CASCADE NATURAL GAS

GAS METER STATISTICAL SAMPLING PROGRAM

2015 RESULTS

GAS METER STATISTICAL SAMPLING PROGRAM

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SCOPE

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, 2015 through December 31, 2015.

Sampling Summary

Meters in the program at the beginning of the plan year	*277,983*
Meters in the program at the end of the plan year	*281,919*
Total meters removed during the year	*5,949*
Meters qualifying for analysis (not uniquely defective)	*4,694*
Uniquely defective meters	*1,255*
Meters statistically required for analysis (>10 yrs in svc)	*3,697*
Meters provided through random selection (>10 yrs in svc)	*997*

GENERAL

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 ±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).

DEFINITIONS

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.

DOMESTIC METERS 1000 CFH AND SMALLER

SUMMARY

Beginning of Report Year 2015, In-Service Meters on 1/1/15

Total Number of Meters For Random Sampling	***277,983***
Total Number of Test Families [(a)]	***175***
Number of Test Families ≥ 10 yrs old [(b)]	***98***
Number of Test Families to be Voluntarily Removed for Admin. Purposes[(c)]	**0**

End of Report Year 2015 Meter Testing Quantities & Results

Number of Meters Tested	***4,694***
Number of Meters Passed, (+/-) 2%	***4,400***
Number of Meters Failed, (+/-) 2%	***294***
Number of Meters, Uniquely Defective Test Result, (+/-) 10%	***1,255***
Meter Families With an Overall Fail Result	***11***
Meter Families With a Fast Fail Result	***11***
Meter Families Removed/Depleted During Report Year [(d)]	***8***

Transition to 2016 Test Year

Total Number of Meters For Random Sampling	**281,919**
Total Number of Test Families [(a)]	**176**
Number of Test Families ≥ 10 yrs old [(b)]	**99**
Number of Test Families to be Voluntarily Removed for Admin. Purposes[(c)]	**11**

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 ≥ 10 years old (i.e. includes meters manufactured in the year 2006 and earlier for the 2016 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.

DOMESTIC METERS 1000 CFH AND SMALLER

SUMMARY

METER FAMILY TEST RESULTS

Cascade Natural Gas Corp.

2015 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
1982	ROCKW	1	28	28	16	14	14	100	13	8	I	14	100	9	13	I	0	ACCEPTABLE
1982	SPRAG	1	54	40	43	37	32	86	6	37	I	37	100	5	17	I	0	ACCEPTABLE
1983	SPRAG	1	332	80	94	83	78	93	6	24	I	83	100	5	23	I	0	ACCEPTABLE*
1986	AMERI	1	611	90	94	91	84	92	6	29	I	84	92	5	90	IIa	0	ACCEPTABLE
1986	ROCKW	1	1614	100	114	100	93	92	6	30	I	97	96	5	65	I	0	ACCEPTABLE
1986	SPRAG	1	1027	90	35	28	28	100	12	11	I	28	100	9	24	I	0	ACCEPTABLE
1987	AMERI	1	2386	100	83	69	67	97	8	15	I	67	97	6	49	I	0	ACCEPTABLE
1987	ROCKW	1	2793	100	116	100	94	94	6	22	I	94	94	5	100	IIa	0	ACCEPTABLE
1987	SPRAG	1	1110	90	44	30	30	100	12	11	I	30	100	9	24	I	0	ACCEPTABLE
1988	AMERI	1	3288	125	47	33	33	100	11	11	I	33	100	9	24	I	0	ACCEPTABLE
1988	ROCKW	1	2382	100	126	100	90	90	6	43	I	93	92	5	100	IIa	0	ACCEPTABLE
1988	SPRAG	1	1826	100	60	35	33	94	11	22	I	35	100	8	24	I	0	ACCEPTABLE
1989	AMERI	1	5123	125	63	49	48	97	9	15	I	48	97	7	49	I	0	ACCEPTABLE
1989	ROCKW	1	4862	125	87	61	59	96	8	17	I	60	98	6	38	I	0	ACCEPTABLE
1989	SPRAG	1	3102	100	83	52	49	94	9	22	I	52	100	7	24	I	0	ACCEPTABLE
1990	AMERI	1	3788	125	52	40	40	100	10	11	I	40	100	8	24	I	0	ACCEPTABLE
1990	ROCKW	1	5509	125	64	41	41	100	10	11	I	41	100	8	24	I	0	ACCEPTABLE

1990	SPRAG	1	2538	100	60	43	40	93	10	25	I	43	100	7	24	I	0	ACCEPTABLE
1991	AMERI	1	4486	125	42	27	26	96	13	17	I	27	100	9	24	I	0	ACCEPTABLE
1991	ROCKW	1	3222	125	83	68	60	88	8	66	I	67	98	6	38	I	0	ACCEPTABLE
1991	SPRAG	1	2133	100	126	102	89	87	6	85	I	102	100	5	24	I	0	ACCEPTABLE
1992	AMERI	1	2978	100	66	53	52	98	9	13	I	52	98	7	38	I	0	ACCEPTABLE
1992	ROCKW	1	7943	125	77	43	43	100	10	11	I	43	100	8	24	I	0	ACCEPTABLE
1992	SPRAG	1	1691	100	47	31	29	93	12	25	I	31	100	9	24	I	0	ACCEPTABLE
1993	AMERI	1	3321	125	49	35	35	100	11	11	I	35	100	8	24	I	0	ACCEPTABLE
1993	AMERI	3	6	6	6	6	4	66	0	6	III	4	66	0	6	III	0	FAMILY DEPLETED
1993	ROCKW	1	5674	125	73	38	37	97	11	15	I	38	100	8	24	I	0	ACCEPTABLE
1993	ROCKW	2	26	26	26	25	22	88	4	20	I	23	92	3	26	I	0	FAMILY DEPLETED
1993	SPRAG	1	5851	125	88	49	48	97	9	15	I	49	100	7	24	I	0	ACCEPTABLE
1994	AMERI	1	5443	125	54	36	36	100	11	11	I	36	100	8	24	I	0	ACCEPTABLE
1994	AMERI	3	18	18	15	15	12	80	7	18	IV	12	80	5	11	III	0	RECALL FAMILY
1994	ROCKW	1	4021	125	68	42	42	100	10	11	I	42	100	8	24	I	0	ACCEPTABLE
1994	SPRAG	1	5773	125	86	49	45	91	9	36	I	48	97	7	49	I	0	ACCEPTABLE
1995	AMERI	1	3175	100	42	29	29	100	12	11	I	29	100	9	24	I	0	ACCEPTABLE
1995	AMERI	3	17	17	11	11	6	54	12	5	III	6	54	9	2	III	0	RECALL FAMILY
1995	ROCKW	1	2506	100	174	125	122	97	6	15	I	122	97	4	49	I	0	ACCEPTABLE*
1995	ROCKW	2	32	32	16	14	11	78	13	31	IV	11	78	10	11	III	0	RECALL FAMILY
1995	SPRAG	1	10257	200	96	61	61	100	8	11	I	61	100	6	24	I	0	ACCEPTABLE
1996	AMERI	1	392	80	83	76	74	97	7	14	I	74	97	5	44	I	0	ACCEPTABLE
1996	AMERI	3	13	13	11	11	8	72	8	11	III	8	72	6	5	III	0	RECALL FAMILY
1996	ROCKW	1	948	90	29	25	24	96	13	17	I	25	100	10	24	I	0	ACCEPTABLE

1996	ROCKW	2	34	34	26	20	15	74	10	27	IV	15	74	7	8	III	0	RECALL FAMILY
1996	SPRAG	1	4382	125	71	52	52	100	9	11	I	52	100	7	24	I	0	ACCEPTABLE
1997	AMERI	1	93	50	57	49	47	95	7	16	I	47	95	5	48	I	0	ACCEPTABLE
1997	AMERI	3	47	40	39	38	33	86	5	34	I	33	86	4	36	III	0	RECALL FAMILY
1997	ROCKW	1	458	80	28	23	23	100	13	11	I	23	100	10	23	I	0	ACCEPTABLE
1997	ROCKW	2	73	50	59	50	43	86	5	46	I	44	88	4	50	IIb	0	MONITOR IN 2016
1997	SPRAG	1	6950	125	67	42	42	100	10	11	I	42	100	8	24	I	0	ACCEPTABLE
1998	AMERI	1	508	90	33	25	25	100	13	11	I	25	100	10	23	I	0	ACCEPTABLE
1998	AMERI	3	6	6	6	6	4	66	0	6	III	4	66	0	6	III	0	FAMILY DEPLETED
1998	ROCKW	1	7536	125	151	128	120	93	6	26	I	120	93	4	125	IIa	0	ACCEPTABLE
1998	ROCKW	2	208	70	55	43	35	81	9	70	IV	36	83	7	40	III	0	RECALL FAMILY
1998	SPRAG	1	760	90	34	26	25	96	13	17	I	26	100	10	24	I	0	ACCEPTABLE
1999	AMERI	1	7179	125	67	49	48	97	9	15	I	48	97	7	49	I	0	ACCEPTABLE
1999	AMERI	3	172	70	94	90	88	97	5	14	I	88	97	4	39	I	0	ACCEPTABLE*
1999	ROCKW	1	510	90	30	26	26	100	13	11	I	26	100	9	23	I	0	ACCEPTABLE
1999	ROCKW	2	85	50	43	41	33	80	7	50	IV	34	82	6	26	III	0	RECALL FAMILY
1999	SPRAG	1	470	80	30	24	24	100	13	11	I	24	100	10	23	I	0	ACCEPTABLE
2000	AMERI	1	8299	125	68	39	39	100	11	11	I	39	100	8	24	I	0	ACCEPTABLE
2000	AMERI	3	151	70	71	70	65	92	6	25	I	65	92	4	70	IIa	0	ACCEPTABLE
2000	ROCKW	1	918	90	34	26	26	100	13	11	I	26	100	10	24	I	0	ACCEPTABLE
2000	ROCKW	2	146	60	49	46	36	78	8	60	IV	36	78	6	15	III	0	RECALL FAMILY
2000	SPRAG	1	63	40	20	19	19	100	13	9	I	19	100	10	18	I	0	ACCEPTABLE
2000	SPRAG	3	1	1	1	1	1	100	0	1	I	1	100	0	1	I	0	FAMILY DEPLETED
2001	AMERI	1	6608	125	48	32	32	100	12	11	I	32	100	9	24	I	0	ACCEPTABLE

2001	AMERI	3	295	80	83	82	73	89	6	45	I	73	89	5	80	IIb	0	MONITOR IN 2016
2001	ROCKW	1	176	70	24	21	21	100	14	10	I	21	100	10	21	I	0	ACCEPTABLE
2001	ROCKW	2	259	70	44	42	41	97	9	14	I	41	97	7	42	I	0	ACCEPTABLE
2001	SPRAG	1	1160	90	32	26	26	100	13	11	I	26	100	10	24	I	0	ACCEPTABLE
2001	SPRAG	3	28	28	26	24	21	87	5	21	I	23	95	4	22	I	0	ACCEPTABLE
2002	ACTAR	1	883	90	29	25	25	100	13	11	I	25	100	10	24	I	0	ACCEPTABLE
2002	AMERI	1	7980	125	190	165	154	93	5	26	I	154	93	4	125	IIa	0	ACCEPTABLE
2002	AMERI	3	189	70	72	70	64	91	6	30	I	64	91	5	70	IIa	0	ACCEPTABLE
2002	ROCKW	1	764	90	33	26	26	100	13	11	I	26	100	10	24	I	0	ACCEPTABLE
2002	ROCKW	2	451	80	27	27	27	100	12	11	I	27	100	9	23	I	0	ACCEPTABLE
2002	SPRAG	1	443	80	34	26	26	100	13	11	I	26	100	9	23	I	0	ACCEPTABLE
2003	AMERI	1	9657	125	171	148	120	81	5	125	IIa	120	81	4	30	III	0	RECALL FAMILY
2003	AMERI	3	424	80	86	83	74	89	6	48	I	74	89	5	80	IIb	0	MONITOR IN 2016
2003	ROCKW	1	344	80	78	73	71	97	7	14	I	71	97	5	44	I	0	ACCEPTABLE
2003	ROCKW	2	187	70	26	23	23	100	13	10	I	23	100	10	22	I	0	ACCEPTABLE
2003	SPRAG	1	680	90	34	31	29	93	12	25	I	31	100	9	24	I	0	ACCEPTABLE
2003	SPRAG	2	2	2	2	1	1	100	0	2	I	1	100	0	2	I	0	FAMILY DEPLETED
2004	ACTAR	1	4	4	4	4	4	100	0	4	I	4	100	0	4	I	0	FAMILY DEPLETED
2004	AMERI	1	13725	200	275	233	198	84	4	200	I	198	84	3	67	III	0	RECALL FAMILY
2004	AMERI	3	335	80	29	27	27	100	12	11	I	27	100	9	23	I	0	ACCEPTABLE
2004	ROCKW	1	374	80	80	77	76	98	7	13	I	76	98	5	35	I	0	ACCEPTABLE
2004	ROCKW	2	343	80	77	74	71	95	7	18	I	72	97	5	44	I	0	ACCEPTABLE
2004	SPRAG	1	96	50	24	22	22	100	12	10	I	22	100	9	20	I	0	ACCEPTABLE
2004	SPRAG	2	5	5	5	5	5	100	0	5	I	5	100	0	5	I	0	FAMILY DEPLETED

2004	SPRAG	3	82	50	36	35	33	94	8	18	I	34	97	6	31	I	0	ACCEPTABLE
2005	ACTAR	1	4	4	4	3	3	100	0	4	I	3	100	0	4	I	0	FAMILY DEPLETED
2005	AMERI	1	13762	200	117	77	74	96	7	17	I	74	96	6	67	I	0	ACCEPTABLE**
2005	AMERI	3	289	80	29	28	28	100	12	10	I	28	100	9	23	I	0	ACCEPTABLE**
2005	ROCKW	1	257	70	23	23	23	100	13	10	I	23	100	10	22	I	0	ACCEPTABLE
2005	ROCKW	2	515	90	28	24	24	100	13	11	I	24	100	10	23	I	0	ACCEPTABLE
2005	SPRAG	1	246	70	28	28	28	100	12	10	I	28	100	9	22	I	0	ACCEPTABLE
2005	SPRAG	2	25	25	19	16	16	100	10	8	I	16	100	8	13	I	0	ACCEPTABLE
2005	SPRAG	3	52	40	34	30	29	96	8	13	I	29	96	6	30	I	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	13389	200	73	38	37	97	11	15	I	37	97	8	50	IV	0	ACCEPTABLE
2006	AMERI	3	439	80	0	0	0	NaN	N/A	40	IV	0	NaN	N/A	40	IV	0	ACCEPTABLE
2006	ROCKW	1	142	60	2	1	1	100	<<>>	10	IV	1	100	<<>>	21	IV	0	ACCEPTABLE
2006	ROCKW	2	514	90	12	8	8	100	<<>>	11	IV	8	100	<<>>	23	IV	0	ACCEPTABLE
2006	SPRAG	1	185	70	4	1	1	100	<<>>	10	IV	1	100	<<>>	22	IV	0	ACCEPTABLE
2006	SPRAG	2	11	11	0	0	0	NaN	N/A	6	IV	0	NaN	N/A	6	IV	0	ACCEPTABLE
2006	SPRAG	3	243	70	9	5	5	100	<<>>	10	IV	5	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	2640	100	13	7	7	100	<<>>	11	IV	7	100	<<>>	24	IV	0	ACCEPTABLE
2007	AMERI	3	215	70	2	2	2	100	<<>>	10	IV	2	100	<<>>	22	IV	0	ACCEPTABLE
2007	ROCKW	1	312	80	2	0	0	NaN	N/A	40	IV	0	NaN	N/A	40	IV	0	ACCEPTABLE
2007	ROCKW	2	370	80	3	1	1	100	<<>>	11	IV	1	100	<<>>	23	IV	0	ACCEPTABLE
2007	SPRAG	1	309	80	4	0	0	NaN	N/A	40	IV	0	NaN	N/A	40	IV	0	ACCEPTABLE
2007	SPRAG	2	26	26	1	1	1	100	<<>>	8	IV	1	100	<<>>	13	IV	0	ACCEPTABLE

2007	SPRAG	3	51	40	1	1	1	100	<<>>	9	IV	1	100	<<>>	17	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	12187	200	63	44	44	100	10	11	I	44	100	7	24	I	0	ACCEPTABLE
2008	AMERI	3	619	90	8	6	6	100	<<>>	11	IV	6	100	<<>>	23	IV	0	ACCEPTABLE
2008	ROCKW	1	239	70	1	0	0	NaN	N/A	35	IV	0	NaN	N/A	35	IV	0	ACCEPTABLE
2008	ROCKW	2	668	90	6	4	4	100	<<>>	11	IV	4	100	<<>>	24	IV	0	ACCEPTABLE
2008	ROOTS	3	1	1	0	0	0	NaN	N/A	1	N/A	0	NaN	N/A	1	N/A	0	ACCEPTABLE
2008	SPRAG	1	90	50	0	0	0	NaN	N/A	25	IV	0	NaN	N/A	25	IV	0	ACCEPTABLE
2008	SPRAG	2	21	21	0	0	0	NaN	N/A	11	IV	0	NaN	N/A	11	IV	0	ACCEPTABLE
2008	SPRAG	3	39	39	0	0	0	NaN	N/A	20	IV	0	NaN	N/A	20	IV	0	ACCEPTABLE
2009	ACTAR	1	15	15	1	0	0	NaN	N/A	8	IV	0	NaN	N/A	8	IV	0	ACCEPTABLE
2009	AMERI	1	4895	125	24	12	12	100	19	11	I	12	100	<<>>	24	IV	0	ACCEPTABLE
2009	AMERI	3	381	80	0	0	0	NaN	N/A	40	IV	0	NaN	N/A	40	IV	0	ACCEPTABLE
2009	ROCKW	1	503	90	1	1	1	100	<<>>	11	IV	1	100	<<>>	23	IV	0	ACCEPTABLE
2009	ROCKW	2	561	90	5	4	4	100	<<>>	11	IV	4	100	<<>>	23	IV	0	ACCEPTABLE
2009	SPRAG	1	482	80	11	7	7	100	<<>>	11	IV	7	100	<<>>	23	IV	0	ACCEPTABLE
2009	SPRAG	2	17	17	2	1	1	100	<<>>	7	IV	1	100	<<>>	10	IV	0	ACCEPTABLE
2009	SPRAG	3	39	39	2	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	3558	125	23	14	14	100	18	11	I	14	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	492	80	9	6	6	100	<<>>	11	IV	6	100	<<>>	23	IV	0	ACCEPTABLE
2010	ROCKW	1	246	70	1	0	0	NaN	N/A	35	IV	0	NaN	N/A	35	IV	0	ACCEPTABLE
2010	ROCKW	2	215	70	1	1	1	100	<<>>	10	IV	1	100	<<>>	22	IV	0	ACCEPTABLE

2010	SPRAG	1	333	80	3	1	1	100	<<>>	11	IV	1	100	<<>>	23	IV	0	ACCEPTABLE
2010	SPRAG	2	13	13	0	0	0	NaN	N/A	7	IV	0	NaN	N/A	7	IV	0	ACCEPTABLE
2010	SPRAG	3	154	70	5	5	5	100	<<>>	10	IV	5	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	4740	125	24	16	16	100	16	11	I	16	100	<<>>	24	IV	0	ACCEPTABLE
2011	AMERI	3	358	80	3	3	3	100	<<>>	11	IV	3	100	<<>>	23	IV	0	ACCEPTABLE
2011	ROCKW	1	231	70	1	0	0	NaN	N/A	35	IV	0	NaN	N/A	35	IV	0	ACCEPTABLE
2011	ROCKW	2	695	90	15	10	10	100	<<>>	11	IV	10	100	<<>>	24	IV	0	ACCEPTABLE
2011	SPRAG	1	246	70	1	1	1	100	<<>>	10	IV	1	100	<<>>	22	IV	0	ACCEPTABLE
2011	SPRAG	2	24	24	0	0	0	NaN	N/A	12	IV	0	NaN	N/A	12	IV	0	ACCEPTABLE
2011	SPRAG	3	27	27	1	1	1	100	<<>>	8	IV	1	100	<<>>	13	IV	0	ACCEPTABLE
2012	ACTAR	1	23	23	1	1	1	100	<<>>	8	IV	1	100	<<>>	12	IV	0	ACCEPTABLE
2012	AMERI	1	3804	125	19	12	12	100	19	11	I	12	100	<<>>	24	IV	0	ACCEPTABLE
2012	AMERI	3	221	70	2	1	1	100	<<>>	10	IV	1	100	<<>>	22	IV	0	ACCEPTABLE
2012	ROCKW	1	230	70	5	3	3	100	<<>>	10	IV	3	100	<<>>	22	IV	0	ACCEPTABLE
2012	ROCKW	2	532	90	5	4	4	100	<<>>	11	IV	4	100	<<>>	23	IV	0	ACCEPTABLE
2012	ROOTS	3	1	1	0	0	0	NaN	N/A	1	N/A	0	NaN	N/A	1	N/A	0	ACCEPTABLE
2012	SPRAG	1	230	70	3	3	3	100	<<>>	10	IV	3	100	<<>>	22	IV	0	ACCEPTABLE
2012	SPRAG	2	22	22	1	1	1	100	<<>>	7	IV	1	100	<<>>	12	IV	0	ACCEPTABLE
2012	SPRAG	3	41	40	2	2	2	100	<<>>	9	IV	2	100	<<>>	16	IV	0	ACCEPTABLE
2013	ACTAR	1	23	23	1	1	1	100	<<>>	8	IV	1	100	<<>>	12	IV	0	ACCEPTABLE
2013	AMERI	1	5501	125	33	21	21	100	14	11	I	21	100	<<>>	24	IV	0	ACCEPTABLE
2013	AMERI	2	152	70	1	1	1	100	<<>>	10	IV	1	100	<<>>	21	IV	0	ACCEPTABLE
2013	AMERI	3	443	80	3	2	2	100	<<>>	11	IV	2	100	<<>>	23	IV	0	ACCEPTABLE

2013	ROCKW	1	250	70	1	0	0	NaN	N/A	35	IV	0	NaN	N/A	35	IV	0	ACCEPTABLE
2013	ROCKW	2	193	70	2	0	0	NaN	N/A	35	IV	0	NaN	N/A	35	IV	0	ACCEPTABLE
2013	SPRAG	1	206	70	0	0	0	NaN	N/A	35	IV	0	NaN	N/A	35	IV	0	ACCEPTABLE
2013	SPRAG	2	19	19	0	0	0	NaN	N/A	10	IV	0	NaN	N/A	10	IV	0	ACCEPTABLE
2013	SPRAG	3	79	50	4	3	3	100	<<>>	10	IV	3	100	<<>>	19	IV	0	ACCEPTABLE
2014	ACTAR	1	24	24	0	0	0	NaN	N/A	12	IV	0	NaN	N/A	12	IV	0	ACCEPTABLE
2014	AMERI	1	368	80	7	3	3	100	<<>>	11	IV	3	100	<<>>	23	IV	0	ACCEPTABLE
2014	AMERI	2	55	40	3	2	2	100	<<>>	9	IV	2	100	<<>>	17	IV	0	ACCEPTABLE
2014	AMERI	3	90	50	8	6	6	100	<<>>	10	IV	6	100	<<>>	19	IV	0	ACCEPTABLE
2014	ROCKW	1	2188	100	17	10	10	100	<<>>	11	IV	10	100	<<>>	24	IV	0	ACCEPTABLE
2014	ROCKW	2	185	70	5	2	2	100	<<>>	10	IV	2	100	<<>>	22	IV	0	ACCEPTABLE
2014	ROOTS	3	6	6	0	0	0	NaN	N/A	3	N/A	0	NaN	N/A	3	N/A	0	ACCEPTABLE
2014	SPRAG	1	129	60	4	2	2	100	<<>>	10	IV	2	100	<<>>	21	IV	0	ACCEPTABLE
2014	SPRAG	2	5	5	0	0	0	NaN	N/A	3	N/A	0	NaN	N/A	3	N/A	0	ACCEPTABLE
GRAND TOTALS			277978		5949	4694	4400					4466					0	

*Test results were combined from samples taken in years 2013, 2014 and 2015 to obtain a sufficiently sized sample.

**A sufficiently sized sample was obtained as of August 1, 2015. Additional test results were not required and, therefore, were excluded from sample.

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.

DOMESTIC METERS 1000 CFH AND SMALLER

METER FAMILIES BELOW ACCEPTABLE THRESHOLD LIMITS

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

Meter Family	Disposition Status	Year Disposition Initiated	Planned Year to Complete Disposition
1994 AMERI3	**Recall Family**	**2016**	**2016**
1995 AMERI3	**Recall Family**	**2016**	**2016**
1995 ROCKW2	**Recall Family**	**2016**	**2016**
1996 AMERI3	**Recall Family**	**2016**	**2016**
1996 ROCKW2	**Recall Family**	**2016**	**2016**
1997 AMERI3	**Recall Family**	**2016**	**2016**
1998 ROCKW2	**Recall Family**	**2016**	**2016**
1999 ROCKW2	**Recall Family**	**2016**	**2016**
2000 ROCKW2	**Recall Family**	**2016**	**2016**
2003 AMERI1	**Recall Family**	**2016**	**2017**
2004 AMERI1	**Recall Family**	**2016**	**2017**

DOMESTIC METERS 1000 CFH AND SMALLER

METER FAMILIES WITH INSUFFICIENTLY SIZED SAMPLE

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

RANDOM SAMPLING METER PERFORMANCE DATA

DOMESTIC METERS 1000 CFH AND SMALLER

STATUS OF METER FAMILIES PREVIOUSLY SCHEDULED FOR REMOVAL

No meters were previously scheduled for removal in 2015

Meter Family	Disposition Status	Year Disposition Initiated	Year Disposition Completed
N/A			

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^3/hr.

The maximum permissible error in the registration of meters placed in service is ±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.

APPENDIX

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:

Remaining Family Size			Division line between Regions II(a and b) and IV on the Control Chart
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

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

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

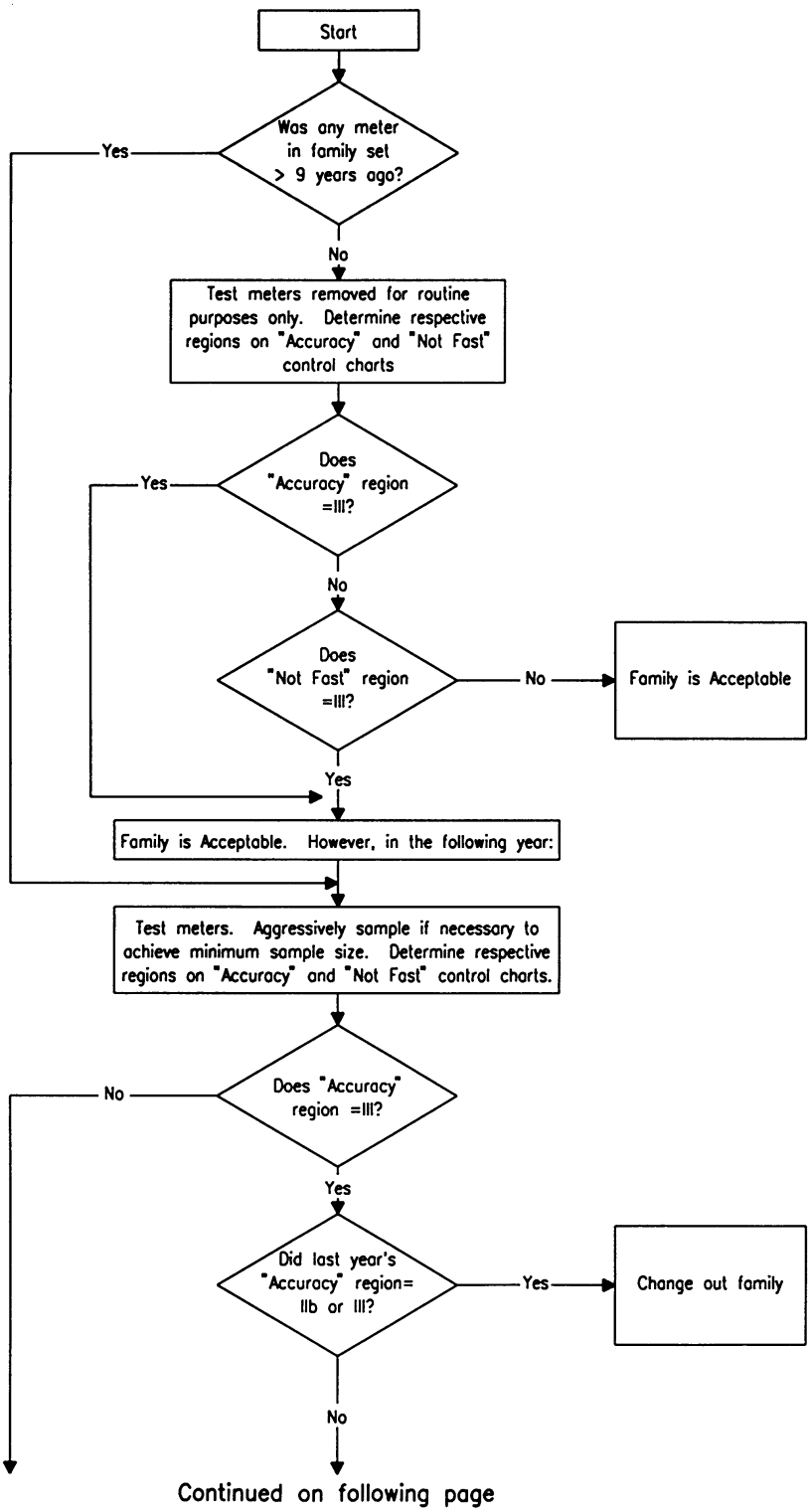


Figure 3.a.

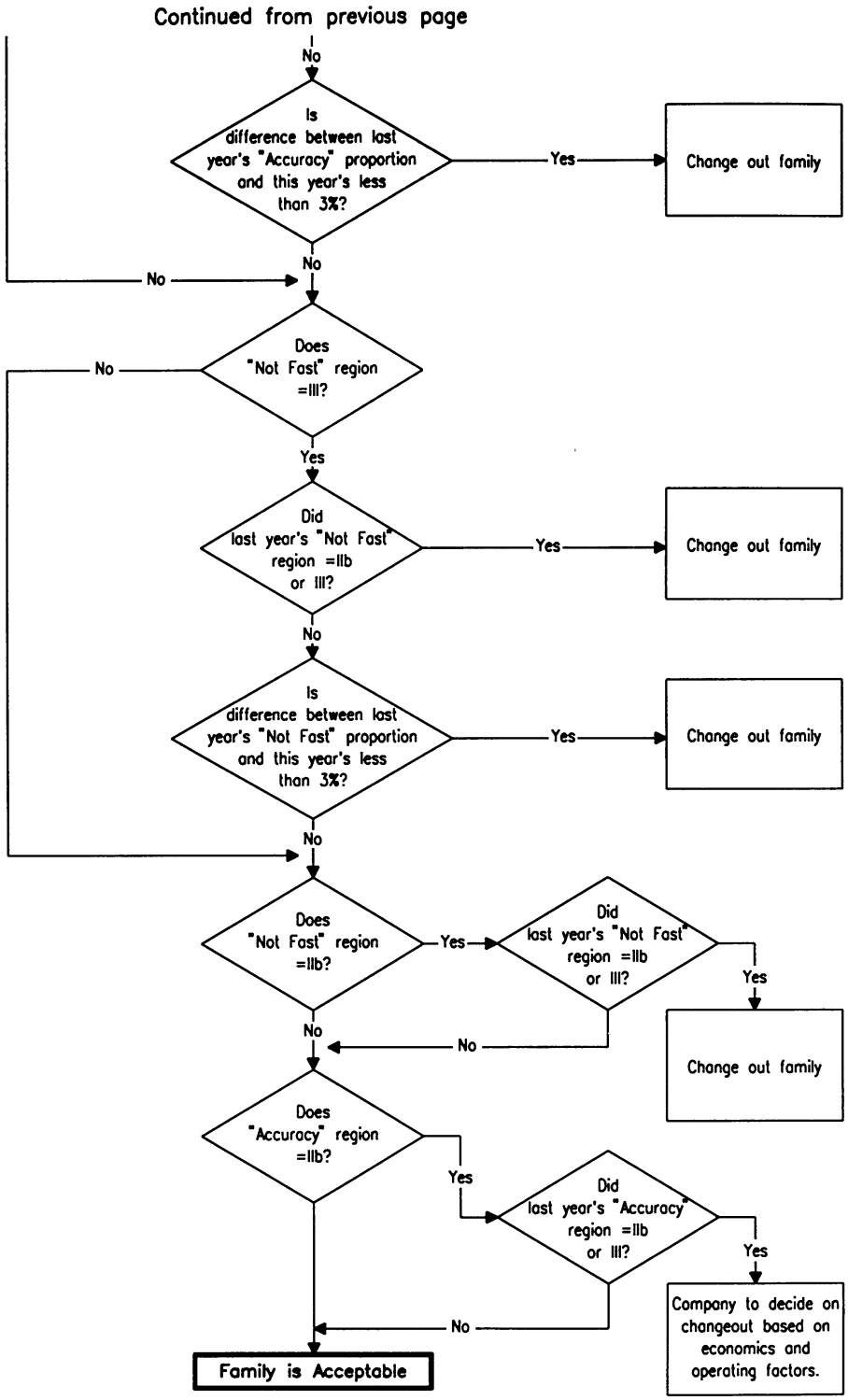

Continued from previous page
No
Is difference between last year's "Accuracy" proportion and this year's less than 3%?
Yes
Change out family
No
No
Does "Not Fast" region =III?
Yes
Yes
Did last year's "Not Fast" region =IIb or III?
Yes
Change out family
No
Is difference between last year's "Not Fast" proportion and this year's less than 3%?
Yes
Change out family
No
Does "Not Fast" region =IIb?
Yes
Did last year's "Not Fast" region =IIb or III?
Yes
Change out family
No
No
Does "Accuracy" region =IIb?
Yes
Did last year's "Accuracy" region =IIb or III?
Yes
Company to decide on changeout based on economics and operating factors.
No
Family is Acceptable

Figure 3.b.

Meter Performance Control Charts

Figure 1. For Meters Accurate

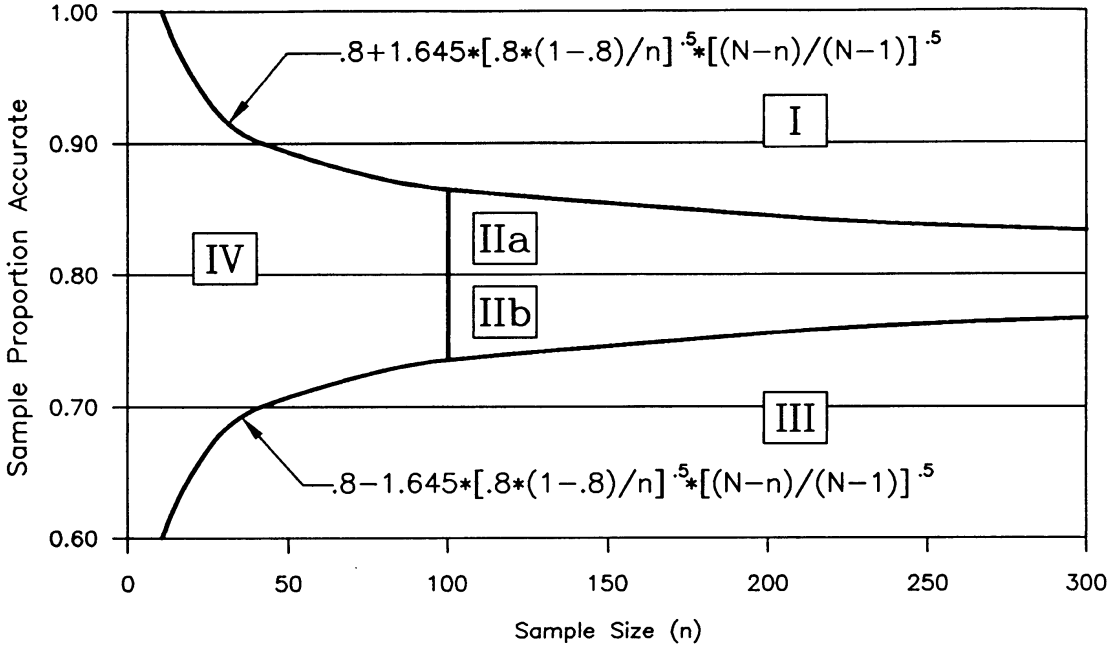
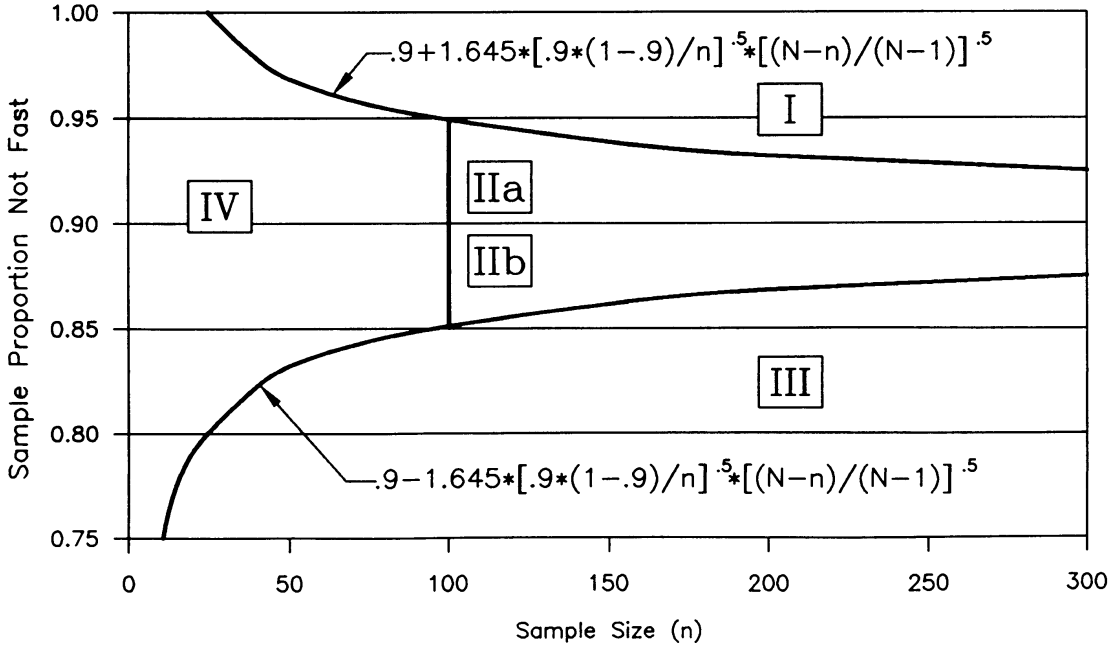


Figure 2. For Meters Not Fast



*Example where family size (N) = 3000