

ALASKA LEGISLATURE SPECIAL COMMITTEE / SUBJECT FILE 8672
1334 SCOMM 50: HOUSE SPECIAL COMMITTEE ON STATE LOANS 1985-86

Case B - 2-1/2% level of subsidy effective 10-1-85
 2% level of subsidy effective 10-1-86
 No reappropriation

04/23/85

ALASKA HOUSING FINANCE CORPORATION

SPECIAL MORTGAGE LOAN PURCHASE PROGRAM

Summary of Mortgage Demand and Proposed Bond Financing

Fiscal Year 1988

(In Millions)

	Mortgage Loan Funds Available 7-1-87	Program Repayments and Earnings	Bond Proceeds	Sales Costs	Subsidy	Subsidy Allocation	Estimated Mortgage Demand FY 88	Mortgage Loan Funds Available 6-30-88
<u>Bonded Programs</u>								
Taxable First Mortgage Program	\$ 23	\$ 65 ⁽¹⁾	\$150	\$ (3)	\$ 30	\$ 4	\$235	\$ 34
First Mortgage Veterans Program State Guaranteed Bonds	40	27 ⁽²⁾	175	(3)	7	(4)	200	42
First Time Homebuyers Program Home Mortgage Bonds	125	11 ⁽²⁾	200	(6)	6	-0-	185	151
<u>Internally Funded Programs</u>								
Second Mortgage Program		5 ⁽³⁾					5	
Mobile Home Loan Program		35 ⁽³⁾					35	
	<u>\$188</u>	<u>\$143</u>	<u>\$525</u>	<u>\$ (12)</u>	<u>\$ 43</u>	<u>-0-</u>	<u>\$660</u>	<u>\$227</u>

(1) Housing and Insured Mortgage Bond prepayments.

(2) Represents amounts made available for recycling subject to federal restrictions as to borrower and residence.

(3) Portion of earnings and prepayments of Revolving Fund including HOF Account.

Case B - 2-1/2% level of subsidy effective 10-1-85
 2% level of subsidy effective 10-1-86
 No reappropriation

04/23/85

ALASKA HOUSING FINANCE CORPORATION

Projected Revolving Fund Activity

Fiscal Year 1989
 (In Millions)

	<u>HOF Account</u>		<u>General Account</u>			<u>Total</u>
	<u>Loans</u>	<u>Investments</u>	<u>Loans & Net Mtg. Securities</u>			
			<u>Conforming</u>	<u>Non-Conforming</u>	<u>Investments</u>	
Balance: July 1, 1988	\$155	-0-	\$192	\$160	\$ 7	\$514
Prepayments and principal reductions	(12)	\$ 12		(13)	13	-0-
Earnings		14			37	51
Home ownership assistance subsidies		(10)				(10)
IMB earnings released					13	13
Non-bonded mortgage programs						
Second mortgages				5	(5)	-0-
Mobile home loans	16	(16)		19	(19)	-0-
Reduction in loans warehoused			(10)		10	-0-
FY 89 legislative appropriation						-0-
Required subsidy transfers	—	—	—	—	(48)	(48)
Balance: June 30, 1989	<u>\$159</u>	<u>-0-</u>	<u>\$182</u>	<u>\$171</u>	<u>\$ 8</u>	<u>\$520</u>

NOTE: The composition of the General Account will vary between conforming loans and investment securities depending upon the closing out of the recently sold issues. The current composition is felt to be reflective of the anticipated future mix.

Case B - 2-1/2% level of subsidy effective 10-1-85
 2% level of subsidy effective 10-1-86
 No reappropriation

04/23/85

ALASKA HOUSING FINANCE CORPORATION

SPECIAL MORTGAGE LOAN PURCHASE PROGRAM

Summary of Mortgage Demand and Proposed Bond Financing

Fiscal Year 1989

(In Millions)

	Mortgage Loan Funds Available 7-1-88	Program Repayments and Earnings	Bond Proceeds	Sales Costs	Subsidy	Subsidy Allocation	Estimated Mortgage Demand FY 89	Mortgage Loan Funds Available 6-30-89
<u>Bonded Programs</u>								
Taxable First Mortgage Program	\$ 34	\$ 65 ⁽¹⁾	\$200	\$ (4)	\$ 40	\$ 2	\$276	\$ 61
First Mortgage Veterans Program State Guaranteed Bonds	42	35 ⁽²⁾	200	(6)	8	(2)	200	77
First Time Homebuyers Program Home Mortgage Bonds	151	23 ⁽²⁾					174	-0-
<u>Internally Funded Programs</u>								
Second Mortgage Program	-0-	5 ⁽³⁾					5	
Mobile Home Loan Program	-0-	35 ⁽³⁾					35	
	<u>\$227</u>	<u>\$163</u>	<u>\$400</u>	<u>\$ (10)</u>	<u>\$ 48</u>	<u>-0-</u>	<u>\$690</u>	<u>\$138</u>

(1) Housing and Insured Mortgage Bond prepayments.

(2) Represents amounts made available for recycling subject to federal restrictions as to borrower and residence.

(3) Portion of earnings and prepayments of Revolving Fund including HOF Account.

STATE OF ALASKA 1985 LEGISLATIVE SESSION
FISCAL NOTE

Revision Date: _____

REQUEST

Bill/Resolution No.: HB 378
Title: An act relating to the
interest rate on State loan programs
Sponsor: Adams and Binkley
Requestor: _____
Date of Request: April 19, 1985

FISCAL DETAIL

Agency Affected: Commerce & Economic Developm
Program Category Affected: _____
Economic Development
BRU, Program or Subprogram(s) Affected: _____
Accounting & Collections

EXPENDITURES/REVENUES: (Thousands of Dollars)

	FY 85	FY 86	FY 87	FY 88	FY 89	FY 90
OPERATING						
100 PERSONAL SERVICES						
200 TRAVEL						
300 CONTRACTUAL						
400 SUPPLIES						
500 EQUIPMENT						
600 LAND & STRUCTURES						
700 GRANTS, CLAIMS						
800 MISCELLANEOUS						
TOTAL OPERATING						
CAPITAL						
REVENUE		80.2	258.4	484.1	750.5	1,048.6

FUNDING: (Thousands of Dollars)

GENERAL FUND						
FEDERAL FUNDS						
OTHER						
TOTAL						

POSITIONS:

FULL-TIME						
PART-TIME						
TEMPORARY						

ANALYSIS Attach a separate page if necessary

Data was provided by the Division of Investments for current market interest rates for the various loan programs and the resulting decreased loan demand.

The fiscal impact to revenue is the net interest rate increase of .5 percent per year, as proposed in HB 378. All active loan programs administered by DCED have been included.

Prepared By: Margaret I. Hamley, Director
Division: Accounting & Collections

Phone: 465-2555

Date: 4-23-85

Approved by Commissioner: Loren H. Lounsbury
Agency: Commerce & Economic Development

Date: 4/23/85

Distribution (by Agency preparing fiscal note):

Legislative Finance
Legislative Sponsor
Requestor
Office of Management and Budget
Impacted Agency(ies)

7/1/84

HB 378
FISCAL NOTE - REVENUE ANALYSIS

ESTIMATED CHANGE IN LOAN DEMAND FOR EACH .5% INCREASE IN INTEREST RATE:

	CF	BF	CC	HD	M	AE	REC	FE
Statutory Rate	10.50	10.52	7.00	7.50	10.00	5.00 15.00	10.52	9.50
Market Rate	14.50	12.50	14.00	15.00	15.50	17.50	17.50	15.50
Decreased Loan Demand								
FY '86	none	none	none	none	none	none	none	none
FY '87	2%	none	none	none	5%	none	5%	none
FY '88	2%	none	none	none	5%	none	5%	none
FY '89	2%	none	none	none	5%	none	5%	none
FY '90	2%	none	none	none	5%	none	5%	none

Estimates provided by Division of Investments, Department of Commerce and Economic Development, as of April 16, 1985.

SUMMARY OF FISCAL IMPACT: REVENUE (based on Division of Investments' assumptions above)

	FY '86	FY '87	FY '88	FY '89	FY '90
Commercial Fish	\$38,010	\$132,525	\$264,749	\$431,176	\$ 627,707
Bulk Fuel	2,625	5,250	7,875	10,500	10,500
Child Care	1,504	6,006	13,493	22,758	36,076
Historical Districts	750	3,191	6,777	12,072	18,892
Mining ✓	24,000	63,624	92,309	108,876	110,855
Alternative Energy	10,307	40,025	87,885	152,524	232,394
Residential Energy Conservation	3,000	7,811	11,058	12,587	12,220
Fisheries Enhancement	Ø	Ø	Ø	Ø	Ø
TOTAL	<u>\$80,196</u>	<u>\$258,432</u>	<u>\$484,146</u>	<u>\$750,493</u>	<u>\$1,048,644</u>

Fiscal impact revenue analysis prepared by Division of Accounting and Collections

STATE OF ALASKA 1985 LEGISLATIVE SESSION
FISCAL NOTE

Revision Date: _____

REQUEST

Bill/Resolution No.: HB 378

Title: _____

~~Rates on State loan programs.~~

Sponsor: Adams

Requestor: _____

Date of Request: _____

FISCAL DETAIL

Agency Affected: Commerce & Econ. Dev.

Program Category Affected: _____

Development

BRU, Program or Subprogram(s) Affected: _____

Division of Investments

EXPENDITURES/REVENUES: (Thousands of Dollars)

	FY 85	FY 86	FY 87	FY 88	FY 89	FY 90
OPERATING						
100 PERSONAL SERVICES						
200 TRAVEL						
300 CONTRACTUAL		10.0	10.0	10.0	10.0	10.0
400 SUPPLIES		10.0				
500 EQUIPMENT						
600 LAND & STRUCTURES						
700 GRANTS, CLAIMS						
800 MISCELLANEOUS						
TOTAL OPERATING		20.0	10.0	10.0	10.0	10.0
CAPITAL		-0-	-0-	-0-	-0-	-0-
REVENUE		-0-	-0-	-0-	-0-	-0-

FUNDING: (Thousands of Dollars)

GENERAL FUND	20.0	10.0	10.0	10.0	10.0
FEDERAL FUNDS					
OTHER					
TOTAL	20.0	10.0	10.0	10.0	10.0

POSITIONS:

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

ANALYSIS: Attach a separate page if necessary

\$10,000 is requested for a one-time charge to prepare and distribute copies of regulations for public comment relating to determination of the existing market rate for each program, and revision and reprinting of the State loan applications and pamphlets. A continuing cost of \$10,000 is required for a contractor to determine market rates for each program on a yearly basis in a manner that would be defensible in court.

Prepared By: Paul B. Arnoldt, Director

Division: Investments

Phone: 465-2510

Date: 4/17/85

Approved by Commissioner: Loren H. Lounsbury

Agency: Commerce and Economic Development

Date: 4/17/85

Distribution (by Agency preparing fiscal note):

Legislative Finance
Legislative Sponsor
Requestor
Office of Management and Budget
Impacted Agency(ies)

7/1/84

STATE OF ALASKA 1985 LEGISLATIVE SESSION
FISCAL NOTE

Revision Date: _____

REQUEST

Bill/Resolution No.: HB 378

Title: RE: Interest Rates on
State Loans

Sponsor: Adams, Binkley

Requestor: Sund

Date of Request: _____

FISCAL DETAIL

Agency Affected: Education

Program Category Affected: Postsecondary
Education

BRU, Program or Subprogram(s) Affected:
Student Loan Program

EXPENDITURES/REVENUES: (Thousands of Dollars)

	FY 85	FY 86	FY 87	FY 88	FY 89	FY 90
OPERATING						
100 PERSONAL SERVICES						
200 TRAVEL						
300 CONTRACTUAL		20.0				
400 SUPPLIES						
500 EQUIPMENT						
600 LAND & STRUCTURES						
700 GRANTS, CLAIMS						
800 MISCELLANEOUS						
TOTAL OPERATING	N.A.	20.0	-0-	-0-	-0-	-0-

CAPITAL						
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REVENUE	N.A.	N.A.	(85.6)	(295.4)	1,671.8	(1,297.0)
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FUNDING: (Thousands of Dollars)

GENERAL FUND		20.0	(85.6)	(295.4)	1,671.8	(1,297.0)
FEDERAL FUNDS						
OTHER						
TOTAL		20.0				

POSITIONS:

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

ANALYSIS: Attach a separate page if necessary

Note there is a one year lag between attached chart and fiscal impact. This is due to the effective date of the Bill.

Prepared By: Kerry D. Romesburg Executive Director Phone: 465-2854

Division: Alaska Commission on Postsecondary Date: 4/22/85
Education

Approved by Commissioner: _____

Date: _____

Agency: _____

Distribution (by Agency preparing fiscal note):

Legislative Finance

Legislative Sponsor

Requestor

Office of Management and Budget

Impacted Agency(ies)

7/1/84

Increase loan interest rates by 1/2% per year, until it reaches 8%, retain other current terms.

(a) Fiscal Impact:

Year of Impact	BORROWING YEAR														Total Impact
	FY86	FY87	FY88	FY89	FY90	FY91	FY92	FY93	FY94	FY95	FY96	FY97	FY98		
FY86	\$ -0-	\$	\$	\$	\$	\$	\$	\$	\$	\$	\$	\$	\$	\$	\$ -0-
FY87	-0-	-0-													-0-
FY88	46.8	-0-	-0-												46.8
FY89	91.2	85.6	-0-	-0-											176.8
FY90	136.8	167.0	128.4	-0-	-0-										432.2
FY91	204.2	250.2	250.5	171.1	-0-	-0-									876.0
FY92	208.8	373.7	375.4	333.9	214.0	-0-	-0-								1,505.8
FY93	208.8	382.1	560.5	500.5	417.4	256.7	-0-	-0-							2,326.0
FY94	208.8	382.1	573.1	747.3	625.6	500.9	256.7	-0-	-0-						3,294.5
FY95	208.8	382.1	573.1	764.1	934.1	750.7	500.9	256.7	-0-	-0-					4,370.5
FY96	208.8	382.1	573.1	764.1	955.1	1,225.1	750.7	500.9	256.7	-0-	-0-				5,616.6
FY97	208.8	382.1	573.1	764.1	955.1	1,146.2	1,225.1	750.7	500.9	256.7	-0-	-0-			6,762.8
FY98	162.0	382.1	573.1	764.1	955.1	1,146.2	1,146.2	1,225.1	750.7	500.9	256.7	-0-	-0-		7,862.2
FY99	117.6	296.5	573.1	764.1	955.1	1,146.2	1,146.2	1,146.2	1,225.1	750.7	500.9	256.7	-0-		8,878.4
FY00	72.0	215.1	444.7	764.1	955.1	1,146.2	1,146.2	1,146.2	1,146.2	1,225.1	750.7	500.9	256.7		9,769.2

STATE OF ALASKA

DEPT. OF COMMUNITY & REGIONAL AFFAIRS

OFFICE OF THE COMMISSIONER

BILL SHEFFIELD, GOVERNOR

☐ POUCH B
JUNEAU, ALASKA 99811
PHONE: (907) 465-4700

☐ 949 E. 38TH AVENUE, SUITE 400
ANCHORAGE, ALASKA 99508
PHONE: (907) 563-1073

April 23, 1985

POSITION PAPER

RE: HOUSE BILL 378

SPONSOR: REPRESENTATIVES ADAMS AND BINKLEY

Program Effects of the Bill:

This bill seeks to raise the interest rates on loan programs administered by the state or an instrumentality of the state by one half percent annually until the rate charged equals the prevailing market rate. Neither this bill nor the other sections of this statute really define "prevailing market rate," although AS 37.05.035(a) gives each loan program agency the right to determine prevailing market rate if none exists.

For the purpose of determining the effects of this bill on our rural loan programs, we used the current FHA/VA rate of 13 percent, and tried to determine what effect this rate would have on our loan program activity if that rate were in effect today. Our average loan amount on our Rural Owner-Occupied Loan Program for FY 84 and FY 85 year to date is \$89,929. Using this figure and our current interest rate of 9.875 percent, a borrower must have a monthly income of at least \$2,311 to qualify for this loan amount. This is assuming the house payment is their only monthly obligation, which is often the case in rural Alaska. In FY 84 and year to date FY 85, 88.6 percent of our borrowers had incomes greater than or equal to this amount. Using the same loan amount and a 13 percent interest rate and the same assumption about the house payment being the sole monthly obligation of the borrower, it would require a monthly income of \$2,985 to qualify. Only 74 percent of our current borrowers could have met this monthly income amount.

We realize that this bill would not increase the interest rate overnight, however, with construction costs increasing approximately three percent per year, the eventual effects of this legislation on the Rural Housing Loan Program would be more devastating than even the current year figures demonstrated, since we assumed construction costs would remain constant and a larger loan amount would not be required to buy the same house in the future.

Position Paper
RE: HOUSE BILL 378
April 23, 1985
Page 2

The intent and purpose of this loan program, to upgrade and improve the housing stock in rural Alaska and make homeownership a reality for more rural Alaskans, would be seriously compromised.

The effects on the Rural Nonowner-Occupied Loan Program would virtually put the program out of business. Most of the projects we are financing today are just breaking even with a 10.5 percent interest rate and the high operating costs incurred in the rural areas. An interest rate any higher than this would make the vast majority of the projects economically nonviable.

To summarize, the increase in interest rates proposed by this bill would put homeownership out of the reach of most rural residents once again. We would see a run on the loan programs during the first few years by those seeking to own homes before the ideal is out of their reach. We would see people buying or building homes before they are financially stable or emotionally ready for homeownership. This will result in higher delinquency rates and more foreclosures.

One last item to be addressed is the effect of this bill on the Homeownership Assistance Fund. The demand on the fund would be significantly increased with the greater differential between the current program interest rate and the six percent rate to which we can subsidize the payments. A portion of any savings the state may realize by eliminating the subsidy in interest rates in whole would be consumed by the greater subsidies used by individual borrowers under the Homeownership Assistance Program.

Comments:

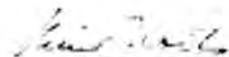
Another aspect that should be examined is the overall effect this bill would have on the state economy. The construction business and service industries constitute a large part of this state's economy. It is estimated that 20 people are employed by every real estate sales transaction that takes place on an existing structure. These would be people at the lending institutions, mortgage companies, credit unions, title insurance firms, real estate brokerage firms, appraisal firms, surveyors, mortgage insurance firms, tax service firms and firms dealing in fire, hazard, flood or homeowners insurance.

Position Paper
RE: HOUSE BILL 378
April 23, 1985
Page 3

The numbers can grow to as much as 60 - 75 jobs when you are dealing with new construction, depending on the size of the project and whether it is a contractor or an owner builder doing the construction. These figures were supplied to the Housing Assistance Division by Dave Ribachi, an Anchorage realtor at a HAD training workshop.

With the slowdown that would be brought about in the market due to the higher interest rates - and based on most economic projections, that is the direction interest rates are expected to go - the unemployment rates will probably increase, or at least not decrease. The state will incur greater costs in welfare and unemployment compensation as a result of this increase. The communities relying upon property taxes will see their tax base growth diminished due to the slowdown in development and market values.

If the intent of HB 378 is to take the State out of the lending business, the State should face this directly by not appropriating money for those loan programs. An across the board increase of interest rates, however, is not an equitable solution to phase out these programs. By increasing interest rates, the income level criteria is raised for loan recipients, making loans less accessible to lower income families. If the goal of HB 378 is to affect interest rates in themselves, we recommend that the committee defer to the Governor's bill HB 109--which establishes a fixed, market-tied interest rate that is based on the U.S. Treasury rate plus adjustments for administration and risk.



Emil Notti, Commissioner

STATE OF ALASKA 1985 LEGISLATIVE SESSION
FISCAL NOTE

Revision Date: _____

REQUEST

Bill/Resolution No.: HB 378
Title: Interest Rates on State

loan programs

Sponsor: _____
Requestor: Rep. Adams & Binkley
Date of Request: _____

FISCAL DETAIL

Agency Affected: DCRA

Program Category Affected: _____

BRU, Program or Subprogram(s) Affected: _____

EXPENDITURES/REVENUES: (Thousands of Dollars)

	FY 85	FY 86	FY 87	FY 88	FY 89	FY 90
OPERATING						
100 PERSONAL SERVICES						
200 TRAVEL						
300 CONTRACTUAL						
400 SUPPLIES						
500 EQUIPMENT						
600 LAND & STRUCTURES						
700 GRANTS, CLAIMS						
800 MISCELLANEOUS						
TOTAL OPERATING		-0-	-0-	-0-		

CAPITAL						
---------	--	--	--	--	--	--

REVENUE						
---------	--	--	--	--	--	--

FUNDING: (Thousands of Dollars)

GENERAL FUND		-0-	-0-	-0-		
FEDERAL FUNDS						
OTHER						
TOTAL		-0-	-0-	-0-		

POSITIONS:

FULL-TIME						
PART-TIME						
TEMPORARY						

ANALYSIS: Attach a separate page if necessary

Prepared By: Clark Boston
Division: Housing Assistance Division

Phone: 561-0900

Date: 4/23/85

Approved by Commissioner: Emil Notti
Agency: Community & Regional Affairs

Date: 4/23/85

Distribution (by Agency preparing fiscal note):

Legislative Finance
Legislative Sponsor
Requestor
Office of Management and Budget
Impacted Agency(ies)

7/1/84

STATE OF ALASKA 1985 LEGISLATIVE SESSION
FISCAL NOTE

Revision Date: _____

REQUEST

Bill/Resolution No.: HB 378
Title: An Act relating to the
interest rate on state loan programs
Sponsor: Adams, Binkley
Requestor: _____
Date of Request: _____

FISCAL DETAIL

Agency Affected: Department of Revenue
Program Category Affected: _____
SRU, Program or Subprogram(s) Affected: _____
Alaska Housing Finance Corporation

EXPENDITURES/REVENUES: (Thousands of Dollars)

	FY 85	FY 86	FY 87	FY 88	FY 89	FY 90
OPERATING						
100 PERSONAL SERVICES						
200 TRAVEL						
300 CONTRACTUAL						
400 SUPPLIES						
500 EQUIPMENT						
600 LAND & STRUCTURES						
700 GRANTS, CLAIMS						
800 MISCELLANEOUS						
TOTAL OPERATING						
CAPITAL	-0-	-0-	-0-	-0-	-0-	-0-
REVENUE						

FUNDING: (Thousands of Dollars)

GENERAL FUND						
FEDERAL FUNDS						
OTHER	-0-	-0-	-0-	-0-	-0-	-0-
TOTAL						

POSITIONS:

FULL-TIME						
PART-TIME						
TEMPORARY						

ANALYSIS: Attach a separate page if necessary

see attachment

Prepared by: Mark H. Cameron
Division: Alaska Housing Finance Corporation

Phone: 7-7-8888
Date: _____

Approved by Commissioner: James P. H. [Signature]
Agency: Department of Revenue

Date: 7/29/85

Distribution (by Agency preparing fiscal note):

Legislative Finance

Legislative Sponsor

Requestor

Office of Management and Budget

Impacted Agency(ies)

7/1/84

HB 378 - Attachment

Please refer to Exhibit A prepared for SB 281 for a hearing before the Senate Finance Committee for an analysis of the fiscal impact of this bill. If HB 378/SB 281 were to pass in the present form AHFC would not expect to be in for a loans appropriation request in FY 1989 of \$100 million.

Exhibit B is a program overview of the Corporation's current activities.

Exhibit I contains alternatives that the Corporation was requested to look at by the Senate Finance Committee. Included is a letter to Senator Halford outlining a proposed mortgage "buy down" program which could reduce the amount of subsidy for the taxable mortgage program by as much as two-thirds.

FREE

Federation's Role in our Enterprise Economy

April 22, 1985

Representative John Sund, Chairman
House Special Committee on Loans
Pouch V
Juneau, Alaska 99811

Attention: John Hartle, Administrative Assistant

Re: HB 378

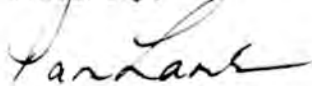
Dear Mr. Hartle,

The Anchorage Woman's Club FREE Committee is pleased to write this letter in support of HB 378. We understand that this bill is the companion to SB 281 and will raise interest rates on all State loan programs by one-half percent per year until they reach the going market rate or cost of funds.

I am enclosing for the House Special Committee on Loans members a copy of our written testimony presented to the Senate Finance Committee's hearing on SB 281, copies of our position paper on Alaska State Loan Programs and an announcement concerning our recently produced video on the loan programs.

Please feel free to contact me (349-6531) or my co-chairman Sarah Schierhorn (279-5305) if we can be of further assistance.

Sincerely,



Pamela Lambe, Co-Chairman
Tax & Economic Development Subcommittee
AWC FREE Committee

TESTIMONY REGARDING SB 281

A BILL RAISING INTEREST RATES ON STATE LOAN PROGRAMS
BY 1/2 PERCENT PER YEAR UNTIL THEY REACH MARKET RATES
OR COST OF FUNDS

TESTIMONY BY PAM LAMBE AND SARAH SCHIERHORN
AWC FREE COMMITTEE

The FREE Committee recommends passage of SB 281. We applaud the sponsors for recognizing the need for this legislation and for filing the bill. The action demonstrates to us the sponsors awareness of the gravity of the revenue decline and their desire to take action to bring State expenditures in line with current revenues.

To summarize the State's investment in loan programs as of June 30, 1984:

- 1 - The combined outstanding balance of State loan programs was approximately \$5 billion.
- 2 - Of that \$5 billion, \$3.8 billion has been funded by bonded indebtedness and the balance by State appropriation.
- 3 - Of the \$3.8 billion in bonded indebtedness, \$3.5 billion funds AHFC debt.

There are more than 40 loan programs and funds administered by various State agencies and State chartered public corporations.

From FY 81 to FY 85, the State appropriated \$2.6 billion to these programs.

Most programs were originated in response to a real need. You will remember market interest rates peaking in the 20% range not too long ago. Today we are experiencing lower, stable interest rates.

Three studies of loan programs published since 1981 generally conclude that government subsidy and competition with private enterprise is not wise. The most recent study by the FREE Committee specifically recommends that the State reduce and eventually eliminate dollar contributions to loan programs by making programs self-supporting and revolving and by eliminating interest subsidies.

SB 281 would accomplish this recommendation in a fair way by treating all programs equally and by using the stair-step mechanism of a one-half percent per year interest increase.

This approach enables consumers to plan financing. If the rules are set now, consumers can assess various finance options. As program interest rates approach market rates, competition among the various sources of financing should result in lower market interest rates.

SB 281 will assure a gradual phase out of interest subsidies providing for a soft landing for the consumer.



RECORDS CERTIFICATION



I, the undersigned, an employee of the State of Alaska, do hereby certify that the microfilm images on this microform are accurate reproductions of the original records of the State of Alaska as accumulated during the regular course of business, and that it is the established policy and practice of this State to microfilm its records and to dispose of the original records after microfilm reproductions have been made.

James O. Smith
Signature of Camera Operator

12/15/89
Date

SCOMM

#50:31



Tony Knowles
Mayor

Municipal Light & Power

1200 EAST FIRST AVENUE — ANCHORAGE, ALASKA 99501-1585
TELEPHONE (907) 279-7671



February 24, 1986

Representative John Sund
Chairman
Special House Committee on Loans
Alaska State Legislature
Room 411
Capitol Building
Juneau, Alaska 99811

Dear Representative Sund:

To assist in your deliberation on HB477 please find enclosed Anchorage Assembly Resolution No. AR 85-267, a Resolution relating to the Power Development Fund, passed and approved by the Anchorage Municipal Assembly on December 17, 1985.

Also enclosed is a copy of a letter from Mayor Knowles of Anchorage to Governor Sheffield expressing the need for an improved transmission line between Anchorage and the Kenai so that Bradley Lake power and power displaced by Bradley Lake can be transmitted to Anchorage and points north. Legislative action may be necessary to insure the availability of Bradley Lake power to all railbelt utilities and consumers.

Very truly yours,

Thomas R. Stahr
General Manager
Municipal Light & Power

TRS/slg
Encls.



Submitted by: Assemblyman Baker

For reading: November 26, 1985

CL & P DEPT.
FEB 21 2 05 PM '86

ANCHORAGE, ALASKA
AR NO. 85- 267

A RESOLUTION RELATING TO THE POWER DEVELOPMENT FUND

WHEREAS the Assembly has expressed its commitment to the development of energy programs for Alaska as established in AS 44.83.380; and

WHEREAS an integral part of these programs include meeting the long-term energy needs of Alaska's railbelt citizens; and

WHEREAS the Power Development Fund provides Alaskans with a savings account to meet these energy needs; and

WHEREAS the Assembly continues its commitment to power projects previously approved as part of the state's energy programs, including the Railbelt power projects; and

WHEREAS the Alaska State Legislature expressed its continued support for the state to proceed with the licensing procedures for the Susitna projects through its expression of Legislative Intent which accompanied the project's \$200 million appropriation for Fiscal Year 1986 in chapter 96 SLA 84; and

WHEREAS a recent court decision invalidated the appropriation to the Susitna project in Fiscal Year 1986;

BE IT RESOLVED the Assembly encourages the Legislature to reaffirm its commitment to meeting the Railbelt's energy needs through appropriations to the Power Development Fund for this purpose.

PASSED AND APPROVED by the Anchorage Municipal Assembly this 17th day of

December, 1985


Chairman

ATTEST:


Municipal Clerk

Municipality of Anchorage



POLICE 4-5511
ANCHORAGE 4-5511-4 555221081
ADT 1261-4417
CITY OF ANCHORAGE
ALASKA

OFFICE OF THE MAYOR

November 13, 1985

Honorable Bill Sheffield
Governor of the State of Alaska
Third Floor, State Capitol
Pouch A
Juneau, Alaska 99811

Dear Governor Sheffield:

Anchorage has supported the construction of the Bradley Lake Hydroelectric project because we believe it constitutes a critical element in the long term power supply for Anchorage and the surrounding areas. With the Alaska Intertie operational, Bradley Lake should logically become an integral part of the Railbelt's power supply and should be so constituted.

Over the past several years Anchorage has repeatedly requested of the Alaska Power Authority that provisions be made so that Anchorage can contract for and receive Bradley Lake power. To meet our requirements it is necessary to have an improved transmission line connection with Bradley Lake, or in the interim, to have contractual arrangements such that Anchorage would be entitled to its share of Bradley power when the necessary transmission circuits are built. Since our latest request, which was for the interim accomodation only, has been summarily dismissed, we have no further recourse but to appeal to you.

It is not only the customers of Anchorage's municipal electric utility that are being deprived of Bradley power, but all consumers in Anchorage and north to Fairbanks. Even though Chugach Electric Association has contracted for a large increment of Bradley power this power cannot reach their customers in Anchorage but can only be used to meet wholesale commitments on the Kenai. Therefore as presently constituted Bradley Lake is of no benefit to Alaskans outside the Kenai and even the displaced generation cannot be effectively used elsewhere. The deficiencies of the existing transmission will also militate against reliability on the Kenai because to a great extent they will remain electrically isolated from the remainder of the Railbelt's interconnected

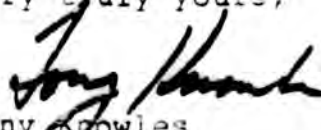
GOVERNOR SHEFFIELD
November 13, 1985
Page 2

system. The improved Kenai to Anchorage transmission link will result in a strong electrical connection from Homer to Fairbanks thus maximizing reliability and insuring that the rate and rate stabilizing benefits of the Bradley Lake Project will become available to nearly three-quarters of all Alaskans.

Considering that the Bradley Lake Hydroelectric project will cost nearly as much as the Four Dam Pool combined, it is incumbent that it be configured to benefit the maximum number of Alaskans as possible. Certainly to restrict for all time these benefits just to consumers whose utilities can take delivery of Bradley Lake power at the time the power comes on line is discriminatory. And at the same time to delay initial studies on the transmission facilities necessary to provide the wider benefit is shortsighted.

We request that you ask the Alaska Power Authority to immediately commence preliminary studies on a Kenai-Anchorage tie line of adequate capacity and reliability at a minimum to transmit to Anchorage the power displaced by Bradley Lake and to modify the conditional sales contracts for Bradley power to allow other utilities to opt in on equal terms; i.e., post card rates, at such time as adequate transmission becomes available.

Very truly yours,


Tony Knowles
Mayor

April 23, 1986

PRELIMINARY BUDGET ESTIMATE

Railbelt Alternatives Study
(Thousands of Dollars)

<u>Tasks</u>	<u>Personal Services and Contractor Overhead</u>	<u>Direct Costs*</u>
A. Review Utility System Data Base	\$ 20.0	\$ 5.0
B. Load Forecast (Incl. ISER and Battelle)	60.0	10.0
C. Power Supply Alternatives		
1. Gas Price Forecasts	80.0	5.0
2. Gas Supply	10.0	5.0
3. Gas Plant Characteristics	10.0	3.0
4. North Slope Natural Gas	40.0	12.0
5. Coal Price Forecasts	50.0	6.0
6. Coal Plant Characteristics	40.0	5.0
7. Oil Price Forecasts	40.0	5.0
8. Non-Susitna Hydro	60.0	10.0
9. Other Alternatives	30.0	6.0
10. Conservation	80.0	12.0
11. Devil Canyon	10.0	5.0
D. Financial Evaluations	10.0	2.0
E. Supply Plans		
1. Inflation, Interest, Discount	20.0	5.0
2. Methodology	30.0	10.0
3. Develop plan	80.0	20.0
F. Related Issues	10.0	6.0
G. Progress Meetings	40.0	20.0
H. Final Report Production/Printing	40.0	5.0**
I. Management/Contract Admin.	<u>60.0</u>	<u>5.0</u>
SUBTOTAL	820.0	+ 163.0
	=	983.0
J. Contingency (20%)		197.0
TOTAL		\$ <u>1,180.0</u>

Additional Costs:

Harza-Ebasco

- | | |
|--|-------|
| 1. Replying to inquiries, document control and limited admin. support. | 100.0 |
| 2. Devil Canyon: Upstream storage investigation | 225.0 |

APA

- | | |
|---|-------|
| 1. Staff and expense related to alternatives study | 125.0 |
| 2. Matching funds for study of Anchorage-Kenai Intertie | 150.0 |

Finance Team	<u>100.0</u>
--------------	--------------

Additional Costs Subtotal	700.0
---------------------------	-------

Contingency (20%)	<u>140.0</u>
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GRAND TOTAL	<u><u>\$2020.0</u></u>
-------------	------------------------

* Direct costs include travel, telecommunications, per diem, computer time etc.

** Cost based on Harza-Ebasco providing typing and printing services for 300 copies of a 300 page report.

Note: No costs are included for public hearings other than the monthly steering committee meetings.



RECORDS CERTIFICATION



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James O. Smith
Signature of Camera Operator

12/15/89
Date

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#50:32

STATE OF ALASKA 1986 LEGISLATIVE SESSION

FISCAL NOTE

Revision Date : 01/28/86

REQUEST

Bill Resolution No. : HB 479
 Title : An Act Relating to Biomass
Fuel Systems
 Sponsor : Representative Duncan
 Requestor : House Labor & Commerce
 Date of Request : _____

FISCAL DETAIL

Agency Affected : Commerce & Economic Dev.
 BRU : Investments
 Components : Economic Development

EXPENDITURES/REVENUES : (Thousands of Dollars)

OPERATING	FY 86	FY 87	FY 88	FY 89	FY 90	FY 91
PERSONAL SERVICES						
TRAVEL						
CONTRACTUAL						
SUPPLIES						
EQUIPMENT						
LAND & STRUCTURES						
GRANTS, CLAIMS						
MISCELLANEOUS						
TOTAL OPERATING	-0-	-0-	-0-	-0-	-0-	-0-

CAPITAL	-0-	-0-	-0-	-0-	-0-	-0-
---------	-----	-----	-----	-----	-----	-----

REVENUE	-0-	-0-	-0-	-0-	-0-	-0-
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FUNDING : (Thousands of Dollars)

GENERAL FUND						
FEDERAL FUNDS						
OTHER						
TOTAL						

POSITIONS :

FULL-TIME						
PART-TIME						
TEMPORARY						

ANALYSIS : Attach a separate page if necessary

It is anticipated that any new loan demand created as a result of HB 479 will be absorbed within the existing funding available under the Alternative Energy Loan Program. New loan application processing will also be absorbed by existing staff within the division.

Prepared by : Paul B. Arnoldt, Director

Division : Investments

Phone : 465-2510

Date : 1/28/86

Approved by Commissioner : Loren H. Lounsbury

Agency : Commerce & Economic Development

Date : 1/28/86

Distribution (by Agency preparing fiscal note) :

Legislative Finance

Legislative Sponsor

Requestor

Office of Management and Budget

Impacted Agency(ies)

Utermohle
1/29/86

Original sponsor: Duncan

1 IN THE HOUSE

BY THE LABOR AND
COMMERCE COMMITTEE

2 CS FOR HOUSE BILL NO. 479 (L&C)

3 IN THE LEGISLATURE OF THE STATE OF ALASKA

4 FOURTEENTH LEGISLATURE - SECOND SESSION

5 A BILL

6 For an Act entitled: "An Act relating to biomass fuel systems."

7 BE IT ENACTED BY THE LEGISLATURE OF THE STATE OF ALASKA:

8 * Section 1. AS 45.88.500(a) is amended to read:

9 (a) In this chapter, "alternative energy system"

10 (1) means a source of thermal, mechanical, or electrical
11 energy which is not dependent on oil or gas or a nuclear fuel for the
12 supply of energy for space heating and cooling, refrigeration and cold
13 storage, electrical power, mechanical power, or the heating of water;

14 (2) includes

15 (A) an alternative energy property as defined by 26
16 U.S.C. 48 (1)(3)(A), (Sec. 301, P.L. 95-618, Internal Revenue
17 Code);

18 (B) a method of architectural design and construction
19 which provides for the collection, storage, and use of direct
20 radiation from the sun;

21 (C) a woodstove with a catalytic converter, [OR] a
22 catalytic converter for a wood stove, or a catalytic fireplace
23 insert; [AND]

24 (D) a steam, hot water, or ducted hot air central
25 heating system that uses wood or coal for fuel; and

26 (E) a stove or furnace that uses biomass fuel produced
27 from any organic matter that is available on a renewable basis,
28 including agricultural crops and agricultural waste and residue,
29 wood waste residue, animal waste, municipal waste, and aquatic

1 plants;

2 (3) does not include, unless described in (2)(C) of this
3 subsection,

4 (A) a stove that uses only firewood [WOOD], coal, or
5 oil for fuel; or

6 (B) a fireplace or fireplace insert.
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INTRODUCTION OF BILLS (House)

HB 475, cont'd

Introduced Jan. 15, and referred to the State Affairs and Finance Committee.

Insurance
Rate Hike
(notice)

HOUSE BILL 476, by Rep. M.M. Miller by request. Requires an insurer who increases premium or adds a surcharge to an auto insurance policy because of an accident in which the insured or a person covered by the policy was at fault to give written notice of the increase or surcharge at least 15 days before it takes effect, stating the reason for the change and the right of appeal.

Introduced Jan. 15, and referred to the Community and Regional Affairs and Judiciary Committees.

Energy
Funding

HOUSE BILL NO. 477, by the Rules Committee by request of the Governor. See SENATE BILL 347, page 14, identical.

Introduced Jan. 15, and referred to the House Special Loans and Finance Committees.

Moose
Hunting
(stamp)

HOUSE BILL NO. 478, by Martin. Requires the Dept. of Revenue to establish a moose habitat conservation stamp program similar to the one established for waterfowl, and to set aside receipts in the fish and game fund to be used for enhancement and maintenance of moose habitat in the state.

Introduced Jan. 15 and referred to the Resources and Finance Committees.

Energy
Loans

HOUSE BILL NO. 479, by Rep. Duncan. Adds to those alternative energy and heating systems which are eligible for alternative energy loans systems which use biomass fuel produced from any organic matter that is available on a renewable basis, such as agricultural crops, waste and residue, animal waste, municipal waste and aquatic plants.

Introduced Jan. 16 and referred to the Labor and Commerce, Loans and Finance Committees.

Corporal
Punishment
(prohibited)

HOUSE BILL NO. 480, by Reps. Koponen and Davis. Prohibits anyone employed by a private or public school from inflicting corporal punishment or bodily pain on a student; permits the use of reasonable and necessary restraint on a student to protect the student or others from physical harm, to obtain possession of a dangerous weapon or object, or to protect property from serious harm.

Introduced Jan. 16, and referred to Health, Education & Social Services and State Affairs Committees.

not know it. It's real easy
and with blasting caps," he

caps are small metallic
few inches in length, usu-
ally to a length of electrical
red is suggesting Juneau
an eye open for such
their homes. If a blasting
d, Windred recommends
police to remove it.

led police to several
sting caps and containers
dynamite stored in the
Windred. Other explo-

sive material was found following a
search of a suspect's bedroom, he
said.

According to Windred, the stolen
blasting caps may be linked to a se-
ries of unexplained explosions in re-
cent months. On Dec. 29, a door at
Floyd Dryden Middle School was
blown open with blasting caps. Sev-
eral area mail boxes may also have
been blown up with the stolen ma-
terial, he said.

Police are investigating possible
violations of laws regulating storage
of explosives at the suspect contrac-

tor's work site. Police will not re-
lease the name of the contractor un-
der investigation until charges are
filed, Windred said.

Meanwhile, two Juneau teen-
agers are expected to be charged
with misconduct involving a weapon
in the first degree following the in-
vestigation into last Friday's bomb
threat at the high school.

According to police, a 14-year-old
student allegedly brought the explo-
sive materials to the school to sell or
give to a 17-year-old male student.

Police have not identified the person
who made the threat.

"Quite a few kids knew this trans-
action was going to take place," said
Windred.

The threat resulted in the closure
of the high school and adjoining Ma-
rie Drake Middle School. Students
were sent home after a search locat-
ed a bag containing four blasting
caps and a two-and-a-half pound con-
tainer of gelatine dynamite in an un-
assigned high school locker.

The material was removed from
the school without incident.

New law allows use of some wood stoves during air alert

Ordinance changes how burning bans are called

By BETSY LONGENBAUGH

THE JUNEAU EMPIRE

There's new hope on the horizon for local residents
who want to keep their wood stoves burning all winter.

Beginning Wednesday, local residents who own
stoves that meet Juneau City-Borough emission stan-
dards may keep their fires burning during wood smoke
alerts.

In the belief that the approved stoves won't let smoke
get in your eyes, the Juneau City-Borough Assembly re-
cently approved an ordinance that allows the stoves to
burn and sets up new criteria for declaring wood smoke
bans.

That new criteria calls for two types of wood smoke
bans - a wood smoke alert and a wood smoke emergen-
cy. Under an alert, owners of approved wood stoves who
have municipal permits may continue to burn. Under an
emergency, no wood stoves are allowed to burn.

Steve Gilbertson, the municipal lands and resources
manager, is in charge of monitoring the air quality of
Mendenhall Valley and enforcing the new ordinance. He
said Friday he hopes that only air alerts will occur in
the future, with air emergencies necessary in the event
of extreme pollution in the valley.

"I think people have to realize this is at an experi-
mental stage," he added.

Gilbertson also said his office now has applications
for people who own approved wood stoves. In order to
use those stoves during alerts, they must have permits

Please turn to Page 14

Lemon Creek vicinity to be monitored for wood smoke

THE JUNEAU EMPIRE

Lemon Creek residents may want to buy warm slip-
pers for next winter, as their neighborhood will proba-
bly end up being subject to its own wood stove bans.

The Lemon Creek area is one place that will feel the
impact of a comprehensive ordinance regulating wood
stove use that was approved by the Juneau City-Bor-
ough Assembly several weeks ago.

At the urging of some assembly members, municipal
staff agreed to begin monitoring the Lemon Creek area
with an eye to regulating wood stove use. This winter,
however, there isn't the necessary equipment in the
area to effectively measure wood smoke pollution.

In next year's municipal budget, staff will be seeking
\$25,000 to buy a wood smoke monitor for the area. Once
installed, the device will allow municipal officials to call
for wood smoke bans in Lemon Creek, as well as the
Mendenhall Valley.

Steve Gilbertson, lands and resources manager, said
he expects the municipality may call separate wood
smoke bans in each area, depending on weather condi-
tions. He said it is now impossible to predict how often
bans may be necessary in Lemon Creek.

"We do not have a lot of data for the area," said
Gilbertson.

He added, however, that his office has received a lot
of calls from Lemon Creek area residents who com-
plained of wood smoke pollution.

The new proposed smoke alert area in Lemon Creek
extends from the Juneau Christian School, including

Please turn to Page 14



ASSOCIATED PRESS

tion may be cut short.

launch window of only a
ments of the current mis-
ambitious schedule of 15

Please turn to Page 14

WEATHER

.....Page 4
.....Pages 6-7
ocks.....Page 13

Rain showers continuing through
Tuesday, Page 14

Juneau
Empire
1-13-86

Woodsmoke...

Continued from Page 1

from the city. The free permits are good for two years.

Gilbertson said the approved wood stoves have two things in common - very low emission standards and certification from Oregon.

Because the municipality is basing its new ordinance on a similar law in Oregon, it is accepting that state's testing procedures for wood stoves.

Many of the approved stoves - there are now 10 on the list - have catalytic converters. Others use pellet fuel to reach the low emission standards.

Gilbertson said at least four other stoves, some of which are for sale locally, have gone through the tests, but are not yet certified. He said he expects a new list from Oregon by the end of this month.

Until then, he said he can only recommend the 10 stoves on the approved list. They are:

- Blaze King "King," a catalytic converter stove.
- Earth Stove 1000-C, a catalytic converter stove.
- Turbo 10, a catalytic converter stove.
- Fisher Tech IV, a catalytic fireplace insert.
- Timber Eze 477, a catalytic wood stove.
- Vista 640, a non-catalytic wood stove.
- Pelletier FS-1, a non-catalytic stove that burns pellet fuel.
- Whitfield, a non-catalytic stove that burns pellet fuel.
- Collins Hopper, an add-on devise that burns pellet fuel.

Those wood stoves that are on this list and sell locally

cost about \$1,000, not including installation.

The assembly hopes to eventually have all stoves in the city-borough meet the emission standards. To meet this goal, the new ordinance calls for all wood stoves installed and sold in Juneau to meet the Oregon emission standards beginning Aug. 1.

Gilbertson expects the most successful enforcement of this new regulation to come from the building department, which issues permits for wood stove installations.

Steve Shows, who assigns building inspections, said a building permit is required for any new installation, including replacement of an existing stove. The permits and their accompanying inspections are free and are designed to make sure wood stoves are safely installed, he said.

"Home owners are sometimes not getting a building permit and installing a stove, sometimes properly, sometimes not," he said.

During the past year, the municipality has been aided in its inspection effort by some insurance companies who now require proof of wood stove inspections before offering insurance, said Shows.

"This is the greatest plus we have seen," he said.

Shows said that "nine times out of 10," wood stoves that are inspected were installed incorrectly.

He said that currently he is able to schedule inspections with a day's notice. Those who want inspections should call a 24-hour recording phone 586-1703, before 7:30 a.m. on the day they want an inspection.

To receive a permit, they should come into the municipal building department and fill out a form. They will also receive a brochure on proper stove installation.

Lemon Creek...

Continued from Page 1

Sunny Point, back to Lemon Creek basin and to Vanderbilt Hill.

Gilbertson also said many Juneau residents remain unclear about where the boundaries are for the Menden-

hall Valley wood smoke alert area.

They could be described as having a southern boundary of the airport area, an north boundary of the glacier recreational area, an east boundary running along the base of Thunder Mountain and a west boundary that bisects the Mendenhall Peninsula.

Not included in the ban are the Auke Lake area and Fritz Cove Road.

Shuttle...

Continued from Page 1

The flight plan today was devoted mainly to astronomy, and Steve Hawley spent the morning pointing two ultraviolet telescopes at star targets in a search for luminous clouds of ultraviolet radiation.

Mission Control awakened the astronauts today with the theme song from the movie "Animal House." The control center said several of the astronauts were fans of the movie, and commander Robert Gibson responded, "It sounds like our secret is out."

Columbia shed its postponement jinx with a spectacular predawn liftoff Sunday, and 9½ hours later the crew launched the world's most powerful commercial communications satellite, RCA's \$50 million Satcom KU-1.

"It's on its way," Mission Control radioed after a rocket engine ignited to propel the satellite toward stationary orbit 22,300 miles above the Earth.

RCA, which paid the National Aeronautics and Space Administration \$14.2 million for the delivery, said Satcom will be capable of providing video and audio communications for all of the United States except Alaska, transmitting a signal powerful enough to be received by dish antennas as small as three feet.

Nelson and Hawley will have an exclusive view of the comet as it nears the sun on its once-every-76-years swing through this part of the solar system.

"You can't observe Halley's from the ground as it makes its closest approach to the sun in January because of the sun's brightness," explained S. Alan Stern of the University of Colorado, who is principal investiga-

Nelson, who will operate the CHAMP cameras, said in an interview before the flight, "We'll be taking some photographs and spectral measurements for the purpose of documenting the comet, and we'll be doing it from above the atmosphere where we can get a real clear look at it. We're going to use the apparatus over the course of three flights, so we should be able to get a good consistent set of data on Halley's."

Stern said the instruments "primarily will be looking at water. The comet is basically an ice ball, and when the sun melts the ice, it breaks the water down into constituents. We'll study these to learn about the comet's atmosphere."

Hawley will use two telescopes to search the universe for sources of luminous clouds of ultraviolet radiation.

"Only in the last 10 years have we begun to look at the universe in the ultraviolet wavelength," he said before the mission. "The reason for that is that the observatories on Earth being beneath the atmosphere are not able to observe these wavelengths because the atmosphere is opaque to UV radiation. So we'll be getting some very fundamental data and will be dealing with questions as to where the UV emission comes from."

He said the knowledge would help astronomers mask out the UV background and thus improve the data from the \$1.2 billion Hubble Space Telescope, which will be launched from a shuttle next October.

One of the telescopes also will be trained on the comet.

Rep. Bill Nelson, a Florida Democrat riding as a con-

JNCIL
Board of trustees of Juneau Arts and Sciences Council will meet at 7:30 Northern Light United Church. Members and interested persons invited to attend.

STAR
Juneau Lodge No. 147, F. and M. will meet at 7:30 tonight. All Masons are urged to attend.

D
Persons of practically any skill level are enthusiastic about forming a band of Alaska-Juneau pep band are invited to contact the UAJ office of student at 789-4528.

RESSURE
Wood pressure testing will be conducted at the Mountain View Senior Center, 1:30 a.m. to 1:30 p.m. Tuesday. Appointment is necessary. Call 586-3736 for information.

S

Fire set off in the Cedar Park area. Fire set on fire.

tip

Firefighters are reminding residents every home should have at least one fire extinguisher and everyone in the household know how to use it. The Glendale Fire Department offers classes on use of fire extinguishers. For information, call 789-7554.

ince calls

Volunteer Fire Department services teams responded to several calls over the weekend:

Call: At 9:49 a.m. Friday, patient, stable, transported to Memorial Hospital.

Vehicle accident: At 10:06 p.m. Egan Drive and the Mendenhall, injuries minor, both patients transported.

Call: At 2:29 a.m. Saturday, patient, no transport; at 11:51 a.m. child choking, mother dislodged the child was stable and taken home by the family; at 2:01 a.m. car cuts, patient taken to the hospital.

Volunteer Fire Department services teams responded to several calls over the weekend:

Call: At 9:34 a.m. Friday, patient, stable, transported to the hospital; at 11:48 a.m. Sunday, no details; patient stable, transported to the hospital; at 2:50 p.m. Sunday, patient in minimal pain, stable condition, transported to hospital.

January 3, 1986

RECEIVED
JAN 6 1986

Senator Bill Ray
Representative Duncan
Representative Miller
P.O. Box V
State Capitol
Juneau, Alaska 99811

Re: State of Alaska
Alternative energy Loans

Dear Senator and Representatives:

We are soon providing an alternative to wood burning stoves in the Juneau area and I understand that this is presently available in Anchorage.

Our product is a pelletized wood and other fuel which burns in specially constructed stoves and burns smoke free.

I am enclosing a couple of articles for your further information.

To meet new ordinances in Juneau, many people will have to replace their wood burning stoves.

I understand that under present law, Alternative Energy Loans are available for catalytic equipped wood stoves, or catalytic converters.

Therefore it would be appreciated if the present law could be amended to authorize loans for biomass pellet fuel burning stoves or furnaces.

Steve Gilbertson, Juneau's Air Quality Control Officer, advised me that he and D.E.C. officials are in favor of this amendment.

I believe the law in question is included in A.S.45.88.010:500.

If you would like further information regarding this, I will be happy to discuss what I have with you.

Thanking you in advance for your consideration.

Very truly yours,

Larry Traeger
Larry Traeger
546 Hemlock
Juneau, Alaska 99801

Phone: 586 3250

*Dele
Jefferson Duncan drafted
the letter
Kua
Huller
June*

Heating homes with pellets

Mount Angel manufacturer designs and sells innovative, affordable furnaces

By DALE STOWELL
Of the Independent

MOUNT ANGEL — Randy Traeger shrugs as he considers the complexity of his pelletized wood burning furnace designs.

"To me, it don't look like nothing super," he says. "Once you've horsed around with it for 15 years, it doesn't seem like that much."

But he seems to know he's on to something as he cites statistics that indicate his wood furnaces burn cleaner than do natural gas or oil furnaces for as little as half the cost for fuel.

Traeger, owner and president of Traeger Industries, has been designing woodstoves and furnaces for more than 20 years and is optimistic that his latest design will catch on.

The fuel source is the most novel aspect of the new furnaces, which have been on the market since fall. Biomass pellets, produced from waste products such as pine shavings or rye stubble, are what the newly designed heating devices consume.

One ton of pellets, which costs about \$100, produces as much heat as two cords of wood but leaves substantially less waste. About 8 of one percent of the pellets remain as ash — approximately two gallons of ash per ton of fuel.

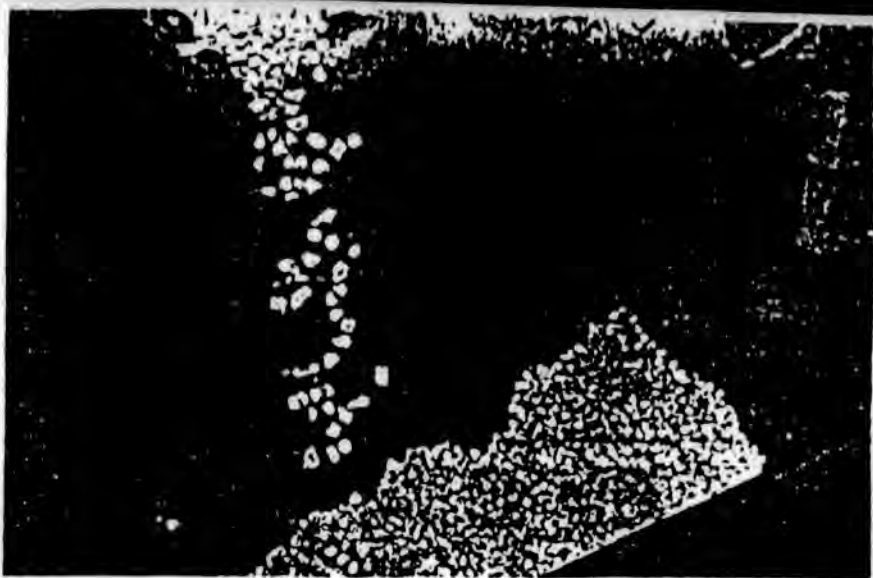
During cold weather, the average home requires about one 50 pound bag per day, Traeger estimated. Average yearly consumption would be in the neighborhood of four tons, he added.

Traeger's thermostatically-controlled stove and furnace designs also attempt to transfer all of the heat produced in the units to the space in the home to be heated.

And Traeger points out another advantage to the pellet-burning systems. "They burn clean. There isn't any smoke. You can stick your nose right in the (smoke)stack."

The major drawback is availability of fuel. Traeger has several hundred tons of it stockpiled to meet the needs of customers who have purchased pellet-burning equipment. It isn't readily available anywhere else in the area.

The fuel, which resembles rabbit food pellets, has existed for several decades, Traeger said. But companies producing it have come and gone due to a lack of demand.



Randy Traeger (above) has designed and is marketing heating systems which burn pine pellets (top photo). Traeger says the new heating units burn cleaner than gas or oil at nearly half the cost for fuel. (Photos by Dale Stowell)

"There's been several plants that have been around and gone broke," he said. "There's the concept of making pelletized fuel. That's fine. But you've got to have something to burn it in. Most of them are looking at commercial applications, but a commercial application can dry up on you very quickly — just a little change in price and they'll switch from one (fuel) to the other."

Before Traeger's design, availability of fuel wasn't the only problem in home-heating pellet applications. In earlier designs, the pellets didn't burn completely, and the furnace

fire would sometimes turn back into the fuel again.

Traeger cured the problems without knowing what caused them in other furnaces. "I really didn't look at anybody's design," he said. "I never paid any attention to them. There's no use in reinventing the wheel over again. It was a matter of taking it apart and putting it together again, taking it apart and putting it together again."

After Traeger put it together again, and it worked to his satisfaction, he began developing different home heating uses. His designs range from an indoor furnace that produces nothing but home heat, to an outdoor pellet pump that will provide heat for home, hot water and even clothes drying. All of the Traeger Industries products are built at the company shop in Mount Angel.

The furnaces are also outside of Department of Environmental Quality regulations that apply to woodstoves. Traeger predicts that many wood stove manufacturers will be forced out of business by continued tightening of regulations for testing and emissions. However, he added pellet-burning furnaces would pass even the most stringent DEQ requirements.

Traeger knows of only five other pelletized-fuel furnace manufacturers in the country, but believes that the heat-producing devices will increase in popularity in time.

He points to the state of Minnesota as an example of forward thinking about the new heating concept. Traeger, as well as other pelletized-fuel furnace manufacturers, recently donated equipment to the state as part of a Minnesota low-income heating assistance program. The state will pay for installation of the furnaces.

"The concept is, if they give people pelletized fuel, they can heat twice as many homes for the same cost as supplying them money to buy natural gas or oil," Traeger said.

According to Traeger, Minnesota also has state funds available for research and development of pelletized-fuel manufacturing and use. "They're just not after it," he said. "They're way ahead of everyone else."

Back home, Traeger said sales of the new furnaces have been good — almost better than he's wanted them to be. "I really want to go through the winter just testing it, getting a few out," he said. "It's kind of run away from us. It's been super good."



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STATE OF ALASKA
THE LEGISLATURE

POUCH V. STATE CAPITOL
JUNEAU, ALASKA 99801
(907) 465-3800

LEGISLATIVE AFFAIRS AGENCY

MEMORANDUM

January 13, 1986

SUBJECT: Alternative energy loans for biomass
fuel stoves (Work Order 14-1546)

TO: Representative Jim Duncan

FROM: George Utermohle
Legislative Counsel

I.

The draft bill that you requested is attached. The bill amends the definition of "alternative energy system" to expressly include stoves and furnaces that use biomass fuels. The effect of this amendment is to allow the Alternative Energy Revolving Loan Fund to make loans for the purchase of biomass fuel stoves and furnaces.

II.

You also asked whether the Alaska Industrial Development Authority (A.I.D.A.) can aid processors of biomass fuels.

In brief, A.I.D.A. does have the power to make loans, to insure loans, and to assist private lenders to make loans to processors of biomass fuels.

A.I.D.A. was created to provide means of financing and means of facilitating financing for

the establishment, operation, and development of industrial, manufacturing, and business enterprises, including, without limitation, facilities for transportation, facilities for pollution control and waste disposal, facilities for the local furnishing of gas, facilities for water, facilities for industrial parks, mass commuting vehicles, facilities for local district heating or cooling, parking facilities, or a storage or training facility relating to a plant or facility.
(AS 44.88.010(a)(5))

The list of facilities eligible for assistance is only illustrative and in no way restricts the kinds of projects that A.I.D.A. can support.

Provided that a project is located in Alaska and will generate additional employment, A.I.D.A. has the authority to insure loans, to make loans, or to assist private lenders in making loans for the project (AS 44.88.080(12), (13), and (15)). A.I.D.A. defines "project" to include

- (A) a plant or facility used or intended for use
 - (i) in connection with making, processing, preparing, or producing in any manner, goods, products or substances of any kind or nature or in connection with developing or utilizing a natural resource, or extracting, smelting, transporting, converting, assembling or producing in any manner, minerals, raw materials, chemicals, compounds, alloys, fibers, commodities and materials, products or substances of any kind or nature;
 - (ii) as an industrial park; in connection with transportation; for the prevention, limitation or control of pollution; for the disposal of sewage or solid waste; for the local furnishing of gas; for the furnishing of water; as or in connection with mass commuting vehicles; for local district heating or cooling; as a parking facility; or as a storage or training facility directly related to a plant or facility described in this paragraph;
- (B) a plant or facility used or intended for use in connection with a business enterprise;
- (C) commercial activity by a small enterprise;
(AS 44.88.220(8))

This definition is broad enough to cover the facilities and equipment necessary to manufacture or produce any form of biomass fuel.

Therefore, processors of biomass fuels are eligible to apply for loans from A.I.D.A. No amendment of the Alaska Industrial Development Authority statutes is necessary.

GU:mkr
M2:020
Enclosure

APPENDIX 1

OREGON DEPARTMENT OF ENVIRONMENTAL QUALITY
STANDARD METHOD FOR MEASURING THE EMISSIONS AND EFFICIENCIES
OF RESIDENTIAL WOODSTOVES

June 8, 1984

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SECTION 1: SCOPE AND PURPOSE

1.1 SCOPE

- 1.1.1 This document prescribes a standard method of testing woodstoves to obtain particulate emission factors based on useful heat output for appliances that produce less than 1.5×10^5 Btu/hr.
- 1.1.2 A woodstove is defined as a woodfired appliance with a closed fire chamber which maintains an air/fuel ratio of less than 30 during the burning of 90 percent or more of the fuel mass consumed in the low firing cycle. The low firing cycle means less than or equal to 25 percent of the maximum burn rate achieved with doors closed or the minimum burn achievable, whichever is greater.

1.2 PURPOSE

- 1.2.1 The purpose of this document is to:
 - a. Establish a uniform procedure for appliance operation to be used in conjunction with a standardized test method for obtaining woodstove emission and efficiency performance data.
 - b. Specify the types of test equipment and establish standard performance requirements for the equipment used for performing such tests.
 - c. Specify data required and calculations to be used.

1.3 METHOD FOR USING THIS STANDARD

- 1.3.1 Determine from Section 1.1.1 and 1.1.2 whether this standard is applicable for the appliance to be tested.
- 1.3.2 Verify that the test facility and equipment is in accordance with Sections 2 and 3.
- 1.3.3 Test and calculate results in accordance with Sections 5, 6, and 7.

SECTION 2: TEST FACILITY AND APPLIANCE INSTALLATION

2.1 DESCRIPTION OF TEST FACILITY

- 2.1.1 The testing will be conducted in an area with a height for atmospheric discharge of flue effluent at 15 ± 1 foot (4.6 ± 0.3 m) above the top surface of the scale.

- 2.1.2 The flue exit shall freely communicate with the laboratory, that is, the area shall have essentially the same pressure such that no artificial draft is imposed on the appliance.
- 2.1.3 The test chamber room temperature shall be maintained between 65° F and 90° F (18° C and 32° C) during the course of any test.
- 2.1.4 Air velocities within 2 feet (0.6m) of the test appliance and exhaust system shall be less than 50 feet/minute (0.25 m/s) without a fire in the unit.
- 2.1.5 All calorimeter rooms must meet the specific criteria in the June, 1982 Wood Heating Alliance document, Standard for Testing the Heating Performance of Wood-Fired Closed Combustion Chamber Heating Appliances, for accuracy verification and calibration procedures before conducting appliance performance testing.

2.2 APPLIANCE INSTALLATION FOR FREE STANDING STOVES

- 2.2.1 Unless specified differently by the manufacturers, the flue pipe shall be made of No. 24 gauge black steel and shall have an insulated metal solid pack type chimney above the particulate and combustion gas sample probe port locations with a minimum 1 inch (2.5 cm) solid pack material.
- 2.2.2 The flue shall extend to 15 ± 1 feet (4.6 ± 0.3 m) above the platform scale on which the appliance is located. All flue pipe cracks or joints shall be sealed.
- 2.2.3 The appliance and parts shall be assembled and installed in conformance with the manufacturer's published installation instructions.

2.3 APPLIANCE INSTALLATION FOR FIREPLACE INSERTS

- 2.3.1 Fireplace inserts shall be installed on the platform scale with R 12 insulation applied to all surfaces not normally exposed to the room to be heated. The appliance parts and exhaust system shall be assembled and installed in conformance with the manufacturer's published installation instructions.
- 2.3.2 The flue pipe shall consist of an insulated metal solid pack type chimney positively connected from the appliance flue outlet, extending to the particulate and combustion gas sample probe port locations with a minimum 1 inch (2.5 cm) solid pack material.

SECTION 3: TEST EQUIPMENT AND INSTRUMENTATION

3.1 TEST EQUIPMENT SET-UP

- 3.1.1 The equipment to be used for emissions and efficiency testing is illustrated in Figure 3.1 and described below.

3.2 TEST FUEL WEIGHT

- 3.2.1 The balance used to weigh the fuel shall be accurate to ± 0.1 pound (0.05 kg).
- 3.2.2 The appliance to be tested shall be centrally placed on a platform scale. The scale shall have a monitor or other feature such that the weight change of the fuel loads may be continuously displayed. The scale shall be capable of reading weights to 0.1 pound (0.05 kg) and shall have a tare feature.

3.3 FLUE GAS TEMPERATURES

- 3.3.1 Flue gas temperatures shall be determined with a thermocouple or other temperature sensing device at a height of 8 to 9 feet (2.4 - 2.7 m) from the top surface of the scale. The temperature sensing device shall be located in the center of the flue gas stream.
- 3.3.2 The temperature sensor and associated display and recording equipment shall have a resolution of 1°F (0.5°C).

3.4 STOVE SURFACE TEMPERATURES

- 3.4.1 Stove surface temperatures shall be determined with a shielded temperature sensing device placed at 5 locations on the appliance's exterior surfaces. Temperature locations shall be centrally positioned on the top, two sidewall, bottom and back combustion chamber surfaces (not on heat shields) if these surfaces are exposed while testing. Surface temperature locations for unusual design shapes (spherical, etc.) shall be positioned to conform to the intent of the locations described.
- 3.4.2 The temperature sensing device and associated display shall have a resolution of 1°F (0.5°C).

3.5 STOVE COMBUSTION TEMPERATURES

- 3.5.1 Radiation shielded thermocouple(s) or other equivalent temperature sensing device(s) shall be located in the primary and secondary (if applicable) combustion chambers to measure gas temperatures at a location where direct flame impingement on the sensing device does not normally occur. If a catalytic

combustor is part of the stove's combustion features, an additional thermocouple must be located in the permanent temperature monitoring port required in Section 8.4.1.

- 3.5.2 The temperature sensing devices and associated display shall have a resolution of 1°F (0.5°C).

3.6 FLUE GAS COMPOSITION

- 3.6.1 Dry flue gas composition shall be measured with continuous combustion gas analyzers to include percent by volume (dry basis) carbon monoxide, carbon dioxide, and oxygen. Samples shall be extracted at the same height as flue gas temperature measurements and withdrawn through a probe and tubing made of inert materials. The probe shall be bent into the flow of the flue gases.
- 3.6.2 A gas stream sample conditioner using a glass fiber filter is required in line before the analyzer. The sample conditioner shall include two impingers encased in an ice bath, one water trap and a silica gel trap in sequence.
- 3.6.3 Minimum performance specifications for accuracy and precision for the combustion gas analyzers and recorders include:

Drift $\leq \pm 1\%$ of full scale per 8 hours
Repeatability $\pm 1\%$ of full scale
Resolution: 0.1% for CO₂ and O₂; 0.01% for CO by volume
Accuracy: $\pm 1\%$ of scale

3.7 TRACER GAS DETECTOR

- 3.7.1 Minimum performance specifications for accuracy and precision for the tracer gas analyzer include:

Drift $\leq \pm 5\%$ of full scale per 8 hours
Repeatability ± 2 percent of full scale
Accuracy $\pm 3\%$ of scale

3.8 FLUE MOISTURE CONTENT DETERMINATION

- 3.8.1 A wet bulb-dry bulb technique shall be used to determine the water vapor present in the flue gases for on-line sampling purposes to maintain proportional sampling and appropriate weighting of enthalpy losses during burn cycle. A wet bulb temperature sensor shall be placed at the same location as the flue gas dry bulb temperature sensor. The wet bulb sensor shall consist of a thermocouple or other temperature sensing device with a cloth sock placed at the sensor end and saturated with water. The wet bulb sensor shall be placed in the center of the flue gas stream until the temperature

reaches a steady state. The wet bulb temperature must be taken while the sock is saturated with water. The appropriate water vapor content is determined using psychometric charts (See Oregon Source Sampling Method 4, Appendix 1).

3.9 DRAFT

- 3.9.1 The draft or static pressure (in inches of water) shall be measured in the flue at a location no greater than 1 foot (30.5 cm) above the flue connector at the stove outlet.

3.10 RELATIVE HUMIDITY

- 3.10.1 The test facilities ambient relative humidity shall be measured and recorded prior to and at the completion of each test cycle.

3.11 DATA RECORDING INTERVALS

- 3.11.1 Data recording shall commence upon charging of the test fuel load and all measurements shall be recorded either manually or automatically at least at every 5 minute interval for the entire test period. In addition, appliance surface and combustion chamber temperatures are also required at every five minute interval one hour prior to the test cycle.

3.12 INSTRUMENT CALIBRATION

- 3.12.1 Notwithstanding any standard calibration procedures designed to assure and maintain the accuracy of standard source testing equipment, the following calibration and testing methods must be utilized on the auxiliary equipment when testing woodstoves for air emissions.

3.12.2 Continuous gas analyzer(s) calibration

Upon receipt of equipment or any time the single point audit described below fails, a multipoint calibration of the analyzer must be completed before the instrument is put into service.

- a) Set up the instrument and allow it to operate for a sufficient time to stabilize as recommended by the manufacturer's published operating procedure.
- b) Introduce zero gas into the instrument at the normal sample flow being careful not to pressurize the sample stream. Normally, this will be accomplished by allowing the zero gas to flow into a three port vessel at a rate of at least twice the instrument sample rate and withdrawing sample from another port on the vessel while the third port is allowed to vent to the atmosphere.

- c) Introduce consecutively in the same manner as b) three certified calibration gases in artificial air noting the instrument response of each. The gases should represent approximately 20%, 50% and 80% of the instruments' full scale concentration.
- d) Construct a calibration curve using the data collected in b) and c).

3.12.3 Continuous gas analyzer(s) audit

Before and after each test, conduct a single point audit of the instrument as described below. It is highly recommended that a single point audit of the instrument be conducted at intervals not to exceed 2 hours during the test periods.

- a) Disconnect the instrument sample line from the sample source at a point upstream of all sample conditioning equipment (dryers, scrubbers, etc.).
- b) Being certain to avoid pressurizing the system, introduce a certified reference gas into the analyzer through all sample conditioning equipment. The sample gas should be in the range of 20% to 80% of full scale of the instrument.
- c) If the instrument response to the audit gas differs by more than 5% from the calibration curve, disregard all data collected with the instrument since the last successful audit and perform a multipoint calibration.
- d) Before and after each test, leak check the system by plugging the inlet and watching the sample flow rotometer.

3.12.4 Platform scale auditing

- a) Upon installation of the scale, a multipoint calibration must be performed using NBS traceable weights. This function will normally be performed by the scale manufacturer. As soon as practicable after the calibration, one or more weights may be weighed for use as a calibration traceable standard weight for audit purposes. The weight should be constructed from a weight stable (non-oxidizable and non-hygroscopic) material and maintained in such a way that its weight integrity is assured.
- b) Before and after each series of tests, the scale must be audited by first zeroing and then weighing at least one calibration traceable weight that corresponds to 20% to 80% of the expected charge load of the stove to be

tested. If the scale does not reproduce the value of traceable weight within ± 0.4 lbs, the scale shall be recalibrated before use and void previous results.

3.12.5 Tracer gas flow measurement

- a) All rotometers used in conjunction with tracer gas injection flow measurement techniques must be calibrated with the intended gas using either a calibrated volume measurement device such as a dry or wet gas meter or an accurate volume (displacement).
- b) The tracer gas detector must be calibrated at the beginning and end of each set of tests by introduction of a certified reference gas. The gas must be introduced through all normal gas conditioning devices and in such a way as to prevent system pressurization.

SECTION 4: TEST FUEL REQUIREMENTS

4.1 FUEL PROPERTIES

- 4.1.1 The test fuel shall be untreated, air dried Douglas fir lumber. Kiln dried lumber is not allowed. To insure positive identification of Douglas fir, species type is stamped D.F. on the lumber by the certified lumber grader at the mills. The oven-dried density range shall be 28.7-37.4 pounds per cubic foot (.46-0.60 gm/cm³). The density shall be determined and reported for certification purposes.
- 4.1.2 The test fuel shall have a moisture content range between 16% and 20% on the wet basis (19-25% dry basis). Moisture content shall be determined by measurements made with a calibrated electrical resistance type moisture meter or other equivalent performance type meter. Note: To convert moisture meter readings from the dry basis to the wet basis: $(100)(\% \text{ dry reading}) \div (100 + \% \text{ dry reading})$.
- 4.1.3 Minimum performance specifications for accuracy of the moisture meter shall be $\pm 3\%$ of reading.
- 4.1.4 Moisture content determination per load shall be an average of a minimum of three readings for each fuel piece measured parallel to the grain of the wood on three sides (end readings excluded). If an electrical resistance type meter is used, electrode penetration shall be to a one inch depth using insulated pins. Moisture content measurements shall be made within a four hour period prior to testing, and the test fuel shall be at room temperature.

- 4.1.5 No wetting of previously dried wood is allowed. It is recommended that the test fuel be stored in a temperature and humidity controlled room.
- 4.1.6 The test fuel shall be essentially free of knots, and free of any rotted or molded areas or other defects such as pitch seams.
- 4.1.7 The higher heat value of the fuel shall be determined by bomb calorimetry using ASTM Method D 3286-77 or D 2015-77. A composite sample from each piece of the test charge shall be analyzed and reported for each test fuel load.

4.2 TEST FUEL PIECES

- 4.2.1 The dimension of each piece of fuel (flanged lumber) shall conform to the nominal measurements of 2x4 and 4x4 lumber (1-1/2 x 3-1/2 and 3-1/2 x 3-1/2 in).
- 4.2.2 The flanged lumber dimensions will vary according to the appliance's firebox volume as indicated below:

<u>Usable firebox volume (ft³)</u>	<u>Flanged lumber piece size (nominal inches)</u>
≤ 1.5	2x4
1.5 ≤ 3	2x4 approximately 1/2 weight of test fuel load 4x4 approximately 1/2 weight of test fuel load
> 3	4 x 4

- 4.2.3 Each flanged piece shall be constructed in a configuration to conform to the following requirement for spacer dimensions and spacing intervals: Spacers will be constructed from air dried Douglas fir lumber (meeting the fuel specifications in Section 4.1) 5 inches in length, 1-1/2 inches in width, and 3/4 inches in height (12.7 x 3.8 x 1.9 cm). The spacers are to be attached by uncoated ungalvanized nails or staples to the lumber flush with the ends of each piece such that a 3/4 inch (1.9 cm) extension of the spacer occurs at the width of each end of the log as illustrated in Figure 4.2-A.
- 4.2.4 An optional acceptable flanged fuel configuration has identical spacing intervals as indicated in 4.2.3, but with a greater spacer dimension in height as depicted in Figure 4.2-A. The optional spacer configuration must conform to the conditions specified in 4.2.3 and meet the 5 inches in length, 1-1/2 inches in width and 1-1/2 inches in height (12.7 x 3.8 x 3.8 cm).

- 4.2.5 The length of each piece of test fuel shall be of equal length and shall closely approximate $5/6$ the length of the longest usable dimension of the firebox. (See 4.3.2)
- 4.2.6 Test fuel pieces shall be arranged in the firebox in conformance with the manufacturers published written instructions and in a configuration which maintains air space intervals between the logs. The fuel shall be positioned so that the flanges are flat (parallel) to the floor of the firebox, with the flanged edges in contact (abutting each other). If loading difficulties result, some fuel pieces may be placed on edge. If the usable firebox volume is between 1.5 and 3.0 ft³, alternating the piece sizes in vertical stacking layers is required to the extent possible. For example, 2x4's shall be placed on the bottom layer in direct contact with the coal bed and 4x4's on the next layer, etc. (See Figure 4.2-B). Photo documentation of the loading configuration for each test cycle shall be provided to the DEQ for certification purposes.
- 4.2.7 Appliances of unusual or unconventional firebox design shall load the fuel in a configuration which maintains air space intervals between the flanged lumber and is in conformance with the manufacturers published written instructions. Any appliance that will not accommodate the loading configuration specified in 4.2.6, must obtain DEQ loading configuration approval prior to testing for certification purposes.
- 4.2.8 Appliances that are designed to provide continuous feed pelletized or chipped fuel must prearrange an equivalent test criteria agreement with the DEQ prior to testing for certification purposes.

4.3 LOAD SIZE

- 4.3.1 The initial fuel load and the test fuel charge shall be based on weight per usable firebox volume. The fuel loads shall be equivalent to seven pounds of fuel as fired per cubic foot (112 kg/m³) of usable firebox volume $\pm 10\%$.
- 4.3.2 To avoid stacking difficulties, or when a whole number of fuel pieces does not result, all piece lengths may be adjusted uniformly to remain within the specified loading density.
- 4.3.3 Usable firebox volume means the entire volume of the (primary) combustion chamber less any volume where firewood could not reasonably be placed, such as areas restricted by baffles or firebrick. (see Figure 4.3)

SECTION 5: APPLIANCE OPERATING PROCEDURE

5.1 PRETEST START UP

- 5.1.1 The pretest startup phase is designed to bring the stove up to a stabilized operating temperature that is reflective of the heat output range required for the following test cycle.
- 5.1.2 Pretest start up will begin with ignition of kindling from a cold start with no charcoal residue in the firebox. A layer of cold wood ashes spread to a uniform depth of up to one inch in depth (2.54 cm) on the floor of the firebox or ash pan is optional. The kindling load shall consist of between 4-8 pounds (1.8 - 3.6 kg) of finely split Douglas fir with a moisture content range up to 20% on the wet basis. Crumpled newspaper balls loaded with the kindling shall be used to help attain ignition. The air supply controls may be adjusted per the manufacturer's published instructions for the kindling start up phase.
- 5.1.3 After 50 - 75% of the kindling by weight has been consumed, a pretest fuel load shall be added. The pretest fuel load shall meet the same fuel species and moisture content specifications as the test load. The pretest fuel load shall consist of whole 2x4 lumber pieces, without flanges, that are no less than 1/3 the length of the test fuel. Additional fuel may be added provided it meets the above requirements and that uniform charcoalization and weight specifications are adhered to before the test cycle begins.
- 5.1.4 The air inlet supply setting may be set at any position desired which will maintain combustion of the pretest fuel load. It is recommended that the air inlet supply setting be set at the position necessary to achieve the lowest heat output level of the following test cycle and be set at least one hour prior to addition of the test fuel load.
- 5.1.5 To document stabilized appliance heat storage effects and to control heat output levels, surface temperatures shall be recorded at each 5 minute interval during the one hour period prior to charging the test fuel.
- 5.1.6 No emissions or efficiency measurements are required during this pretest startup phase.

5.2 TEST CYCLE OPERATION

- 5.2.1 All stove surface temperatures shall be averaged and compared to those recorded at the beginning and the end of each test

cycle. To approximate thermal equilibrium, the averaged beginning and ending test cycle stove surface temperatures must be within 125°F (51.7°C) of each other. For all appliances, a correction factor shall be made to correct for heat storage effects. The correction factor shall be 0.12 Btu/lb °F multiplied by the averaged surface temperature difference in °F obtained from the beginning and ending temperatures of each test cycle. Some stoves (e.g., high mass stoves) may require more than one pretest fuel load to stay within the required averaged temperature range at the beginning and at the end of the test cycle.

- 5.2.2 An appliance may be tested in one continuous testing period that encompasses discrete test cycles for each of the four specified heat output levels (see 5.8) provided that a one hour minimum interval between each discrete test cycle occurs. The interval between test cycles provides time to reposition the air supply adjustment to the appropriate setting, re-establish and maintain the required coal bed, and meet the surface temperature requirements for the next desired heat output level.

5.3 TEST FUEL LOADING

- 5.3.1 When the kindling and pretest fuel load has been consumed to leave a weight equal to 20-25 percent of the test fuel load, the test fuel load shall be charged. Manipulation of the hot coal bed prior to charging the test fuel load shall conform to the manufacturer's published written instructions. In the absence of written instructions, breaking up, raking and uniform spreading of the embers or hot coal bed is required prior to addition of the test fuel load. No manipulation or rearrangement of the test fuel load configuration is allowed during any portion of the test cycle.
- 5.3.2 Additional fuel may be added between the test cycle intervals, provided it meets the fuel species and moisture content specifications. Whole 2x4 lumber pieces, without flanges, no less than 1/3 the length of the test fuel may be used, provided proper re-establishment of the hot ember bed is controlled to the specified weight criteria and uniform charcoalization of the ember bed is adhered to.

5.4 AIR SUPPLY CONTROL

- 5.4.1 Adjustment of the primary air supply controls or holding the fuel loading door open up to the first 5 minute phase of the test cycle is allowed to insure good ignition of the test charge and catalyst if so equipped. Adjustments should be conducted per the manufacturer's published written instructions. Immediately thereafter, the primary inlet air supply control(s),

either manual or automatic, shall be set to the position necessary to achieve the required heat output level. No additional adjustments of the air supply controls or opening the loading door will be allowed during the remainder of each test cycle.

- 5.4.2 Maximum heat output shall be achieved by operating the appliance with the primary air supply inlet controls fully open during the entire fuel load cycle unless the manufacturer's published written instructions specify that maximum heat output occurs at another setting.
- 5.4.3 All other heat output levels shall be achieved by operating the appliance with the primary air supply inlet control or other mechanical control device set in a predetermined position necessary to obtain average heat output levels specified in 5.8 during the entire test cycle.
- 5.4.4 If the primary air supply inlet control(s) cannot be adjusted to obtain variable burn rates or variable heat output levels, the appliance shall be tested at the fixed air supply setting.
- 5.4.5 Secondary or tertiary air supply may be adjusted one time only during each test cycle following the manufacturer's published written instructions.

5.5 TEST CYCLE COMPLETION

- 5.5.1 A test cycle ends when the entire weight ± 0.1 lb (.045 kg) of the test fuel load has been consumed, (i.e., when a bed of coals equal to the beginning coal bed weight remains).

5.6 BLOWERS, FANS

- 5.6.1 The use of blowers for heat exchange is optional. Beginning with the start of the test cycle, blower speed may be positioned at a recommended setting but no changes in setting will be allowed throughout the entire test period and the position setting shall be recorded at the time positioning occurs.

5.7 OTHER APPURTENANCES

- 5.7.1 Shaker grates, by-pass handles, or other appurtenances (not primary air supply controls) may be adjusted one time only during each test cycle in accordance with the manufacturer's written published instructions, and all adjustments shall be recorded.

5.8 NUMBER OF TESTS REQUIRED

- 5.8.1 Simultaneous emissions and efficiency tests are required during an entire test cycle within each of four discrete heat output ranges as indicated below.

Test Cycle Heat Output

(Average Btu/hr)

Category 1.	Category 2.	Category 3.	Category 4.
< 10,000	10-15,000	15-25,000	Maximum heat output

- 5.8.2 If the lowest sustainable burn rate produces an average heat output greater than the first category, then two tests must be conducted near the low and high end of the second category plus tests at the remaining categories. A total of four test cycles are required.
- 5.8.3 If the lowest sustainable burn rate produces an average heat output greater than the second category, then two tests must be conducted near the low and high end of the third category plus a test at the remaining category. A total of three test cycles are required.
- 5.8.4 If the lowest sustainable burn rate produces an average heat output greater than the third category, three tests must be conducted, one at the lowest sustainable burn rate, one at the maximum heat output level and one at an intermediate level between the lowest and maximum level. A total of three test cycles are required.
- 5.8.5 If lowest sustainable burn rate is greater than 10,000 Btu/hr then documentation shall be submitted to demonstrate the actual burn rate is the lowest sustainable. This documentation can be in the form of proof that the appliance was run at its lowest permanent air supply setting or test data that demonstrates the burn rate approaches zero (less than 0.1 kg/hr) within the area of 1 to 1.1 times the lowest sustainable burn time and when greater than 90% of the test charge has been consumed. Such test data shall be collected by following all the stove operating procedures specified in this document.

- 5.8.6 If an appliance has a fixed air supply setting, two replicate tests shall be conducted at the "on" firing mode setting. A total of two test cycles are required.
- 5.8.7 If an appliance is unable to achieve an average heat output level of 25,000 Btu/hr at its maximum heat output, four tests must be conducted. One test must be conducted at the first category, one at the second category and two tests at the third category, one conducted near the low end of the range and one at the maximum heat output. A total of four test cycles are required.

SECTION 6: TEST METHODOLOGY AND CALCULATIONS

6.1 EMISSION TESTING

- 6.1.1 Particulate emission testing shall be conducted in conformance with Oregon Source Sampling Methods 5 and 7 (Attachments 2 and 3) with the following exceptions: 1) no traverse of the flue is necessary, 2) sample extraction shall occur in the center of the flue at a height of eight to nine feet above the top surface of the scale, 3) on-line stack gas velocity and volumetric flow rate determination will be made using an alternate method (Section 6.3). Total volume and average flow rates for the test period will be calculated using a simultaneous stoichiometric carbon, hydrogen and oxygen balance method (Section 6.2.1). Sample extraction rates shall be maintained at or proportional to the flue gas velocity as determined by the measured concentration of a tracer gas injected into the stack gases to determine dilution rate and thus, total flow. Adjustments to the sampling rate will be made at each five minute interval during the entire test period.

6.2 PROCEDURES FOR DETERMINING EQUIVALENCE BETWEEN CANDIDATE METHODS AND THE REFERENCE METHOD FOR WOODSTOVE EMISSION TESTING

6.2.1 Determination of Equivalence

The test procedures outlined in this section shall be used to determine if a candidate method is equivalent to the reference method when both methods measure particulate emissions from woodstoves. Equivalence is shown for the methods when the differences between the measurements made by a candidate method and the measurements made simultaneously by the reference method are less than or equal to the precision and consistency values specified below.

- 5.3.6 If an appliance has a fixed air supply setting, two replicate tests shall be conducted at the "on" firing mode setting. A total of two test cycles are required.
- 5.8.7 If an appliance is unable to achieve an average heat output level of 25,000 Btu/hr at its maximum heat output, four tests must be conducted. One test must be conducted at the first category, one at the second category and two tests at the third category, one conducted near the low end of the range and one at the maximum heat output. A total of four test cycles are required.

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Specifications For Woodstove Emission Test Methods

Parameter	Units	Limits
Emission rate range	g/hr	1.0-45.0
Minimum number of test runs		16
Minimum number of simultaneous samples per test run		4
(Candidate method)		(2)
(Reference method)		(2)
Maximum analytical precision (individual test runs)	%	18
Maximum analytical precision (standard deviation)	%	10
Maximum difference in consistent relationship (weighted averages)	%	20

6.2.2 Test Conditions

The woodstove burn rate and operating cycle shall be in accordance with procedures specified by DEQ. Testing procedures and schedules shall be approved by DEQ at least 60 days prior to testing. All test measurements or samples shall be taken in such a way that both the candidate method and the reference method receive stack gas samples that are homogenous or as nearly identical as practical.

Collect simultaneous and duplicate samples of woodstove emissions with both the reference and candidate methods until at least 16 quadruple samples (duplicate pairs of both candidate and reference methods) have been obtained. The 16 quadruple samples should represent 16 full test runs, four test runs on each of four stoves. The tests on each stove shall be in each of the four heat output ranges specified in the certification procedures and 5.8.1 of this document. Calculate the emission rates as determined by the candidate and reference methods for each test run. For the reference method, calculate the average particulate emissions for each test run by averaging the results calculated from the duplicate analyses (A and B):

$$R_{i \text{ ave}} = \frac{R_{iA} + R_{iB}}{2} \quad 6.2.2.a$$

where R denotes results from the reference method and where i is the sample number. Disregard all quadruple samples for which the particulate emission rate as determined by the average of the duplicate reference method analyses falls out-

side the range of 1.0 to 45.0 grams per hour (g/hr). All remaining quadruple samples must be subjected to the following test for precision (in 6.2.3).

Calculate the weighted emission rates, using the procedures specified in OAR 340-21-120(5), as determined by the candidate and reference methods for each of the four woodstoves tested. For the reference method, calculate the average weighted emission rate for each woodstove tested by averaging the results calculated from the duplicate analysis (A and B). One woodstove weighted emission rate (average of duplicate reference method analysis) must be within each of the following ranges for the procedure to be valid: Less than 5.0 g/hr, 5.0 to 10.0 g/hr, 10.0 to 15.0 g/hr, and greater than 15.0 g/hr. All weighted emission rates must be subjected to the consistent relationship test (in 6.2.4 following).

6.2.3 Test For Precision

Calculate the precision (P) of the analysis (in percent) for each duplicate sample and for each method, as the maximum minus the minimum divided by the average of the duplicate analyses, as follows:

$$PR_i = \frac{R_{i \text{ max}} - R_{i \text{ min}}}{R_{i \text{ ave}}} \times 100\% \quad 6.2.2.b$$

$$PC_i = \frac{C_{i \text{ max}} - C_{i \text{ min}}}{C_{i \text{ ave}}} \times 100\% \quad 6.2.2.c$$

where C denotes results from the candidate method, R denotes results from the reference method, and i indicates the sample number.

Calculate the standard deviation (SD) of the reference and candidate precision analyses as follows:

$$SD_R = 1.77 \times PR_{\text{ave}} \quad 6.2.2.d$$

$$SD_C = 1.77 \times PC_{\text{ave}} \quad 6.2.2.e$$

where PR_{ave} is the average of the absolute values of PR_i ; and PC_{ave} is the average of the absolute values of PC_i .

If any reference method precision value (PR_i) exceeds 18 percent or if the standard deviation (SD_R) exceeds 10 percent, the precision of the reference method analytical procedure is out of control. Corrective action must be taken to determine the source(s) of imprecision and the reference method determinations must be repeated, or the entire test procedure must be repeated.

The candidate method passes this test if the precision values of the candidate method (PC_i) are less than or equal to 18 percent and the standard deviation (SD_C) is less than or equal to 10 percent.

6.2.4 Test For Consistent Relationship

For each of the four woodstoves tested, calculate the weighted average emission using DEQ procedure specified in OAR 340-21-120(5).

For each quadruple sample, calculate all four possible percent differences (D) between the reference and candidate methods, using all four possible combinations of the duplicate determinations (A and B) for each method, as:

$$D_{in} = \frac{C_{ij} - R_{ik}}{R_{ik}} \times 100\% \quad 6.2.2.f$$

where i is the woodstove model tested and n numbers from 1 to 4 for the four possible difference combinations for the duplicate determinations for each method (j = A, B, candidate; k = A, B, reference).

If the candidate method is to include dual units and averaging of test results, then calculate the differences (D) between the reference and candidate methods as follows:

$$D_i = \frac{C_i - R_i}{R_i} \times 100\% \quad 6.2.2.g$$

where i is the woodstove model tested, C is the average of the dual candidate results, and R is the average of the dual reference results.

The candidate method passes this test if the absolute values of all of the applicable differences (D) are less than or equal to 20 percent.

6.2.5 Test For Equivalence

The candidate method must pass both the precision test and the consistent relationship test to qualify for designation by DEQ as an equivalent method. DEQ may require dual units and precision criteria between dual units, or other conditions in the designation as an equivalent method.

6.2.6 Verification Testing

DEQ may conduct verification testing of the candidate method. If DEQ testing does not verify the precision and consistent

relationship of the candidate method then the candidate method will not be approved as an equivalent method.

6.3 TRACER GAS DILUTION METHOD

- 6.3.1 This method is used for on-line measurement of stack gas flows during the test period. Other techniques that can provide equivalent results may be accepted, provided prior approval by DEQ has been made before testing for certification purposes commences.

a) Tracer Gas Dilution Method

A pure tracer gas (sulfur dioxide or equivalent, or approved performance gas) is metered through a calibrated rotometer for injection into the flue pipe. Injection shall be made through a stainless steel multi-perforated tube loop located inside the stack at four flue diameters downstream from the particulate and gas sampling port. A downstream diluted sample extraction probe shall be located 8 flue diameters downstream from the injection loop. The dilution sample gas stream shall be processed through a sample conditioner consisting of a combustion tube furnace, and in series, a glass fiber filter and three impingers encased in an ice bath. Impingers one and two shall be empty for water collection and the third shall contain silica gel.

The tracer gas content of the diluted gas sample stream shall be determined with an appropriate calibrated analyzer. Downstream tracer gas concentrations should not exceed 0.5% of the total flue gas volume. The tracer gas shall be as non-reactive with other flue gas constituents as possible and measurable by instrumentation capable of obtaining an accuracy of $\pm 1\%$ of the instrument scale reading. Instrument calibrations shall be performed and recorded before and after each test run.

Stack gas volumetric flow rates shall be calculated using the following equations:

$$\text{Flow (cfm)} = \frac{I_r}{D_c} \times \frac{1}{60} \times \frac{T_r}{P_r \times 17.65^{\circ}} \quad 6.3.1.a$$

Where: I_r = Tracer gas injection rate (ft³/hour)

D_c = Downstream tracer gas concentration
(ppm $\times 10^{-6}$)

T_r = Injection gas temperature (°R) at the rotometer

Pr = Injection gas pressure (inches Hg)
 * = Density specific for SO₂

Other tracer gases such as helium may be substituted for sulfur dioxide provided prior written agreement has been made with the DEQ.

6.4 STOICHIOMETRIC CARBON, HYDROGEN AND OXYGEN BALANCE METHOD

6.4.1 A carbon, hydrogen and oxygen mass balance will be used for determining overall flue gas volume--not for on-line measurements during the test period.

- a) The carbon, hydrogen and oxygen balance method for volumetric flow rates is based on the following basic combustion equation and will be determined and reported for every five minute interval.

$$\theta [C_xH_yO_z + pH_2O] + Tsg(1-k)(a) [O_2 + 3.785N_2 + mH_2O] \quad 6.4.1.a$$

$$Tsg[(1-k)(dCO_2 + eCO + gO_2 + hN_2) + jH_2O + kCH_4]$$

Where θ = Dry weight of fuel burned (lbs)
 x = Moles of carbon per lb of dry fuel (assumed 0.0425)
 y = Moles of hydrogen per lb of dry fuel (assumed 0.073)
 z = Moles of oxygen per lb of dry fuel (assumed 0.0256)
 p = Moles of H₂O per lb of dry fuel
 = Dry basis moisture (free and combined) * 1800
 a = Mole fraction of oxygen in air supply
 = Moles O₂ supplied per mole of stack gas
 d = Mole fraction of CO₂ in stack gas
 e = Mole fraction of CO in stack gas
 g = Mole fraction of O₂ in stack gas
 h = Mole fraction of N₂ in stack gas
 j = Mole fraction of H₂O in stack gas
 k = Mole fraction of unburned hydrocarbon in stack gas (as CH₄).
 m = Mole fraction of H₂O in supply air (mole H₂O per mole of supply oxygen)
 Tsg = Total moles of stack gas (dry)

- b) Mass balance equations for the combustion of θ lbs of wood are as follows:

Carbon:	$x\theta = Tsg [(1-k)(d+e)+k]$	6.4.1.b
Hydrogen:	$\theta(2p + y) + Tsg(1-k)(a)(2m) = Tsg(2j + k)$	6.4.1.c
Oxygen:	$\theta(p+z) + Tsg(1-k)(a)[2+m] = Tsg[(1-k)(2d + e + 2g) + j]$	6.4.1.d
Nitrogen:	$3.785 (a) = h$	6.4.1.e

Stack gas total as measured by combustion gas analyzers:

$$1 = (d + e + g + h) \quad 6.4.1.f$$

The stack gas composition equation can be solved for "h" which will then provide a solution for "a" in the nitrogen balance equation. The remaining unknown values for "e", "p", and "k" are determined by simultaneously solving the carbon, hydrogen, and oxygen balance equations.

- c) Two calculation runs of the simultaneous equation set are performed for each set (5 minute test segment) of data collected. The first run is performed to determine an average weighted "e" for the test burn. This first run "e" is then used to determine a corrected Tsg for the second run as follows:

$$\text{Tsg' (corrected)} = \text{Tsg (tracer gas)} \frac{e \text{ (actual)}}{e \text{ (calculated first run)}} \quad 6.4.1.g$$

Where: $e \text{ (actual)}$ = Dry weight burn rate for test burn (lb/hour)

- d) "Tsg" is converted to a flow rate by the following equation:

$$\text{Flow (cubic feet per minute)} = \frac{\text{Tsg} \times 386.2}{60} \quad 6.4.1.h$$

This calculation procedure is necessary for each five minute test period segment, therefore a computer program is recommended.

6.5 EFFICIENCY TESTING AND CALCULATIONS

- 6.5.1 If a calorimeter room is used to measure appliance efficiency, combustion gas analyzers must be included to determine and report appliance combustion and heat transfer efficiencies for each heat output level required.

- 6.5.2 Efficiency values shall be determined based on the following stack loss method. The approach shall include determination for each heat output level for combustion, heat transfer, and overall efficiency.

- a) Combustion Efficiency

Combustion efficiencies are calculated as the percentage represented by the actual heat produced in the firebox

relative to the total heat production potential for the fuel consumed. Actual heat production in the firebox is calculated as the difference between the heat of combustion of the incompletely combusted stack gas constituents (carbon monoxide and unburned hydrocarbon equivalents) and the gross caloric content of the fuel burned. The basic equation used for combustion efficiency is as follows:

$$\text{Combustion Efficiency} = \frac{\text{Thi} - \text{Clo}}{\text{Thi}} \times 100 \quad 6.5.2.a$$

Where: Thi = Total heat content of the fuel consumed
Clo = Combustible losses out stack

- b) The total heat content of the fuel consumed shall be calculated using the following equation:

$$\text{Thi} = \text{Gcvf} \times \text{Wfc} \quad 6.5.2.b$$

Where : Gcvf = Gross caloric value of the fuel
(use HHV determined from bomb calorimetry analysis)
Wfc = Weight of fuel consumed (lbs) dry weight

- c) The heat content of the combustible losses are calculated using the following equation:

$$\text{Clo} = \text{Tsg} [(e \times \text{Hco}) + (k \times \text{Huh})] \quad 6.5.2.c$$

Where: Hco = Heat of combustion for carbon monoxide
= 128,000 Btu/mole
Huh = Heat of combustion for unburned hydrocarbons
= 181,000 Btu/mole (estimated)

This calculation procedure is necessary for each five minute test period segment.

- d) Heat Transfer Efficiency

Heat transfer efficiencies are calculated as the percentage represented by the useful heat released to the room relative to the actual heat produced in the firebox. The useful heat released to the room (Uhr) is calculated as the difference between the actual heat produced in the firebox (Ahf or Thi-Clo), and the sensible and latent heat losses out the stack (Sllo). The basic equation for heat transfer efficiency is as follows:

Heat Transfer

$$\text{Efficiency} = \frac{U_{hr}}{A_{hf}} = \frac{A_{hf} - S_{llo}}{A_{hf}} = \frac{(T_{hi} - C_{lo}) - S_{llo}}{(T_{hi} - C_{lo})} \times 100 \quad 6.5.2.d$$

Where: S_{llo} = Sensible and latent heat losses
 $= (T_o - T_i) [T_{sg}(dC_{pCO_2} + eC_{pCO} + gC_{pO_2} + hC_{pN_2} + jC_{pH_2O})] + (j-m)LH_{2O}$

Where: T_o = Temperature of stack gases out
 T_i = Temperature of inlet air and fuel

C_{pCO_2} = Specific heat of CO_2 = 9.3 Btu/mole
 C_{pCO} = Specific heat of CO = 7.0 Btu/mole
 C_{pO_2} = Specific heat of O_2 = 7.1 Btu/mole
 C_{pN_2} = Specific heat of N_2 = 7.0 Btu/mole
 C_{pH_2O} = Specific heat of water = 8.3 Btu/mole
 LH_{2O} = Latent heat of evaporation of water
 = 18,810 Btu/mole

This calculation procedure is necessary for each five minute test period segment.

e) Overall Efficiency

Overall average efficiency is calculated as the percentage represented by the heat released to the room relative to the total heat production potential of the fuel consumed. The overall efficiency is calculated as the product of the combustion efficiency and the heat transfer efficiency as follows:

$$\begin{aligned} \text{Overall Efficiency} &= \text{Combustion Efficiency} \times \text{Heat Transfer Efficiency} \\ &= \frac{A_{hf}}{T_{hi}} \times \frac{U_{hr}}{A_{hf}} = \frac{U_{hr}}{T_{hi}} \quad 6.5.2.e \end{aligned}$$

6.5.3 A corrected flue gas moisture content for each five minute interval must be determined as follows:

Final flue moisture determination shall be made by calculating a corrected flue gas moisture content for each data interval taken during the test cycle. The average wet bulb-dry bulb moisture measurement must be weighted by the volumetric flow rate for that 5 minute interval. The correction factor which is applied to each 5 minute moisture determination is calculated as the ratio between the average wet bulb-dry bulb measurement and the Oregon Source Sampling Method 4 (Attachment 1) measurement (condensate catch) for the entire burn cycle.

6.6 EQUIVALENCE BETWEEN CANDIDATE METHODS AND THE REFERENCE METHOD FOR WOODSTOVE EFFICIENCY TESTING

- 6.6.1 Candidate methods for woodstove efficiency testing must demonstrate consistent relationship to the reference method (stack loss) comparable to the consistent relationship between the reference method (stack loss) and the calorimeter room method as described in the DEQ's Confirmation Testing Summary, Section 18, Part C, Table 1: Comparison of Calorimeter Room Method vs. Stack Loss Method, 1984.
- 6.6.2 DEQ may conduct verification testing of the candidate method. If DEQ testing does not verify equivalence of the candidate method to the reference method (stack loss), then the candidate method will not be approved as an equivalent method.

SECTION 7: TEST DATA

7.1 DATA TO BE REPORTED

- 7.1.1 All raw and reduced test data must be included in the material sent to DEQ for appliance certification. Reduced test data shall be tabulated as indicated in Sections 7.1.2 through 7.1.10.
- 7.1.2 Particulate Emissions For Each Test Cycle
- a) Concentration: total grains/dscf, total grams/m³
 - b) Emission rate: grams/hr
 - c) Emission factor: grams/kg (dry fuel weight basis)
 - d) Emission process rate: grams/10⁶ joule useful heat output
 - e) Front half catch: % of total
 - f) Total mass captured: front and back catch, mg
- 7.1.3 Average Efficiency Values For Each Test Cycle
- a) Overall appliance efficiency %
 - b) Combustion efficiency %
 - c) Heat transfer efficiency %
- 7.1.4 Heat Output For Each Test Cycle
- a) Btu/hr average over entire test
- 7.1.5 Burn Rate For Each Test Cycle

The average values (kg/hr wet and dry basis) over the entire test cycle and an hourly average over the entire test cycle at each heat output level.

7.1.6 Average Fuel Moisture Content For Each Test Cycle

- a) Kindling (wet basis) %
- b) Test fuel (wet basis) %

7.1.7 Air/Fuel Ratio

Mass of combustion air to the mass of fuel over 90% or more of each test cycle (lbs air/lbs fuel).

7.1.8 Average Stack Gas Composition For Each Test Cycle

- a) Carbon dioxide %
- b) Carbon monoxide %
- c) Oxygen %
- d) Excess air %
- e) Moisture %

7.1.9 Average Stack Gas Flow and Draft For Each Test Cycle

- a) Average flow rate cfm
- b) Stack flow rate dscf/min (tracer gas and CHO balance)
- c) Draft, inches H₂O

7.1.10 Average Stack Gas Emission Factors and Process Rates For Each Test Cycle

- a) Carbon monoxide: grams/kg, and grams/10⁶ joule (measured)
- b) Hydrocarbons: grams/kg, and grams/10⁶ joule (calculated)

7.1.11 Average Temperatures For Each Test Cycle

- a) Stack gas °F
- b) Primary combustion chamber gas °F
- c) Secondary combustion chamber gas (if applicable) °F
- d) Above catalyst gas (if applicable) °F
- e) Stove top surface °F
- f) Stove sidewall surfaces °F
- g) Stove back surface °F
- h) Stove bottom surface °F

7.1.12 Fuel Load Weight and Burn Cycle Period For Each Test Cycle

- a) Coal bed weight, lbs
- b) Test fuel load weight, lbs
- c) Total burn cycle time period, minutes

SECTION 8: CATALYTIC COMPONENT CERTIFICATION REQUIREMENTS

8.1 CATALYTIC COMBUSTOR DESIGN CRITERIA

- 8.1.1 To insure equivalent performance of catalytic combustors used in testing versus production model stoves, a combustor model number for every catalytically equipped stove evaluated for certification shall be supplied. The model number will serve to identify catalytic combustor types by brand (manufacturer), dimensions, and design (substrate and coating material). The model number must be imprinted or inscribed on a readily visible surface (such as a metal sleeve or canned surface). This will allow DEQ field verification monitoring. Any change in combustor brand, size and design type will require retesting of the appliance with the new combustor model for performance change unless test data or sufficient information can be provided demonstrating equivalent or improved performance.

8.2 CATALYTIC COMBUSTOR AGING CRITERIA

- 8.2.1 Any appliance that contains a catalytic combustor must use a pre-aged combustor when testing for certification purposes. The combustor aging process will consist of burning Douglas fir dimensional lumber or cordwood with a moisture content range on the wet basis of 15-25% in a woodstove specifically designed for an internal catalytic combustor. The stove must be operated at its medium burn rate with a new catalytic combustor in place and in operation for a period of 50 hours. The accredited testing laboratory must document and provide combustor temperature data, hours of aging operation and certify to the DEQ that each catalytic appliance tested for certification purposes has met this provision.

8.3 CATALYTIC COMBUSTOR LONGEVITY CRITERIA

- 8.3.1 All catalytic combustor manufacturers must submit to the DEQ evidence in the form of test data that each combustor design type, identified by model number, has been longevity tested for 5000 hours and document that the percent reduction in particulate emissions from the new state is no less than 70%. Three test conditions are required: 1) unused (0 hours), 2) 250 hours, and 3) 5000 hours. Testing must be performed by a DEQ accredited laboratory. In lieu of this requirement, the manufacturer may substitute a 24 month non pro-rated combustor replacement warranty.

8.4 CATALYTIC COMBUSTOR TEMPERATURE MONITORING PROVISION

- 8.4.1 In order to qualify for DEQ certification, catalytically equipped woodstoves must be equipped with a permanent provision to accommodate a commercially available temperature sensor which can monitor combustor gas stream temperatures within or immediately downstream (within 1.0 inch or 2.5 cm) of the combustor surface.

EXAMPLE OF TEST EQUIPMENT SET-UP FOR FREE STANDING WOODSTOVES

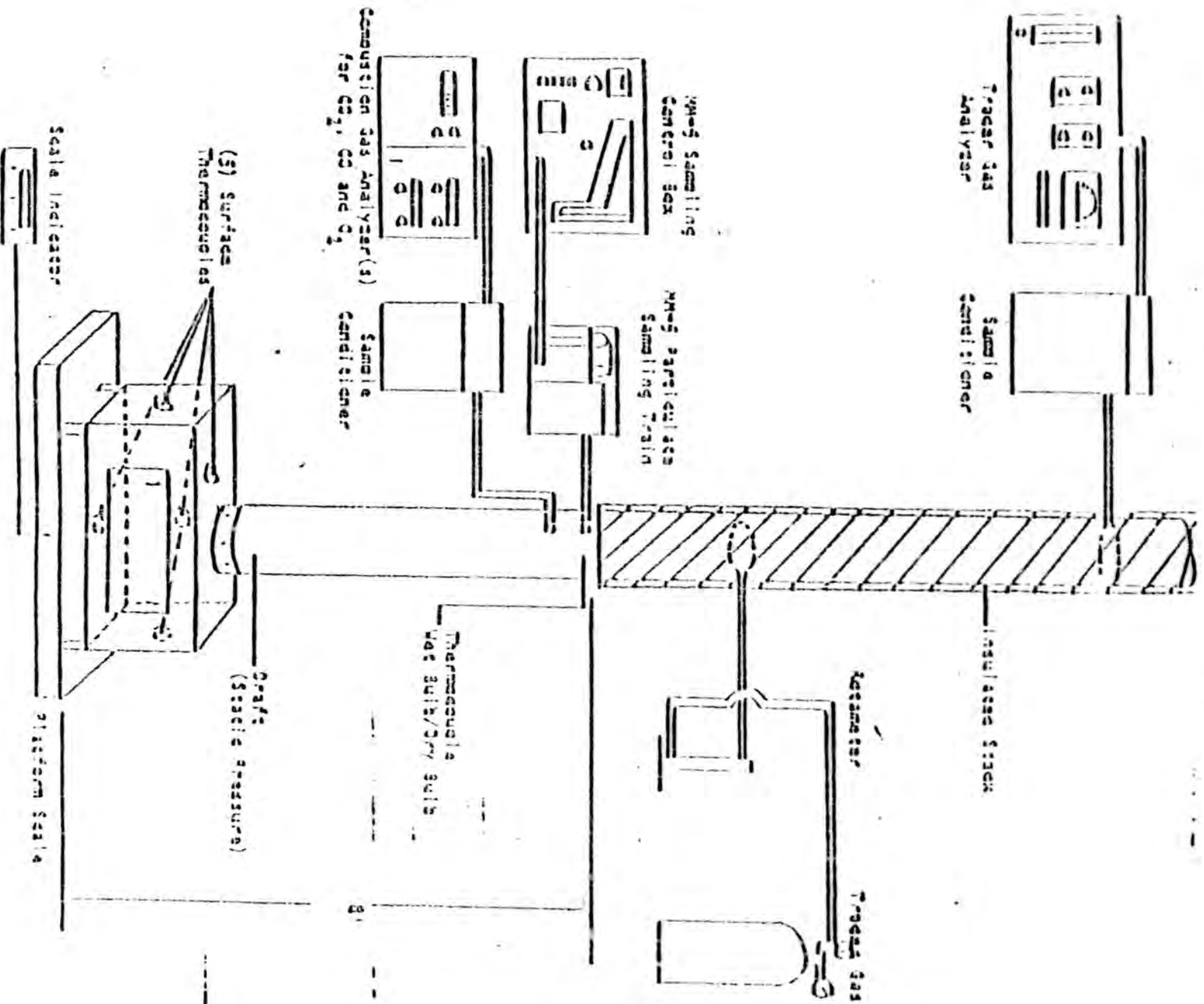


Figure C.1

Test Fuel Size

Usable Firebox Volume (ft^3)

Size = Flanged End Nominal (Inches)

≤ 1.5

2 x 4

$> 1.5 \leq 3$

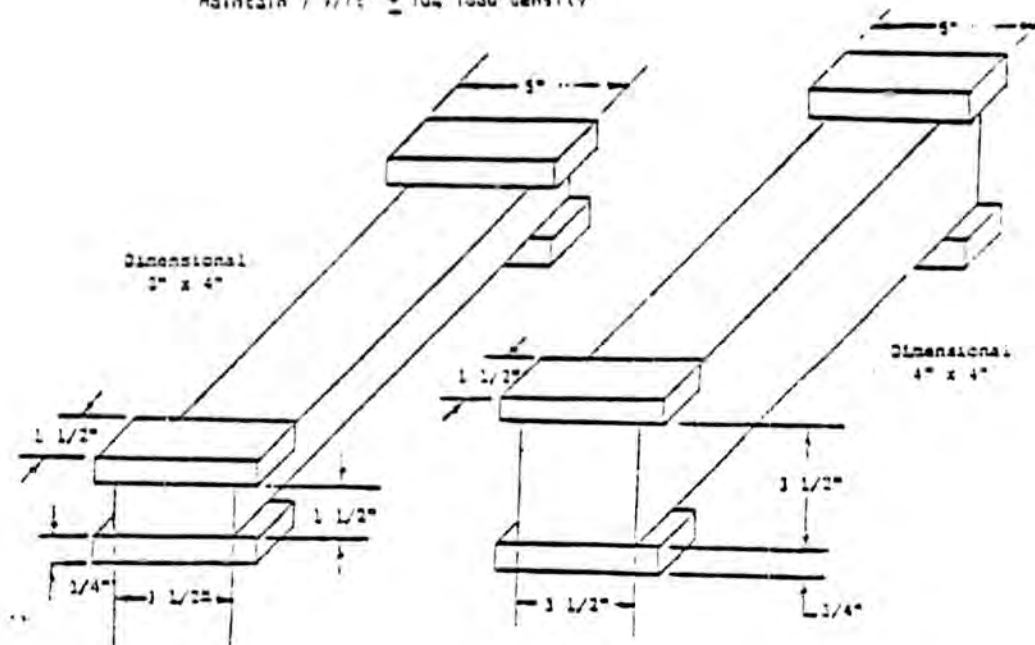
Combination

2x4 approximately $\frac{1}{4}$ weight of
test fuel load
4x4 approximately $\frac{1}{4}$ weight of
test fuel load

> 3

4 x 4

Maintain $7 \text{ ft}^3 \pm 10\%$ load density



Scale $1/4" = 1"$

* Length will vary depending on length of firebox

Alternative Flange
Configuration

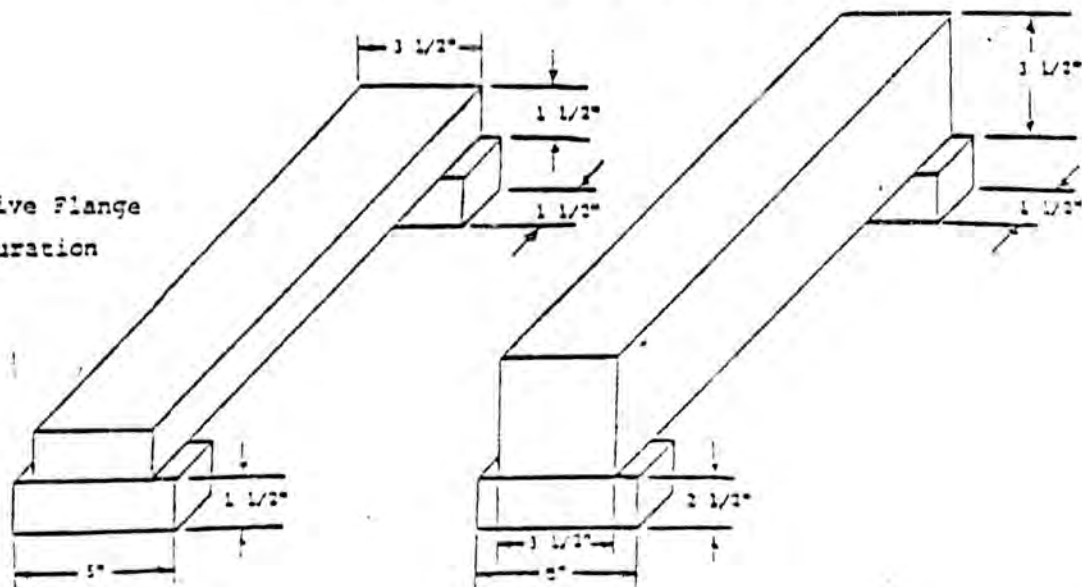
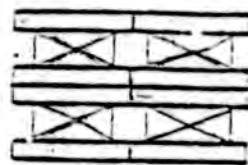
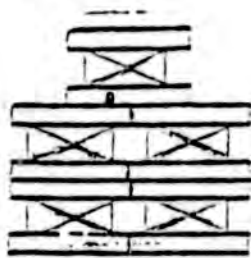
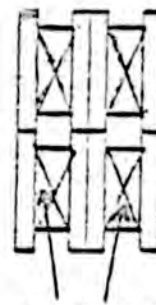


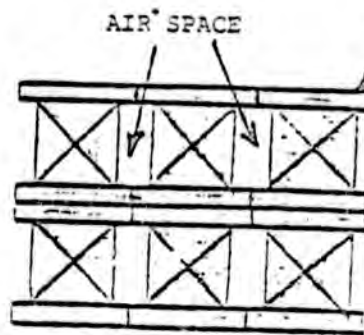
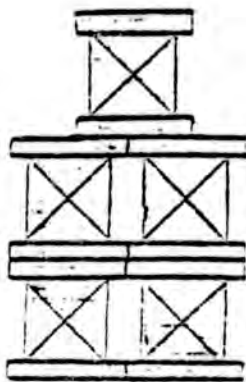
Figure 4.2-A



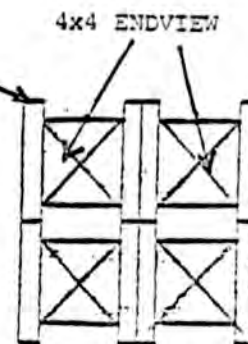
2 X 4



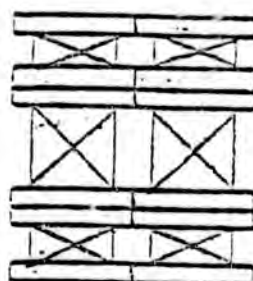
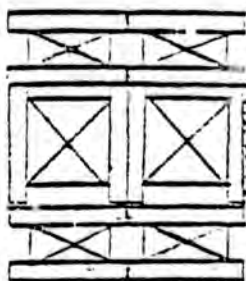
2x4 ENDVIEW



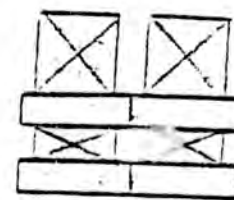
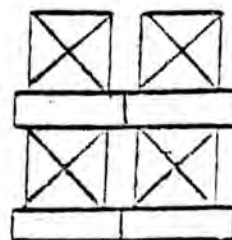
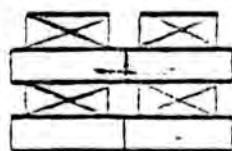
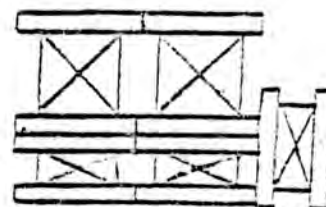
4 X 4



4x4 ENDVIEW



2 X 4 & 4 X 4



Alternative Flange Configuration

Woodstove Stacking & Loading Examples
Figure 4.2- B

EXAMPLES OF USABLE FIREBOX VOLUME (Designated by Shaded Area)

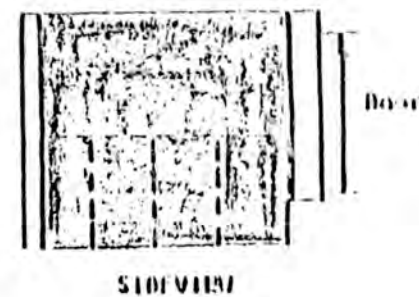
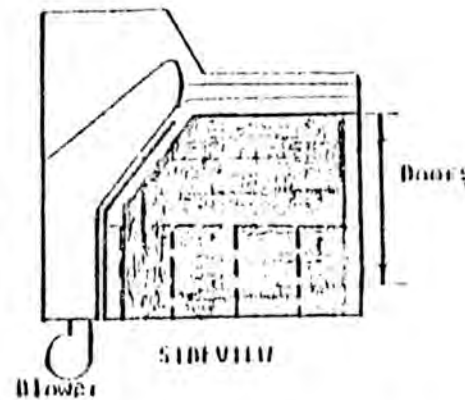
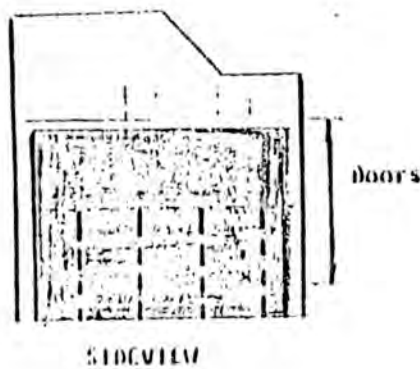
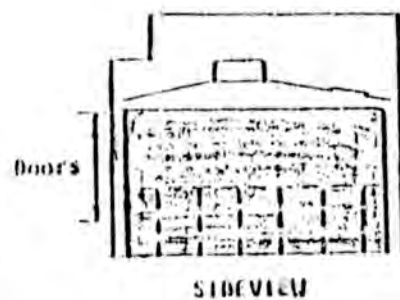


Figure 4.3

STATE OF OREGON
DEPARTMENT OF ENVIRONMENTAL QUALITY

Source Sampling Method 4

Determination of Moisture Content of Stack Gases

1. Principle and Applicability

1.1 Principle. A gas sample is extracted from the flowing gas stream and its moisture removed and measured either volumetrically or gravimetrically. Alternately, the moisture can be estimated by less accurate techniques for the purpose of setting the nomograph for isokinetic sampling. A wet bulb-dry bulb technique is discussed.

1.2 Applicability. The reference method is applicable for the determination of moisture in exhaust gases from stationary sources. The alternate method is to be used only for estimating the moisture content for the purpose of setting the nomograph unless otherwise specified.

2. Reference method

2.1 The method employed is essentially the same as used in the particulate determination source sampling method 3 and will not be discussed here.

3. Alternate method

3.1 Theory. The water vapor in a non-saturated gas stream causes a depression of the wet bulb temperature which is proportional to the fraction of moisture present.

3.2 Procedure

3.2.1 Measure the dry bulb temperature in the conventional way using either a thermometer or thermocouple.

3.2.2 Insert the end of the temperature measuring device in a cloth sock and saturate the sock with water. Inset the sock into the flowing gas stream and allow the temperature to reach a steady state. Caution: after the water on the sock has evaporated, the temperature will rise to the dry bulb temperature. (Figure 4-1). The wet bulb temperature must be taken while the sock is saturated with moisture.

3.2.3 Apply the wet bulb and dry bulb readings to the appropriate graph (Figure 4-2, 4-3, or 4-4) and determine the approximate water vapor content if the barometric pressure is near 29.92 in. Hg.

3.2.4 Alternately apply the wet bulb and dry bulb readings to equation 4-1 in Figure 4-3.

4. Interferences

4.1 The following conditions may drastically change the wet bulb reading causing erroneous results:

4.1.1 The presence of acid gases in the gas stream, i.e. SO_2 , SO_3 , HCl .

4.1.2 The presence of hydrocarbons in the gas stream.

4.1.3 Marked differences from atmospheric pressure (29.9 in. Hg) of the gas stream (if the graphs are used).

4.2 Should any of the above interferences be present, the tester should consider another approach to determining moisture content.

4.3 Additionally, the following conditions can lead to difficulties.

4.3.1 Very high dry bulb temperature (in excess of 500°F).

4.3.2 Very high or very low gas velocities.

4.3.3 High concentration of particulate matter which may adhere to the wet sock.

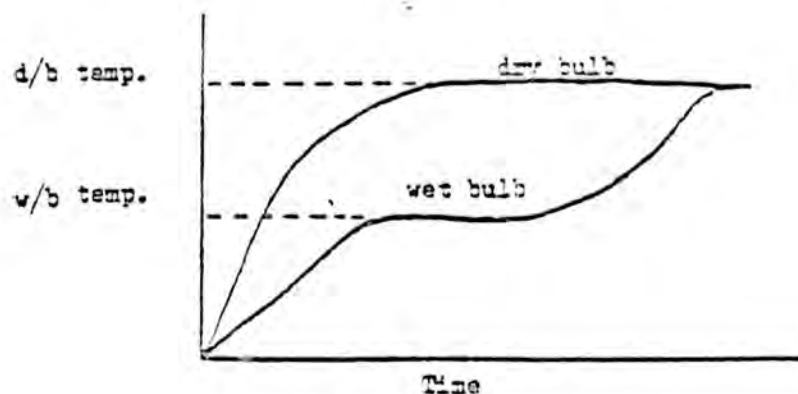


Figure 4-1

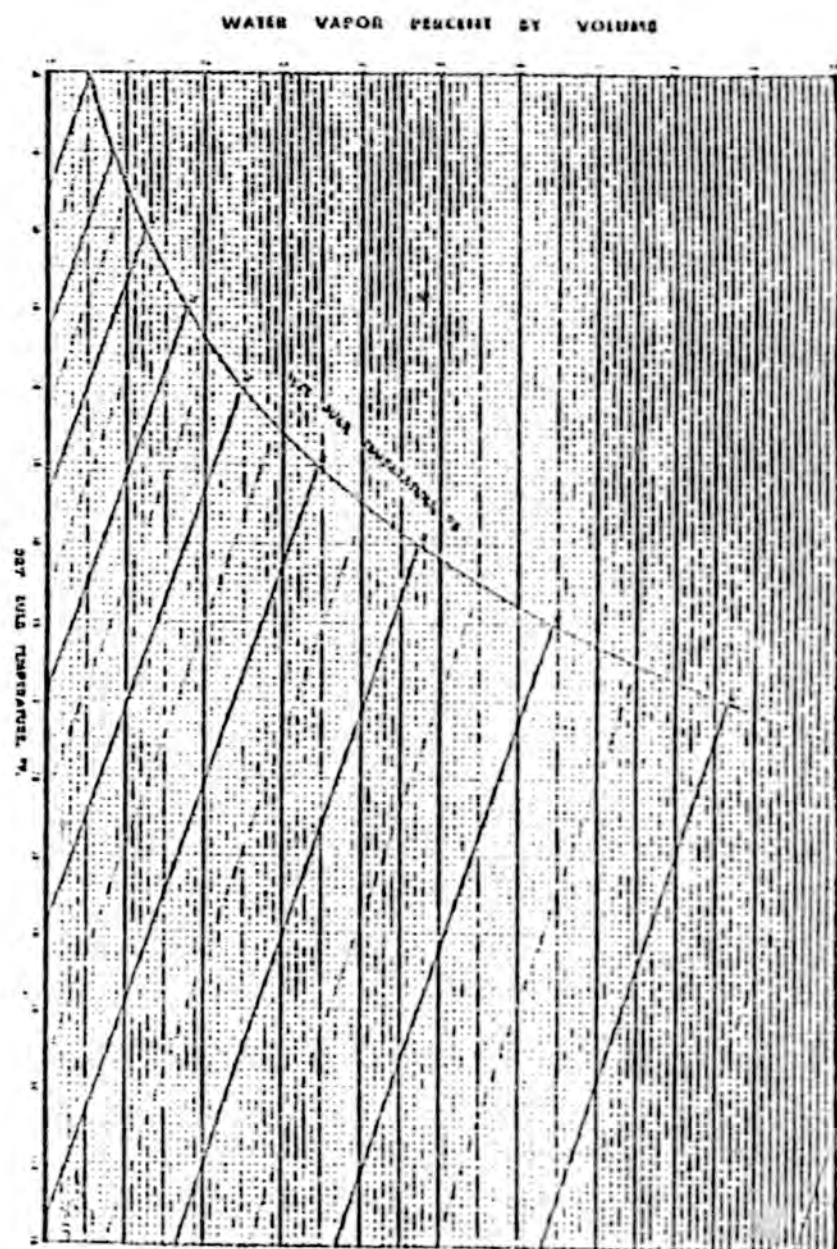


FIGURE 4-2

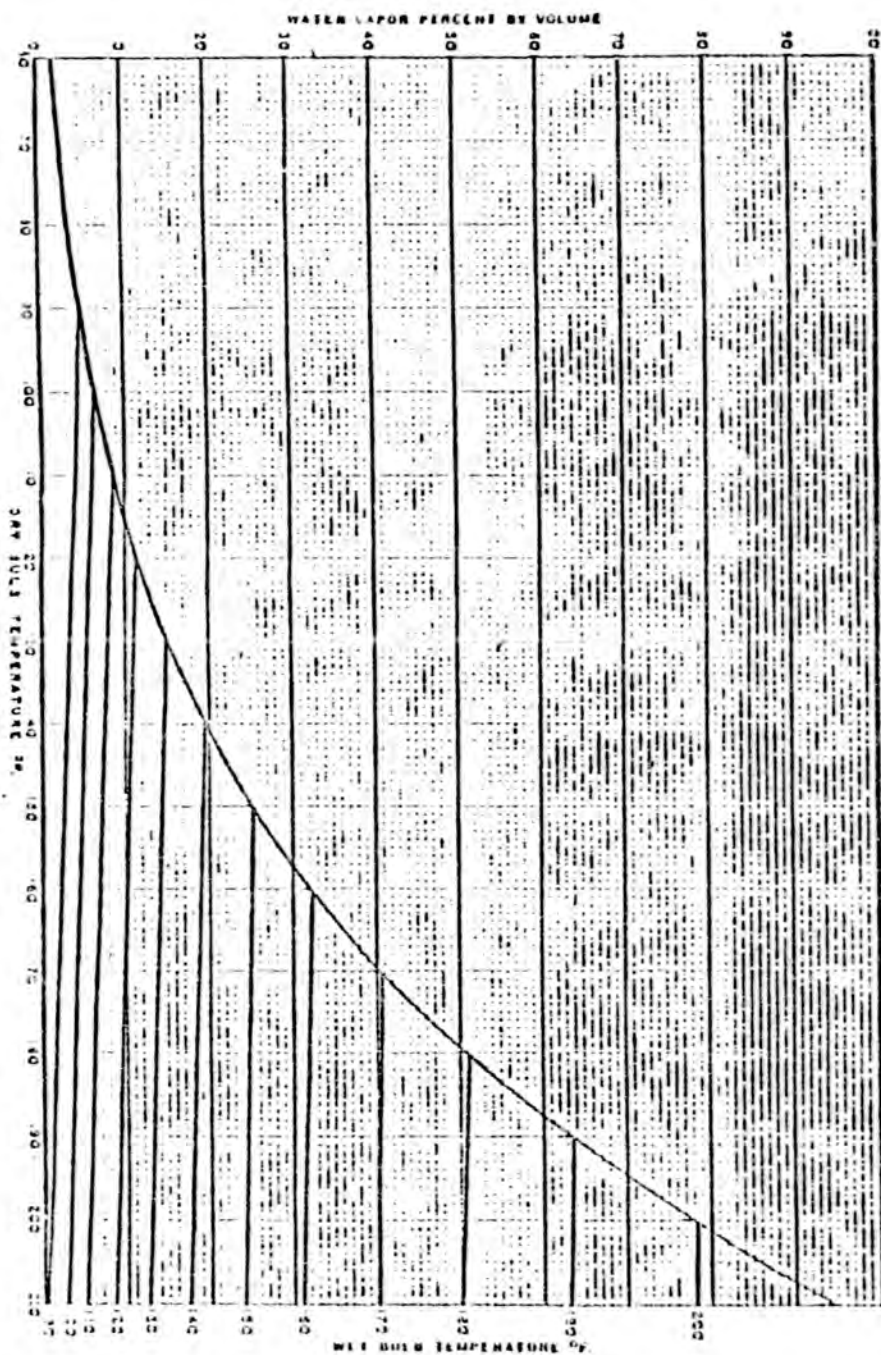


FIGURE 4-3

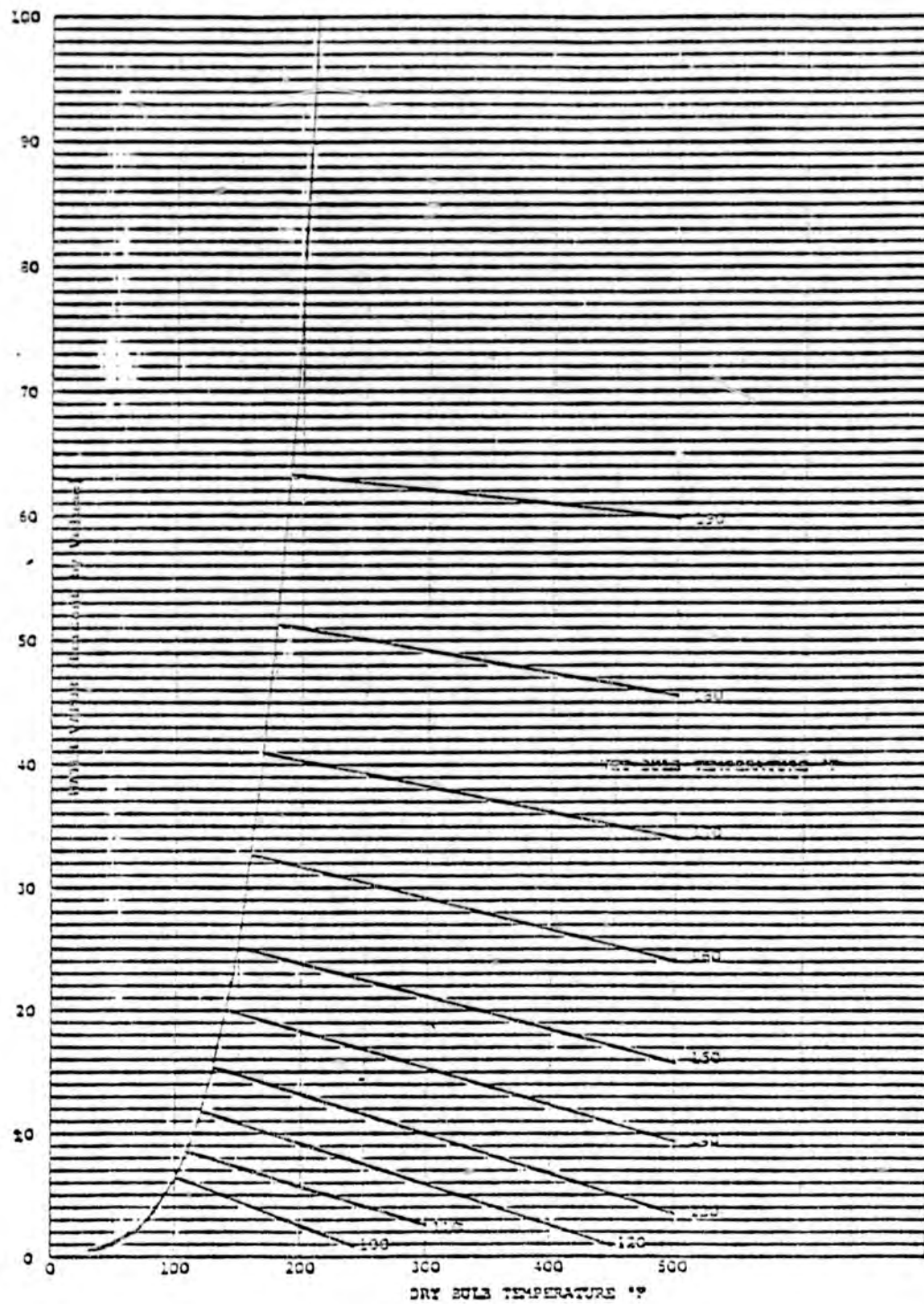


Figure 4-4

$$e^* = \frac{(P_a - e^*)(t_d - t_w)}{2800 - 1.3 t_w} \times 100$$

(4-1)

Where:

e^* = Vapor pressure of H_2O at t_w , in. Hg (See Figure 4-5)

P_a = Absolute barometric pressure, in. Hg

t_d = Dry bulb temperature, $^{\circ}F$

t_w = Wet bulb temperature, $^{\circ}F$

VAPOR PRESSURES OF WATER AT SATURATION (Inches of Mercury)

Temp. Deg. F.	0	1	2	3	4	5	6	7	8	9
—20	.0125	.0119	.0112	.0106	.0100	.0095	.0089	.0084	.0080	.0075
—10	.0222	.0209	.0199	.0187	.0175	.0163	.0153	.0142	.0134	.0124
0	.0375	.0359	.0333	.0324	.0306	.0289	.0275	.0259	.0247	.0233
10	.0531	.0513	.0493	.0473	.0453	.0433	.0413	.0393	.0373	.0353
20	.0691	.0669	.0646	.0623	.0600	.0577	.0554	.0531	.0508	.0485
30	.0854	.0829	.0803	.0777	.0751	.0725	.0699	.0673	.0647	.0621
40	.1020	.0992	.0964	.0936	.0908	.0879	.0851	.0823	.0795	.0767
50	.1190	.1160	.1130	.1100	.1070	.1040	.1010	.0980	.0950	.0920
60	.1363	.1331	.1300	.1269	.1237	.1206	.1175	.1144	.1113	.1082
70	.1539	.1505	.1473	.1441	.1409	.1377	.1345	.1313	.1281	.1250
80	.1718	.1683	.1649	.1615	.1581	.1547	.1513	.1479	.1445	.1411
90	.1899	.1863	.1828	.1793	.1758	.1723	.1688	.1653	.1618	.1583
100	.2082	.2045	.2009	.1973	.1937	.1901	.1865	.1829	.1793	.1757
110	.2267	.2229	.2192	.2155	.2118	.2081	.2044	.2007	.1970	.1933
120	.2454	.2415	.2377	.2339	.2301	.2263	.2225	.2187	.2149	.2111
130	.2642	.2602	.2563	.2524	.2485	.2446	.2407	.2368	.2329	.2290
140	.2832	.2791	.2751	.2711	.2671	.2631	.2591	.2551	.2511	.2471
150	.3023	.2981	.2940	.2900	.2859	.2818	.2777	.2736	.2695	.2654
160	.3215	.3172	.3130	.3088	.3046	.3004	.2962	.2920	.2878	.2836
170	.3408	.3364	.3321	.3278	.3235	.3192	.3149	.3106	.3063	.3020
180	.3602	.3558	.3514	.3470	.3426	.3382	.3338	.3294	.3250	.3206
190	.3797	.3752	.3707	.3662	.3617	.3572	.3527	.3482	.3437	.3392
200	.3993	.3947	.3901	.3856	.3810	.3765	.3719	.3673	.3628	.3582
210	.4190	.4143	.4096	.4050	.4003	.3957	.3910	.3863	.3817	.3770
220	.4388	.4340	.4292	.4245	.4197	.4150	.4102	.4055	.4007	.3960
230	.4587	.4538	.4489	.4441	.4392	.4344	.4295	.4247	.4198	.4150
240	.4787	.4737	.4688	.4639	.4589	.4540	.4491	.4441	.4392	.4343

Methods for Determination of Velocity, Volume, Dust, and Mist Content of Gases, Bulletin WP-50, Western Precipitation Corp., Los Angeles, Calif.

Figure 4-5

STATE OF OREGON
DEPARTMENT OF ENVIRONMENTAL QUALITY

Source Sampling Method 5

Sampling Particulate Emissions From Stationary Sources

1. Principle and Applicability

1.1 Principle. Particulate matter including condensible gases are withdrawn isokinetically from a flowing gas stream. The particulate matter is determined gravimetrically after removal of combined water.

1.2 Applicability. This method is applicable to the determination of particulate emissions from stationary sources except those sources for which specified sampling methods have been devised and are on file with the Department.

2. Acceptability. Results of this method will be accepted as demonstration of compliance (or non-compliance) provided that the methods included or referenced in this procedure are strictly adhered to and a report containing at least the minimum amount of information regarding the source is included as described in Sections 15 & 16. Deviations from the procedures described herein will be permitted only if permission from the Department is obtained in writing in advance of the tests.

3. Sampling Apparatus (Figure 3-1)

3.1 Probe - With heating system capable of maintaining sample gas temperature at 250° F at its exit and during sampling. Probes which are to be used at temperatures of 600° F or less may have liners constructed of seamless 316 stainless steel, Pyrex Glass or Incoloy 825¹. Probes for temperatures in excess of 600° F may be constructed of Borosilicate glass (limit 900° F) or Quartz glass (limit 1650° F). Probes for temperatures in excess of 1650° F must be approved by the Department before use. Testing in corrosive atmospheres may require a special probe liner to prevent contamination of the sample.

3.2 Probe Nozzle - Constructed of stainless steel (316) with an external taper 30° or less to a sharp leading edge. The inside diameter of the nozzle shall be constant throughout the length of the nozzle. The wall thickness of the nozzle shall be less than or equal to 0.063 in. and a straight run of at least two times the internal diameter shall be provided between the leading edge and the first bend or point of disturbance. The nozzle shall be connected to the probe liner in such a way as to provide an airtight seal with no exposed threads or gaps to collect particulate matter. Calibration of the nozzle is covered in Section 12.3.

¹ Trade Name

- 3.3 Pitot tube - Type S or equivalent attached to the probe. The probe nozzle and face openings of the pitot tube shall be adjacent and parallel to each other (not necessarily in the same plane) and the free space between the nozzle and the pitot tube shall be at least 0.5 in. Calibration of the pitot tube is covered in Section 3, Source Sampling Method 1.
 - 3.4 Differential pressure gauges - Inclined or vertical fluid manometer capable of measuring the pressure differential to within 10% of the minimum measured value. Below 0.1 in. H₂O gauge, micro-manometers with sufficient sensitivities shall be used. Other differential pressure measuring devices may be used provided they are calibrated against a fluid manometer and are adequately sensitive.
 - 3.5 Cyclone (optional) - Miniature glass cyclone used when heavy concentrations of particulate are expected. The cyclone will extend the time a filter can be used before plugging.
 - 3.6 Filter holder - Pyrex¹ glass with a glass frit filter support and silicone rubber gasket. The holder shall provide a positive seal against leakage from the outside or around the filter.
 - 3.7 Filter heating system - Capable of maintaining a temperature of 250° F around the filter holder. A temperature gauge shall be provided to monitor this temperature.
 - 3.8 Impingers - Greenburg-Smith design. The first, third and fourth may be modified by replacing the tip with a 1/2 inch ID glass tube extending to within 1/2 inch of the bottom of the flask. The second impinger shall have the standard tip installed.
- Note: All connections between the probe and last impinger shall be made with glass ball joints.
- 3.9 Metering system - Vacuum gauge, leak-free pump, thermometers capable of measuring temperature to within 5° F dry gas meter accurate to within $\pm 1\%$ and flow measuring device (orifice or rotameter) enabling isokinetic sampling to be maintained.
 - 3.10 Barometer - Mercury, aneroid or other type capable of measuring atmospheric pressure to within 0.1 in. Hg. If the barometric pressure is to be obtained from a nearby weather bureau station, the true station pressure (not corrected for elevation) must be obtained and an adjustment for elevation differences between the station and sampling site must be applied.
 - 3.11 Temperature and pressure measurement equipment - As described in Source Sampling Method 2.
 - 3.12 Gas analyzer - As described in Source Sampling Method 3.
 - 3.13 Ncmograph
 - 3.14 Timer - Integrating type, accurate, readable to the nearest 5 seconds per hour.

¹ Trade Name