

CASCADE NATURAL GAS

GAS METER  
STATISTICAL SAMPLING  
PROGRAM

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2013 RESULTS

# GAS METER STATISTICAL SAMPLING PROGRAM

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GAS METER PERFORMANCE FOR THE PERIOD JANUARY 1, 2013 – DECEMBER 31, 2013

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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, 2013 through December 31, 2013.

### **Sampling Summary**

Meters in the program at the beginning of the plan year	270,265
Meters in the program at the end of the plan year	274,351
Total meters removed during the year	2,977
Meters qualifying for analysis (not uniquely defective)	2,383
Uniquely defective meters	594
Meters statistically required for analysis (>10 yrs in svc)	1,861
Meters provided through random selection (>10 yrs in svc)	1,512

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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 effective February 27, 2005 and Tariff Rule No. 6, part 1 filed in the state of Oregon effective June 15, 2007. 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.

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## RANDOM SAMPLING METER PERFORMANCE DATA

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### DOMESTIC METERS 1000 CFH AND SMALLER

#### SUMMARY

#### **Beginning of Report Year 2013, In-Service Meters on 1/1/13**

Total Number of Meters For Random Sampling	270,265
Total Number of Test Families <sup>(a)</sup>	165
Number of Test Families $\geq$ 10 yrs old <sup>(b)</sup>	88
Number of Test Families to be Voluntarily Removed for Admin. Purposes <sup>(c)</sup>	0

#### **End of Report Year 2013 Meter Testing Quantities & Results**

Number of Meters Tested	2,383
Number of Meters Passed, (+/-) 2%	2,383
Number of Meters Failed, (+/-) 2%	0
Number of Meters, Uniquely Defective Test Result, (+/-) 10%	594
Meter Families With an Overall Fail Result	0
Meter Families With a Fast Fail Result	0
Meter Families Removed/Depleted During Report Year <sup>(d)</sup>	5

#### **Transition to 2014 Test Year**

Total Number of Meters For Random Sampling	274,351
Total Number of Test Families <sup>(a)</sup>	172
Number of Test Families $\geq$ 10 yrs old <sup>(b)</sup>	95
Number of Test Families to be Voluntarily Removed for Admin. Purposes <sup>(c)</sup>	0

- 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 2003 and earlier for the 2013 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) Number of meter families that were voluntarily removed for administrative reasons. Includes families with less than 10 meters in population and meter populations that were observed to be trending towards failure
- d) Total number of meter families depleted during the report year including those removed for administrative purposes.

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**RANDOM SAMPLING METER PERFORMANCE DATA**

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**DOMESTIC METERS 1000 CFH AND SMALLER  
SUMMARY**

**METER FAMILY TEST RESULTS**

**Cascade Natural Gas Corp.**  
**2013 METER SAMPLING PROGRAM**  
**YEAR END 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
1981	SPRAG	1	7	7	7	5	5	100	0	7	I	5	100	0	7	I	0	FAMILY DEPLETED
1982	ROCKW	1	67	50	22	21	21	100	12	9	I	21	100	9	18	I	0	ACCEPTABLE
1982	SPRAG	1	96	50	21	20	20	100	13	10	I	20	100	10	20	I	0	ACCEPTABLE
1983	SPRAG	1	385	80	25	23	23	100	13	11	I	23	100	10	23	I	0	ACCEPTABLE
1986	AMERI	1	665	90	27	25	25	100	13	11	I	25	100	10	24	I	0	ACCEPTABLE
1986	ROCKW	1	1701	100	36	27	27	100	13	11	I	27	100	9	24	I	0	ACCEPTABLE
1986	SPRAG	1	1097	90	38	30	30	100	12	11	I	30	100	9	24	I	0	ACCEPTABLE
1987	AMERI	1	2455	100	30	27	27	100	13	11	I	27	100	9	24	I	0	ACCEPTABLE
1987	ROCKW	1	2878	100	39	32	32	100	12	11	I	32	100	9	24	I	0	ACCEPTABLE
1987	SPRAG	1	1183	90	30	25	25	100	13	11	I	25	100	10	24	I	0	ACCEPTABLE
1988	AMERI	1	3373	125	34	27	27	100	13	11	I	27	100	9	24	I	0	ACCEPTABLE
1988	ROCKW	1	2460	100	30	25	25	100	13	11	I	25	100	10	24	I	0	ACCEPTABLE
1988	SPRAG	1	1924	100	47	33	33	100	11	11	I	33	100	9	24	I	0	ACCEPTABLE
1989	AMERI	1	5238	125	40	28	28	100	12	11	I	28	100	9	24	I	0	ACCEPTABLE
1989	ROCKW	1	4990	125	44	31	31	100	12	11	I	31	100	9	24	I	0	ACCEPTABLE
1989	SPRAG	1	3216	125	46	33	33	100	11	11	I	33	100	9	24	I	0	ACCEPTABLE
1990	AMERI	1	3873	125	35	25	25	100	13	11	I	25	100	10	24	I	0	ACCEPTABLE



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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
1990	ROCKW	1	5622	125	39	35	35	100	11	11	I	35	100	8	24	I	0	ACCEPTABLE
1990	SPRAG	1	2653	100	46	36	36	100	11	11	I	36	100	8	24	I	0	ACCEPTABLE
1991	AMERI	1	4562	125	36	28	28	100	12	11	I	28	100	9	24	I	0	ACCEPTABLE
1991	ROCKW	1	3321	125	39	33	33	100	11	11	I	33	100	9	24	I	0	ACCEPTABLE
1991	SPRAG	1	2236	100	45	34	34	100	11	11	I	34	100	8	24	I	0	ACCEPTABLE
1992	AMERI	1	3063	100	40	30	30	100	12	11	I	30	100	9	24	I	0	ACCEPTABLE
1992	ROCKW	1	8079	125	49	39	39	100	11	11	I	39	100	8	24	I	0	ACCEPTABLE
1992	ROCKW	2	14	14	10	10	10	100	12	6	I	10	100	9	9	I	0	ACCEPTABLE
1992	SPRAG	1	1769	100	38	29	29	100	12	11	I	29	100	9	24	I	0	ACCEPTABLE
1993	AMERI	1	3405	125	34	27	27	100	13	11	I	27	100	9	24	I	0	ACCEPTABLE
1993	AMERI	3	35	35	15	15	15	100	13	8	I	15	100	10	15	I	0	ACCEPTABLE
1993	ROCKW	1	5774	125	47	36	36	100	11	11	I	36	100	8	24	I	0	ACCEPTABLE
1993	ROCKW	2	61	40	18	18	18	100	13	9	I	18	100	10	18	I	0	ACCEPTABLE
1993	SPRAG	1	5998	125	54	31	31	100	12	11	I	31	100	9	24	I	0	ACCEPTABLE
1994	AMERI	1	5544	125	36	28	28	100	12	11	I	28	100	9	24	I	0	ACCEPTABLE
1994	AMERI	3	46	40	16	16	16	100	13	9	I	16	100	10	16	I	0	ACCEPTABLE
1994	ROCKW	1	4146	125	62	48	48	100	9	11	I	48	100	7	24	I	0	ACCEPTABLE

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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
1994	SPRAG	1	5916	125	51	35	35	100	11	11	I	35	100	8	24	I	0	ACCEPTABLE
1995	AMERI	1	3254	125	31	27	27	100	13	11	I	27	100	9	24	I	0	ACCEPTABLE
1995	AMERI	3	46	40	16	16	16	100	13	9	I	16	100	10	16	I	0	ACCEPTABLE
1995	ROCKW	1	2607	100	39	30	30	100	12	11	I	30	100	9	24	I	0	ACCEPTABLE
1995	ROCKW	2	68	50	18	18	18	100	13	9	I	18	100	10	18	I	0	ACCEPTABLE
1995	SPRAG	1	10393	200	57	36	36	100	11	11	I	36	100	8	24	I	0	ACCEPTABLE
1996	AMERI	1	447	80	25	23	23	100	13	11	I	23	100	10	23	I	0	ACCEPTABLE
1996	AMERI	3	38	38	15	15	15	100	13	9	I	15	100	10	15	I	0	ACCEPTABLE
1996	ROCKW	1	1010	90	29	25	25	100	13	11	I	25	100	10	24	I	0	ACCEPTABLE
1996	ROCKW	2	71	50	19	18	18	100	13	10	I	18	100	10	18	I	0	ACCEPTABLE
1996	SPRAG	1	4482	125	40	26	26	100	13	11	I	26	100	10	24	I	0	ACCEPTABLE
1997	AMERI	1	137	60	22	21	21	100	13	10	I	21	100	10	21	I	0	ACCEPTABLE
1997	AMERI	3	117	60	20	20	20	100	13	10	I	20	100	10	20	I	0	ACCEPTABLE
1997	ROCKW	1	507	90	26	25	25	100	13	11	I	25	100	10	23	I	0	ACCEPTABLE
1997	ROCKW	2	117	60	21	20	20	100	13	10	I	20	100	10	20	I	0	ACCEPTABLE
1997	SPRAG	1	7058	125	41	29	29	100	12	11	I	29	100	9	24	I	0	ACCEPTABLE
1998	AMERI	1	558	90	26	24	24	100	13	11	I	24	100	10	23	I	0	ACCEPTABLE

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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
1998	AMERI	3	35	35	15	15	15	100	13	8	I	15	100	10	15	I	0	ACCEPTABLE
1998	ROCKW	1	7655	125	36	30	30	100	12	11	I	30	100	9	24	I	0	ACCEPTABLE
1998	ROCKW	2	254	70	24	22	22	100	13	10	I	22	100	10	22	I	0	ACCEPTABLE
1998	SPRAG	1	820	90	35	25	25	100	13	11	I	25	100	10	24	I	0	ACCEPTABLE
1999	AMERI	1	7270	125	39	31	31	100	12	11	I	31	100	9	24	I	0	ACCEPTABLE
1999	AMERI	3	220	70	22	22	22	100	13	10	I	22	100	10	22	I	0	ACCEPTABLE
1999	ROCKW	1	569	90	28	27	27	100	12	11	I	27	100	9	23	I	0	ACCEPTABLE
1999	ROCKW	2	173	70	24	22	22	100	13	10	I	22	100	10	21	I	0	ACCEPTABLE
1999	SPRAG	1	527	90	28	23	23	100	13	11	I	23	100	10	23	I	0	ACCEPTABLE
2000	AMERI	1	8433	125	39	33	33	100	11	11	I	33	100	9	24	I	0	ACCEPTABLE
2000	AMERI	3	213	70	22	22	22	100	13	10	I	22	100	10	22	I	0	ACCEPTABLE
2000	ROCKW	1	993	90	29	26	26	100	13	11	I	26	100	10	24	I	0	ACCEPTABLE
2000	ROCKW	2	193	70	25	23	23	100	13	10	I	23	100	10	22	I	0	ACCEPTABLE
2000	SPRAG	1	119	60	21	20	20	100	13	10	I	20	100	10	20	I	0	ACCEPTABLE
2000	SPRAG	3	33	33	15	15	15	100	13	8	I	15	100	10	14	I	0	ACCEPTABLE
2001	AMERI	1	6685	125	33	27	27	100	13	11	I	27	100	9	24	I	0	ACCEPTABLE
2001	AMERI	3	347	80	24	24	24	100	13	11	I	24	100	10	23	I	0	ACCEPTABLE

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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
2001	ROCKW	1	220	70	23	22	22	100	13	10	I	22	100	10	22	I	0	ACCEPTABLE
2001	ROCKW	2	312	80	26	26	26	100	12	10	I	26	100	9	23	I	0	ACCEPTABLE
2001	SPRAG	1	1228	100	38	24	24	100	13	11	I	24	100	10	24	I	0	ACCEPTABLE
2001	SPRAG	2	6	6	6	6	6	100	0	6	I	6	100	0	6	I	0	FAMILY DEPLETED
2001	SPRAG	3	62	40	18	18	18	100	13	9	I	18	100	10	18	I	0	ACCEPTABLE
2002	ACTAR	1	942	90	25	24	24	100	13	11	I	24	100	10	24	I	0	ACCEPTABLE
2002	AMERI	1	8080	125	39	32	32	100	12	11	I	32	100	9	24	I	0	ACCEPTABLE
2002	AMERI	3	249	70	24	22	22	100	13	10	I	22	100	10	22	I	0	ACCEPTABLE
2002	ROCKW	1	822	90	28	25	25	100	13	11	I	25	100	10	24	I	0	ACCEPTABLE
2002	ROCKW	2	510	90	29	26	26	100	13	11	I	26	100	9	23	I	0	ACCEPTABLE
2002	SPRAG	1	501	90	26	25	25	100	13	11	I	25	100	10	23	I	0	ACCEPTABLE
2002	SPRAG	2	2	2	2	2	2	100	0	2	I	2	100	0	2	I	0	FAMILY DEPLETED
2002	SPRAG	3	12	12	8	8	8	100	14	6	I	8	100	10	8	I	0	ACCEPTABLE
2003	AMERI	1	9770	125	44	30	30	100	12	11	I	30	100	9	24	I	0	ACCEPTABLE
2003	AMERI	3	473	80	23	23	23	100	13	11	I	23	100	10	23	I	0	ACCEPTABLE
2003	ROCKW	1	397	80	30	30	30	100	12	11	I	30	100	9	23	I	0	ACCEPTABLE
2003	ROCKW	2	238	70	27	24	24	100	13	10	I	24	100	10	22	I	0	ACCEPTABLE

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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
2003	SPRAG	1	742	90	32	24	24	100	13	11	I	24	100	10	24	I	0	ACCEPTABLE
2003	SPRAG	2	25	25	15	13	13	100	13	8	I	13	100	10	13	I	0	ACCEPTABLE
2003	SPRAG	3	3	3	3	3	3	100	0	3	I	3	100	0	3	I	0	FAMILY DEPLETED
2004	ACTAR	1	14	14	0	0	0	NaN	N/A	7	IV	0	NaN	N/A	7	IV	0	ACCEPTABLE
2004	AMERI	1	13839	200	37	21	21	100	14	11	I	21	100	<<>>	24	IV	0	ACCEPTABLE
2004	AMERI	3	365	80	0	0	0	NaN	N/A	40	IV	0	NaN	N/A	40	IV	0	ACCEPTABLE
2004	ROCKW	1	401	80	2	1	1	100	<<>>	11	IV	1	100	<<>>	23	IV	0	ACCEPTABLE
2004	ROCKW	2	369	80	2	1	1	100	<<>>	11	IV	1	100	<<>>	23	IV	0	ACCEPTABLE
2004	ROOTS	3	5	5	0	0	0	NaN	N/A	3	N/A	0	NaN	N/A	3	N/A	0	ACCEPTABLE
2004	SPRAG	1	123	60	5	2	2	100	<<>>	10	IV	2	100	<<>>	20	IV	0	ACCEPTABLE
2004	SPRAG	2	15	15	1	1	1	100	<<>>	7	IV	1	100	<<>>	10	IV	0	ACCEPTABLE
2004	SPRAG	3	105	60	1	1	1	100	<<>>	10	IV	1	100	<<>>	20	IV	0	ACCEPTABLE
2005	ACTAR	1	4	4	0	0	0	NaN	N/A	2	N/A	0	NaN	N/A	2	N/A	0	ACCEPTABLE
2005	AMERI	1	13888	200	39	17	17	100	16	11	I	17	100	<<>>	24	IV	0	ACCEPTABLE
2005	AMERI	3	298	80	3	2	2	100	<<>>	10	IV	2	100	<<>>	23	IV	0	ACCEPTABLE
2005	ROCKW	1	262	70	2	1	1	100	<<>>	10	IV	1	100	<<>>	22	IV	0	ACCEPTABLE
2005	ROCKW	2	527	90	5	4	4	100	<<>>	11	IV	4	100	<<>>	23	IV	0	ACCEPTABLE

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**2013 METER SAMPLING PROGRAM**  
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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
2005	SPRAG	1	252	70	2	1	1	100	<<>>	10	IV	1	100	<<>>	22	IV	0	ACCEPTABLE
2005	SPRAG	2	27	27	2	2	2	100	<<>>	8	IV	2	100	<<>>	13	IV	0	ACCEPTABLE
2005	SPRAG	3	54	40	1	1	1	100	<<>>	9	IV	1	100	<<>>	17	IV	0	ACCEPTABLE
2006	ACTAR	1	1	1	0	0	0	NaN	N/A	1	N/A	0	NaN	N/A	1	N/A	0	ACCEPTABLE
2006	AMERI	1	13502	200	37	16	16	100	16	11	I	16	100	<<>>	24	IV	0	ACCEPTABLE
2006	AMERI	3	448	80	1	0	0	NaN	N/A	40	IV	0	NaN	N/A	40	IV	0	ACCEPTABLE
2006	ROCKW	1	146	60	2	2	2	100	<<>>	10	IV	2	100	<<>>	21	IV	0	ACCEPTABLE
2006	ROCKW	2	527	90	6	4	4	100	<<>>	11	IV	4	100	<<>>	23	IV	0	ACCEPTABLE
2006	SPRAG	1	187	70	0	0	0	NaN	N/A	35	IV	0	NaN	N/A	35	IV	0	ACCEPTABLE
2006	SPRAG	2	11	11	1	0	0	NaN	N/A	6	IV	0	NaN	N/A	6	IV	0	ACCEPTABLE
2006	SPRAG	3	255	70	6	6	6	100	<<>>	10	IV	6	100	<<>>	22	IV	0	ACCEPTABLE
2007	ACTAR	1	16	16	0	0	0	NaN	N/A	8	IV	0	NaN	N/A	8	IV	0	ACCEPTABLE
2007	AMERI	1	2662	100	12	7	7	100	<<>>	11	IV	7	100	<<>>	24	IV	0	ACCEPTABLE
2007	AMERI	3	222	70	2	2	2	100	<<>>	10	IV	2	100	<<>>	22	IV	0	ACCEPTABLE
2007	ROCKW	1	314	80	2	1	1	100	<<>>	10	IV	1	100	<<>>	23	IV	0	ACCEPTABLE
2007	ROCKW	2	375	80	3	2	2	100	<<>>	11	IV	2	100	<<>>	23	IV	0	ACCEPTABLE
2007	ROOTS	3	1	1	0	0	0	NaN	N/A	1	N/A	0	NaN	N/A	1	N/A	0	ACCEPTABLE

**Cascade Natural Gas Corp.**  
**2013 METER SAMPLING PROGRAM**  
**YEAR END 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
2007	SPRAG	1	314	80	3	3	3	100	<<>>	10	IV	3	100	<<>>	23	IV	0	ACCEPTABLE
2007	SPRAG	2	26	26	1	0	0	NaN	N/A	13	IV	0	NaN	N/A	13	IV	0	ACCEPTABLE
2007	SPRAG	3	54	40	0	0	0	NaN	N/A	20	IV	0	NaN	N/A	20	IV	0	ACCEPTABLE
2008	ACTAR	1	3	3	0	0	0	NaN	N/A	2	N/A	0	NaN	N/A	2	N/A	0	ACCEPTABLE
2008	AMERI	1	12249	200	39	23	23	100	14	11	I	23	100	10	24	IV	0	ACCEPTABLE
2008	AMERI	3	641	90	8	7	7	100	<<>>	11	IV	7	100	<<>>	23	IV	0	ACCEPTABLE
2008	ROCKW	1	245	70	2	2	2	100	<<>>	10	IV	2	100	<<>>	22	IV	0	ACCEPTABLE
2008	ROCKW	2	680	90	4	3	3	100	<<>>	11	IV	3	100	<<>>	24	IV	0	ACCEPTABLE
2008	ROOTS	3	1	1	1	1	1	100	0	1	I	1	100	0	1	I	0	FAMILY DEPLETED
2008	SPRAG	1	93	50	1	1	1	100	<<>>	10	IV	1	100	<<>>	19	IV	0	ACCEPTABLE
2008	SPRAG	2	23	23	1	1	1	100	<<>>	8	IV	1	100	<<>>	12	IV	0	ACCEPTABLE
2008	SPRAG	3	41	40	1	1	1	100	<<>>	9	IV	1	100	<<>>	16	IV	0	ACCEPTABLE
2009	ACTAR	1	16	16	0	0	0	NaN	N/A	8	IV	0	NaN	N/A	8	IV	0	ACCEPTABLE
2009	AMERI	1	4912	125	7	5	5	100	<<>>	11	IV	5	100	<<>>	24	IV	0	ACCEPTABLE
2009	AMERI	3	390	80	3	3	3	100	<<>>	11	IV	3	100	<<>>	23	IV	0	ACCEPTABLE
2009	ROCKW	1	506	90	0	0	0	NaN	N/A	45	IV	0	NaN	N/A	45	IV	0	ACCEPTABLE
2009	ROCKW	2	576	90	7	3	3	100	<<>>	11	IV	3	100	<<>>	23	IV	0	ACCEPTABLE

**Cascade Natural Gas Corp.**  
**2013 METER SAMPLING PROGRAM**  
**YEAR END 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
2009	SPRAG	1	499	80	5	3	3	100	<<>>	11	IV	3	100	<<>>	23	IV	0	ACCEPTABLE
2009	SPRAG	2	17	17	0	0	0	NaN	N/A	9	IV	0	NaN	N/A	9	IV	0	ACCEPTABLE
2009	SPRAG	3	52	40	0	0	0	NaN	N/A	20	IV	0	NaN	N/A	20	IV	0	ACCEPTABLE
2010	ACTAR	1	3	3	0	0	0	NaN	N/A	2	N/A	0	NaN	N/A	2	N/A	0	ACCEPTABLE
2010	AMERI	1	3598	125	16	13	13	100	18	11	I	13	100	<<>>	24	IV	0	ACCEPTABLE
2010	AMERI	2	1	1	0	0	0	NaN	N/A	1	N/A	0	NaN	N/A	1	N/A	0	ACCEPTABLE
2010	AMERI	3	498	80	2	2	2	100	<<>>	11	IV	2	100	<<>>	23	IV	0	ACCEPTABLE
2010	ROCKW	1	250	70	1	1	1	100	<<>>	10	IV	1	100	<<>>	22	IV	0	ACCEPTABLE
2010	ROCKW	2	224	70	3	2	2	100	<<>>	10	IV	2	100	<<>>	22	IV	0	ACCEPTABLE
2010	SPRAG	1	342	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	152	70	3	3	3	100	<<>>	10	IV	3	100	<<>>	21	IV	0	ACCEPTABLE
2011	ACTAR	1	6	6	0	0	0	NaN	N/A	3	N/A	0	NaN	N/A	3	N/A	0	ACCEPTABLE
2011	AMERI	1	4186	125	14	9	9	100	<<>>	11	IV	9	100	<<>>	24	IV	0	ACCEPTABLE
2011	AMERI	3	210	70	2	2	2	100	<<>>	10	IV	2	100	<<>>	22	IV	0	ACCEPTABLE
2011	ROCKW	1	237	70	2	1	1	100	<<>>	10	IV	1	100	<<>>	22	IV	0	ACCEPTABLE
2011	ROCKW	2	589	90	3	3	3	100	<<>>	11	IV	3	100	<<>>	23	IV	0	ACCEPTABLE



**Cascade Natural Gas Corp.**  
**2013 METER SAMPLING PROGRAM**  
**YEAR END 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
2011	ROOTS	2	1	1	0	0	0	NaN	N/A	1	N/A	0	NaN	N/A	1	N/A	0	ACCEPTABLE
2011	SPRAG	1	253	70	1	1	1	100	<<>>	10	IV	1	100	<<>>	22	IV	0	ACCEPTABLE
2011	SPRAG	2	20	20	0	0	0	NaN	N/A	10	IV	0	NaN	N/A	10	IV	0	ACCEPTABLE
2011	SPRAG	3	26	26	0	0	0	NaN	N/A	13	IV	0	NaN	N/A	13	IV	0	ACCEPTABLE
2012	ACTAR	1	22	22	0	0	0	NaN	N/A	11	IV	0	NaN	N/A	11	IV	0	ACCEPTABLE
2012	AMERI	1	578	90	14	6	6	100	<<>>	11	IV	6	100	<<>>	23	IV	0	ACCEPTABLE
2012	AMERI	3	134	60	5	4	4	100	<<>>	10	IV	4	100	<<>>	21	IV	0	ACCEPTABLE
2012	ROCKW	1	184	70	0	0	0	NaN	N/A	35	IV	0	NaN	N/A	35	IV	0	ACCEPTABLE
2012	ROCKW	2	107	60	10	7	7	100	<<>>	10	IV	7	100	<<>>	20	IV	0	ACCEPTABLE
2012	SPRAG	1	162	70	7	0	0	NaN	N/A	35	IV	0	NaN	N/A	35	IV	0	ACCEPTABLE
2012	SPRAG	2	15	15	1	0	0	NaN	N/A	8	IV	0	NaN	N/A	8	IV	0	ACCEPTABLE
2012	SPRAG	3	7	7	2	1	1	100	N/A	7	N/A	1	100	N/A	7	N/A	0	ACCEPTABLE
GRAND TOTALS			270265		2944	2361		2361				2361					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**

*No meter families in service ten or more years were found below the acceptable threshold.*

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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**

*No meters were previously scheduled for removal in 2013*

<b>Meter Family</b>	<b>Disposition Status</b>	<b>Year Disposition Initiated</b>	<b>Year Disposition Completed</b>
N/A			

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**APPENDIX**

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Cascade Natural Gas Corporation  
**Statistical Sample Program**  
August 18, 1995

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## APPENDIX

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### **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 type, and test year. At the option of the company, meters in any family may be further subdivided according to 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 1 October and end on 30 September of the following year.<sup>1</sup>

### **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.

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

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<sup>1</sup> The plan year changed to a calendar year in Oct 2010 to conform to requirement of new CIS system.

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## APPENDIX

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- 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

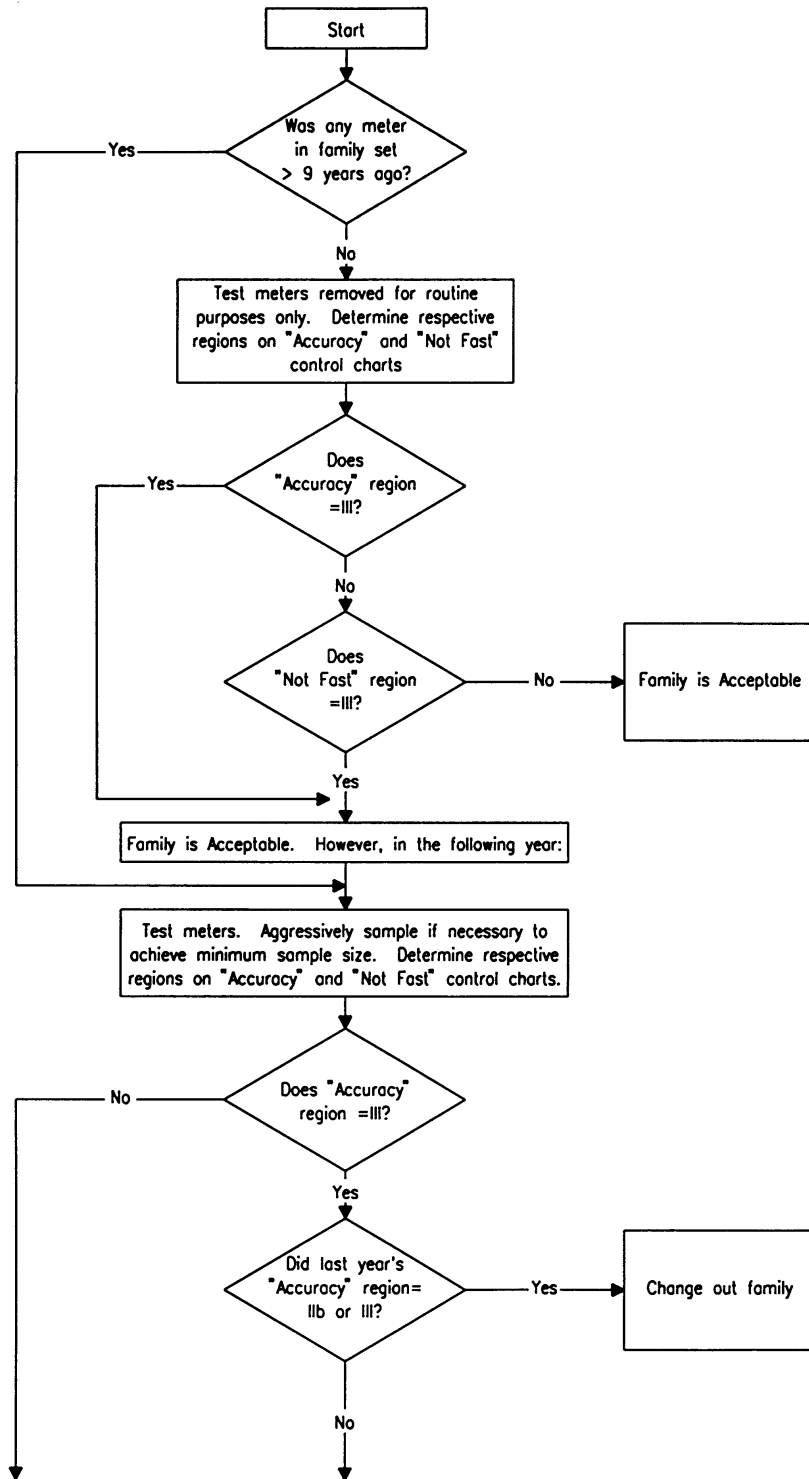
### **Meter Family Disposition**

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

- a. 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.
- b. 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.
- c. If the region is determined to be "IV" on either the "Accuracy" control chart or "Not Fast" control chart, an additional random sample will be obtained sufficient so the region determined from the combined sample data is not "IV".
- d. 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.
- e. Meters in families determined to be acceptable will be allowed to remain in service, subject to sample testing and review in succeeding years.
- f. Meters in families that are subject to change-out at the company's option will be reviewed and a decision on whether they are to be removed will be made based on economic and operating factors. If the meters remain in service, they will be subject to sample testing and review in succeeding years.
- g. Meters in families determined to require change-out will be changed by October of the second year following determination of the need for change-out (i.e. two years following the program year when the samples were taken.) However, if in any given year the total number of meters required for change-out 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).



## Decision Tree for Meter Families in Meter Sample Program



Continued on following page

Figure 3.a.

APPENDIX

Continued from previous page

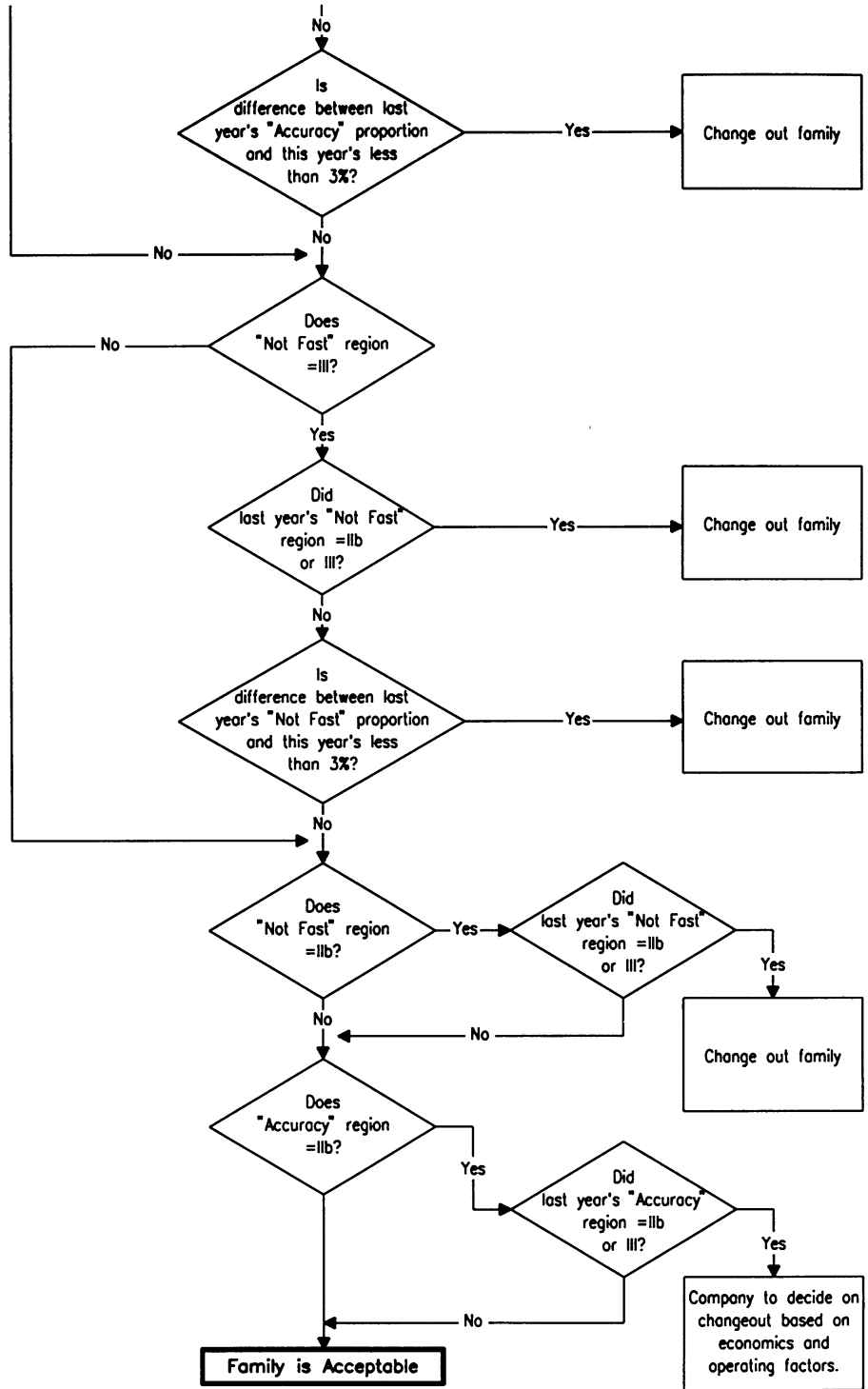
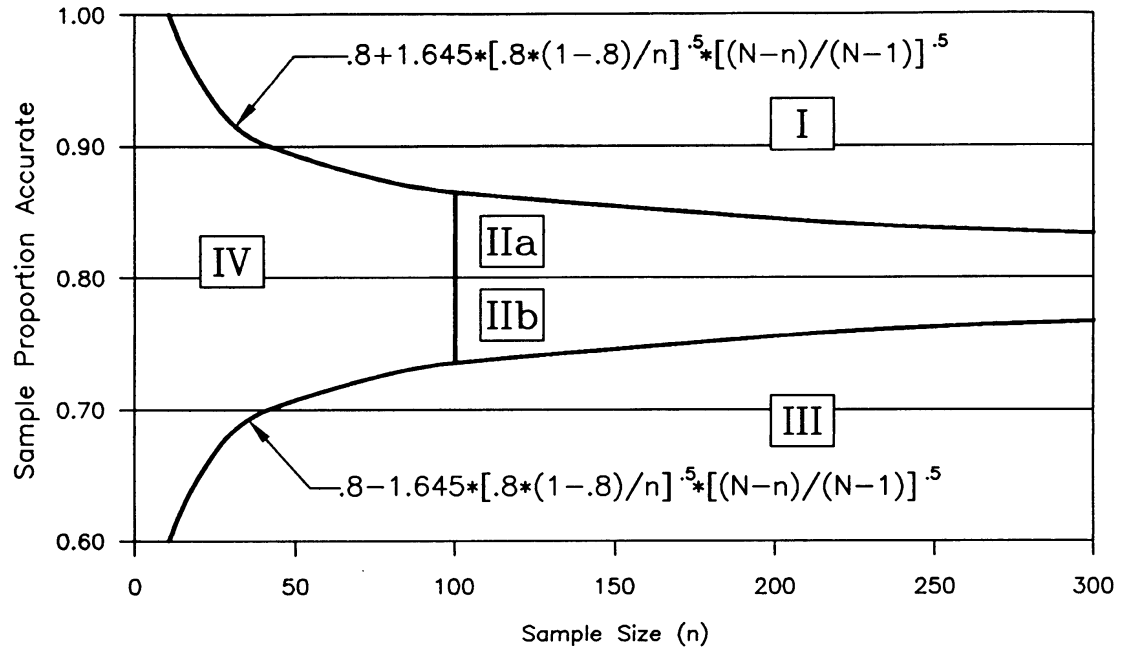


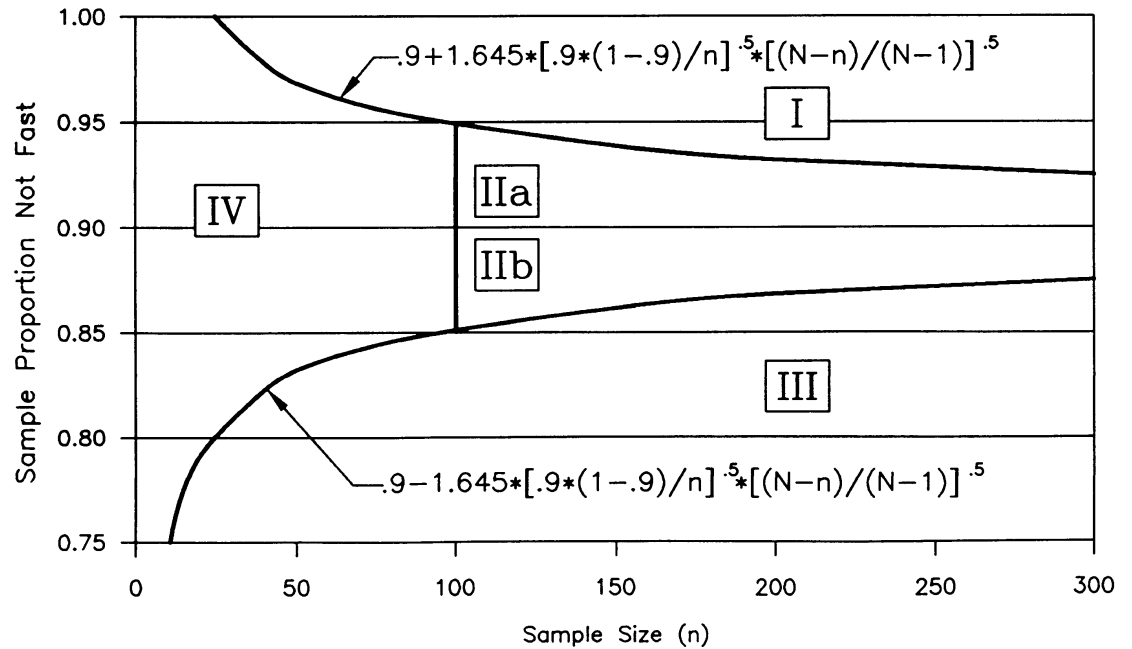
Figure 3.b.

## Meter Performance Control Charts

**Figure 1. For Meters Accurate**



**Figure 2. For Meters Not Fast**



\*Example where family size (N) = 3000