test (i.e. 98.0 to 102.0 percent accurate).**

- a) **OK.CNT:** Number of meters in the sample found 98.0 to 102.0 percent accurate.
- b) **PCT.OK:** Percent or proportion of the sample found "accurate".
- c) **OK.LMT:** The control limits above or below the 80% proportion threshold.
- d) **MIN.SAMP:** The minimum number of meters required in each sample to provide a statistically valid sample.
- e) **CTL.RGN:** Control region in which the sample is determined to be on the "meters accurate" control chart provided in the program document.

#### **4) "NOT FAST" TEST RESULTS: Compilation of test results to determine the proportion of the sample meeting the "not fast" test (i.e. not more than 102.0 percent accurate).**

- a) **NF.CNT:** Number of meters in the sample found not exceeding 102.0 percent accurate.
- b) **PCT..NF:** Percent or proportion of sample found "not fast".
- c) **NF.LMT:** The control limits above and below the 90% proportion threshold.
- d) **MIN.SAMP:** The minimum number of meters required in each sample to provide a statistically valid sample.
- e) **CTL.RGN:** Control region in which the sample is determined to be on the "meters not fast" control chart provided in the program document.

#### **5) FURTHER ACTION OR STATUS: Further action(s) that may be necessary to ensure the sample is of sufficient size and the family remains in compliance with program guidelines.**

- a) **ADD.REQ:** Additional number of meters required to meet or exceed minimum sample size.
- b) **DISP.OF.FAMILY:** Future disposition or status of each family as determined by the decision tree provided in the program document.

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**RANDOM SAMPLING METER PERFORMANCE DATA**

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**DOMESTIC METERS 1000 CFH AND SMALLER**

**METER FAMILIES BELOW ACCEPTABLE THRESHOLD LIMITS**

*Three meter families in service ten or more years were found below the acceptable threshold limits (i.e. fall in region III).*

<b>Meter Family</b>	<b>Disposition Status</b>	<b>Year Disposition Initiated</b>	<b>Planned Year to Complete Disposition</b>
<b>2004ROCKW2</b>	<b>Recall Family</b>	<b>2019</b>	<b>2019</b>
<b>2005AMERI3</b>	<b>Recall Family</b>	<b>2019</b>	<b>2019</b>
<b>2005ROCKW2</b>	<b>Recall Family</b>	<b>2019</b>	<b>2019</b>

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**RANDOM SAMPLING METER PERFORMANCE DATA**

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**DOMESTIC METERS 1000 CFH AND SMALLER**

**METER FAMILIES WITH INSUFFICIENTLY SIZED SAMPLE**

*No meter families in service ten or more years were found to have an insufficient sized sample.*

<b>Meter Family</b>	<b>Family Size</b>	<b>Min Sample Size Required</b>	<b>Meters Qualifying for Sample in 2015</b>
N/A			

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**RANDOM SAMPLING METER PERFORMANCE DATA**

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**DOMESTIC METERS 1000 CFH AND SMALLER**

**STATUS OF METER FAMILIES PREVIOUSLY SCHEDULED FOR REMOVAL**

*Two meter families were previously scheduled for removal in 2018.*

<b>Meter Family</b>	<b>Disposition Status</b>	<b>Year Disposition Initiated</b>	<b>Year Disposition Completed</b>
<b>1999AMERI3</b>	<b>Recall Family</b>	<b>2018</b>	<b>2018</b>
<b>2002AMERI3</b>	<b>Recall Family</b>	<b>2018</b>	<b>2018</b>

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## APPENDIX

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### Cascade Natural Gas Corporation **Statistical Sample Program**

August 18, 1995

(Revised November 3, 2014)

#### **Program Description**

Using knowledge of the operating histories of similar meters, the company may elect to keep particular meters in service for intervals beyond those specified in applicable state regulations, provided the meter performance meets the criteria of the company's Statistical Sample Program. Eligible meters are diaphragm type meters with a rated capacity of up to 3,000 ft<sup>3</sup>/hr.

The maximum permissible error in the registration of meters placed in service is  $\pm 2.0\%$  at both the open and check rates. For the purposes of the Statistical Sample Program, the definition of a meter registering with an error of  $-2.0\%$  is one that registers 98.0% of accuracy and a meter registering with a  $+2.0\%$  error is one that registers 102.0% of accuracy. A meter, therefore, must register between 98.0% and 102.0% of accuracy at each test rate, before being placed in service.

Each meter in the Statistical Sample Program will be assigned to a meter group or "family" according to its manufacturer, meter size, meter class, and test year. At the option of the company, meters in any family may be further subdivided according to meter type, size, location, age, or other factors that may be disclosed by test data to have an effect on the performance of the meters. Subsequently, meter families may be modified or combined as justified by the performance records.

The program year shall begin on January 1 and end on December 31 of the same year.

#### **Sample Selection and Evaluation**

The performance evaluation of each meter family will be based on an evaluation of test results from random sampling of the family. Sample data collected during a given program year will be analyzed, and a decision regarding meter family disposition will be made in the first quarter of the following calendar year. The performance and status, including disposition, of each meter family will be reported to the regulatory commissions as part of the annual meter report.

The random sample for each family will include meters which are removed from service on a routine basis, e.g. meters not in use, too large, too small, damaged index cover, service relocation or replacement, etc. If more meters are required for testing than have been removed from service for routine purposes, a random sample of meters within that family will be removed from service and included in the sample.

All non-contaminated, testable meters will be tested in accordance with ANSI B109.1, and B109.2, using an average of the open and check in-test results to evaluate each meter's performance. For purposes of evaluating the performance of each meter family, the analysis of the test results will exclude data on meters which are damaged, meters which do not register, meters which do not pass gas, and meters which measure either less than 90.0 percent accurate or more than 110.0 percent accurate.

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## APPENDIX

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A meter family will be considered to be acceptable if the sample of the family indicates:

- a) a minimum proportion of .80 of the family measures between 98.0 percent and 102.0 percent accurate ("accuracy" requirement); and
- b) a minimum proportion of .90 of the family measures no more than 102.0 percent accurate ("not fast" requirement).

To determine the significance of the proportions measured from sampling, the test results will be compared with threshold proportions and control limits on a control chart. The control limits will be defined as follows:

$$P_{.90} = p_t \pm 1.645 * [p_t(1-p_t)/n]^{.5} * [(N-n)/(N-1)]^{.5}$$

where:

$P_{.90}$  is the upper and lower proportion corresponding with an interval which will have a 90 percent probability of including the proportion from a random sample of size  $n$  (drawn without replacement) from a population of size  $N$  and a proportion equal to  $p_t$ .  $p_t$  is the threshold proportion, equal to the minimum acceptable proportion of the meter family and is:

= .80 for meters registering between 98.0% and 102% accurate, or

= .90 for meters registering no more than 102% accurate.

$n$  is the sample size.

$N$  is the meter family size prior to sampling.

1.645 is the factor necessary to provide the interval estimate associated with the threshold proportion, such that, nine times out of ten, the sample proportion will be included within that interval.

Each proportion measured from sampling will specify a particular region (I, II, III, or IV) on the control chart within which the sample data would plot. The regions (I, IIa, IIb, III, and IV) are outlined by the control limits and the threshold proportions, and will be as defined by figures 1 and 2. The vertical line between the regions II(a and b) and IV on the control chart will be established according to the following schedule:

<u>Remaining Family Size</u>	<u>Division line between Regions II(a and b) and IV on the Control Chart</u>
1 to 65	40 (or family size if less)
66 to 100	50
101 to 150	60
151 to 280	70
281 to 500	80
501 to 1200	90
1201 to 3200	100
3201 to 10000	125
10001 and over	200

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**APPENDIX**

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The performance of each family will be characterized by the regions on the control chart according to the following table:

	Meter Family < 10 yrs old -----	Meter Family ≥ 10 yrs old -----
Region I	Satisfactory	Satisfactory
Region II a	Satisfactory	Satisfactory
Region II b	Satisfactory	Satisfactory
Region III	At/below Limits	At/below Limits
Region IV	Satisfactory	Insufficient Sample

**Meter Family Disposition**

Meter family disposition will be determined according to the following steps:

1. The proportion of the meters in the sample that measure between 98.0 percent and 102.0 percent accurate will be calculated, and the respective region on the "Accuracy" control chart determined.
2. The proportion of the meters in the sample which measure not more than 102.0 percent accurate will be calculated, and the respective region on the "Not Fast" control chart determined.
3. If the region is determined to be "IV" on either the "Accuracy" control chart or "Not Fast" control chart, additional random samples shall be taken so that the combined sample is sufficient to move the sample into any region other than "IV". However, if meters tested in the fourth quarter of the plan year cause the family to fall into region "IV" unexpectedly, leaving insufficient time to obtain the additional number of meters required to complete the sample, the company may elect to increase the sample size of the family by combining the current sample with the samples from the previous two years so that a sufficiently sized sample is obtained to cause the family to fall in a region other than "IV". The disposition of this "multiple year family" shall then be subject to the same rules of the plan as any other family in the plan. "Multiple year families" that fall in region I shall be subject to aggressive sampling in the following plan year so that a follow up determination is made within the first six months without any need to combine multiple years.
4. The results from steps 1 and 2 (provided neither are region "IV") will be applied to the conditions outlined in the decision tree, shown in figures 3a and 3b.
5. Meters in families falling in regions I and IIa are determined to be satisfactory and will be allowed to remain in service, subject to sample testing and review in succeeding years.
6. Meters in families falling in region IIb are subject to change-out at the company's discretion. The decision as to their removal will be based on economic and operating factors. If the meters remain in service, they will be subject to sample testing and review in

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## APPENDIX

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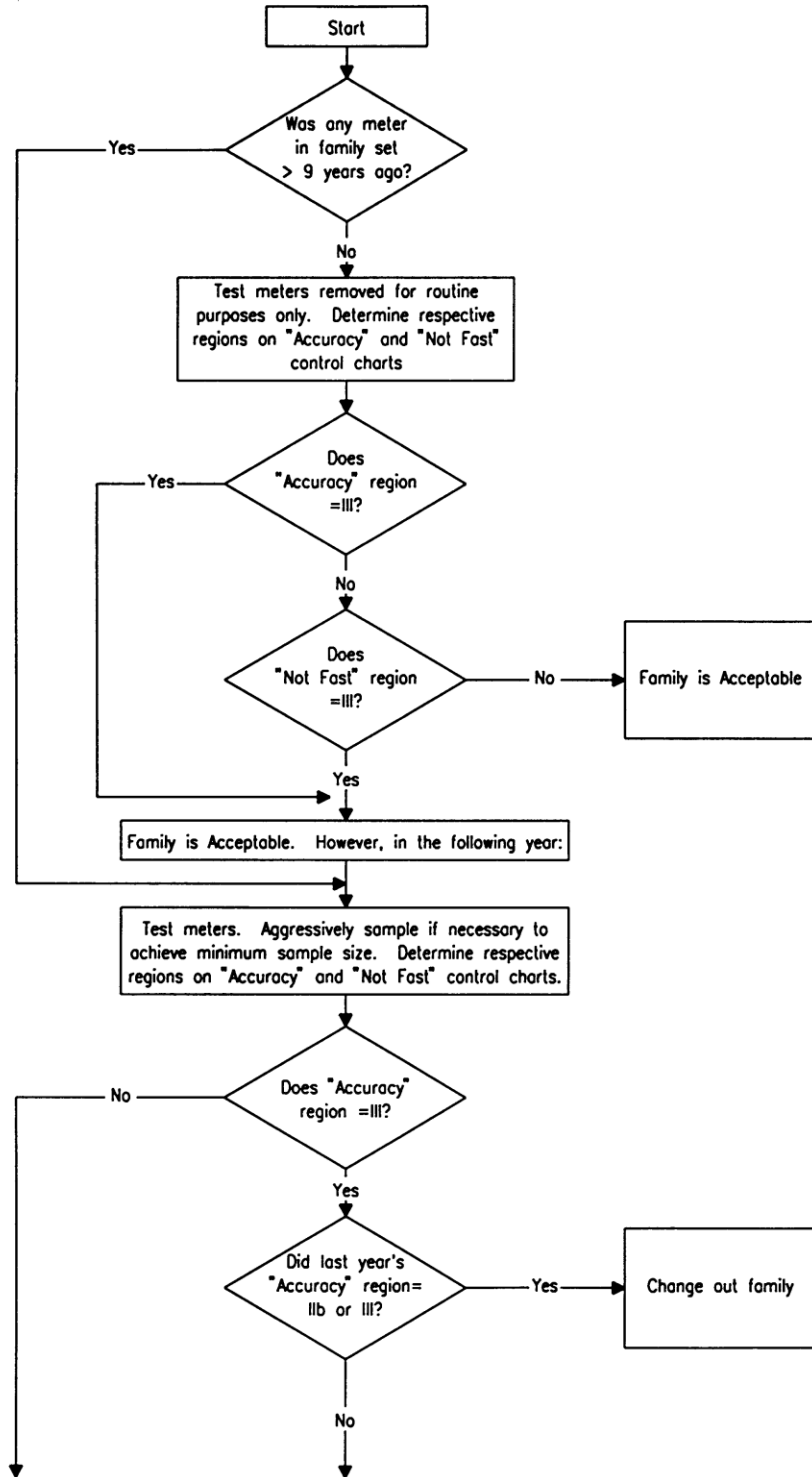
succeeding years.

7. Meters in families falling in region III shall be removed from service by December 31 of the second year following the determination (i.e. two years following the program year when the samples were taken.) However, if in any given year the total number of meters to be removed from service exceeds four percent of the number of meters in the Statistical Sample Program, the company may, at its option and with Commission approval, extend the change-out schedule so that each meter family is changed within a maximum of four years from determination that change-out is required (i.e. four years following the program year when the samples were taken).

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## Decision Tree for Meter Families in Meter Sample Program



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Figure 3.a.

APPENDIX

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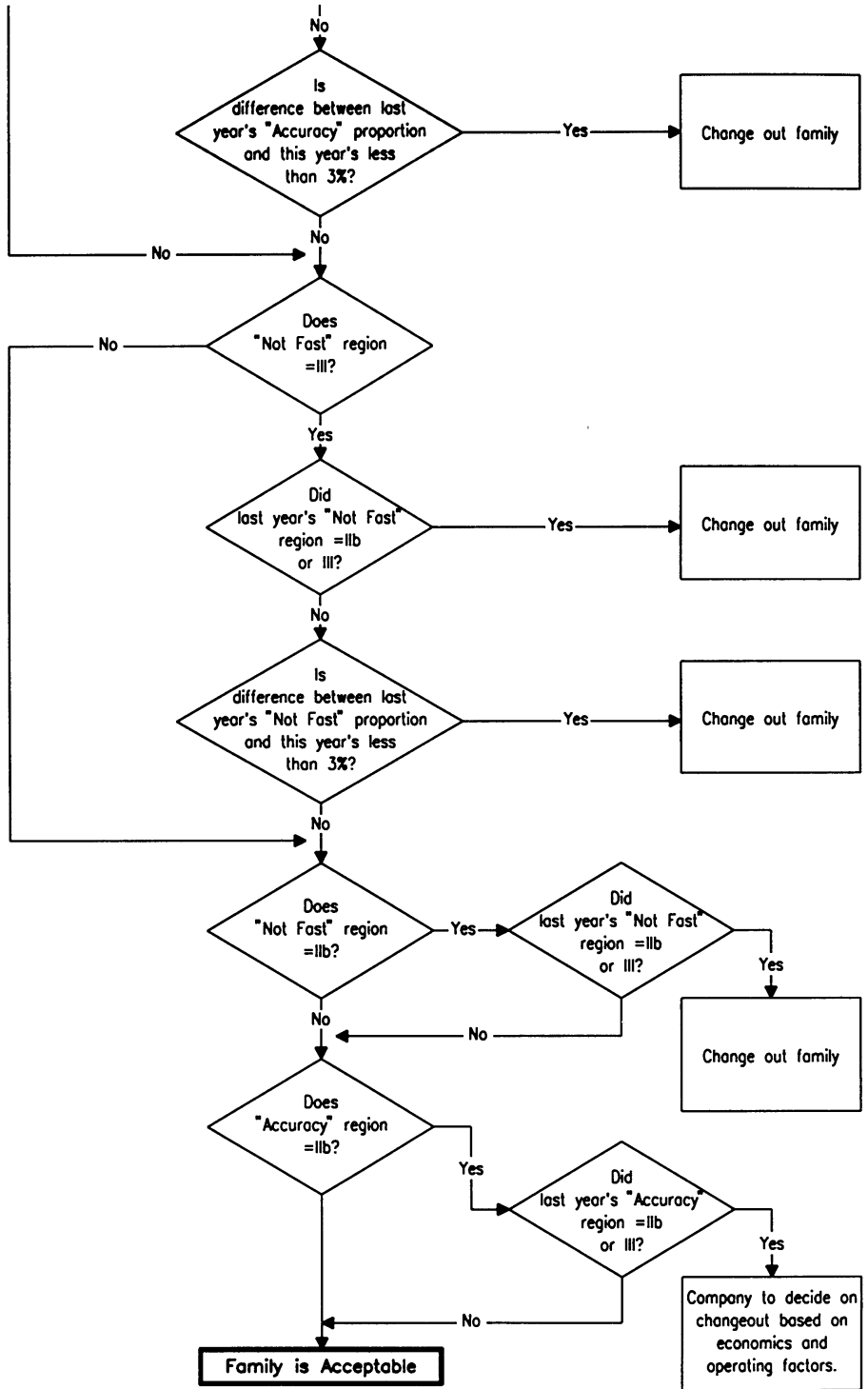
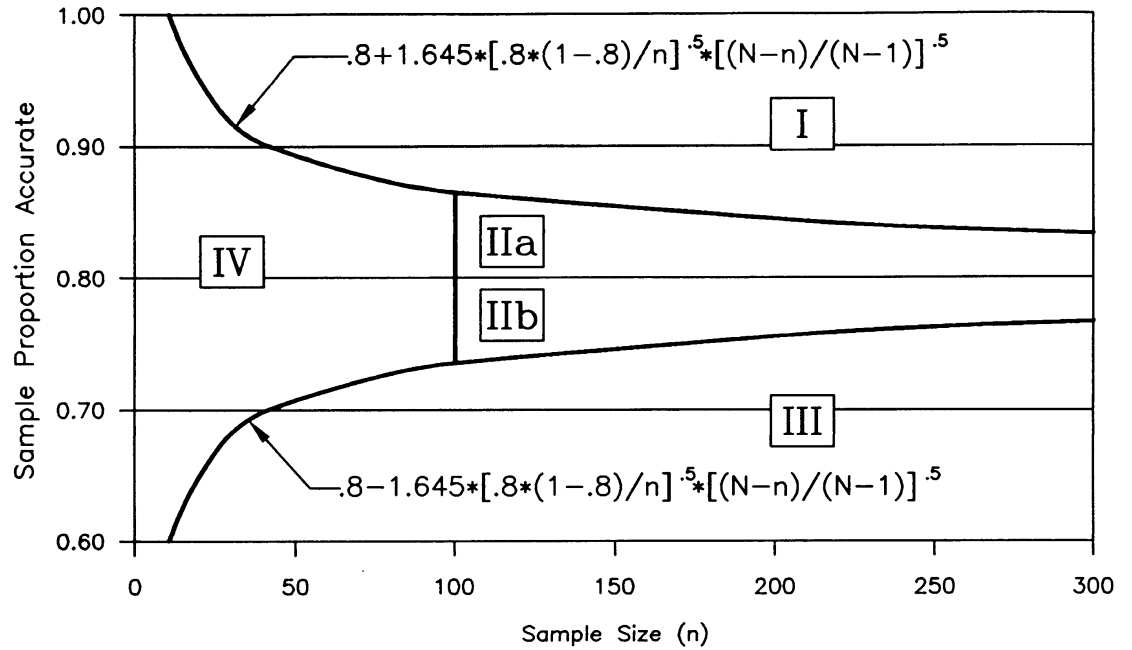


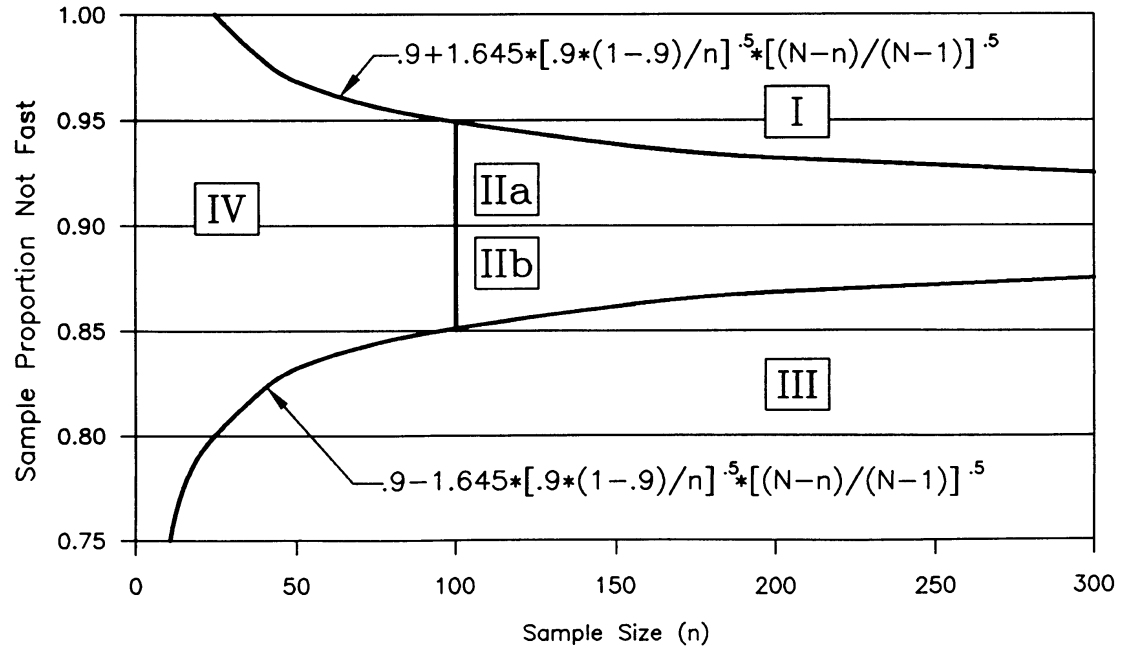
Figure 3.b.

## Meter Performance Control Charts

**Figure 1. For Meters Accurate**



**Figure 2. For Meters Not Fast**



\*Example where family size (N) = 3000