FLOW CAPACITY TESTS AT CEESI LABORATORY
MIDLAND PRESSURE RELIEF VALVES

		NOMINAL (PSI)	ACTUAL TESTED PRESSURES (PSI)			FLOW RATE (SCFM)		
TEST NO.	VALVE PART	START TO	START TO	FLOW	VAPOR	AVERAGE	EACH	5 % VARIATION
96MMC-	NO.	DISCHARGE	DISCHARGE	RATING	TIGHT	FOR 3 VALVES	VALVE	PER [6.02(d)]
			(218.2 - 231.7)	(247.5 MAX.)	(180 MIN.)			
108	A-37225	225	219.7	246	218.4	34713	34926	(32977 -36448)
109	A-37225	225	220.6	245.8	219.4		34796	
110	A-37225	225	220.6	245.1	219.4		34416	
			(240.1 - 254.9)	(272.2 MAX.)	(198 MIN.)			
94	A-37247	247.5	248.7	268.8	245.9	37254	36697	(35391 - 39117)
105	A-37247	247.5	250.2	269.4	245.6		37171	
106	A-37247	247.5	249.5	270.7	247		37893	
			(247.3 - 262.6)	(280.5 MAX.)	(204 MIN.)			
94	A-37255	255	248.7	277.1	245.9	38528	38272	(36602 - 40454)
105	A-37255	255	250.2	278.2	245.6		38525	
106	A-37255	255	249.5	279.2	247		38787	
			(272.1 - 288.9)	(308.5 MAX.)	(224.4 MIN.)			
54	A-37280	280.5	276.1	305.2	274.1	39612	40015	(37631 - 41593)
57	A-37280	280.5	273	304.8	270.4		39592	
58	A-37280	280.5	282.7	304.9	268.9		39230	
			(291 - 309)	(330 MAX.)	(240 MIN.)			
91	A-37300	300	295.3	328.4	292.4	44614	44698	(42383 - 46845)
92	A-37300	300	296.3	328.4	294.8		45003	
93	A-37300	300	294.4	327.2	292		44140	
			(320.1 - 339.9)	(363 MAX.)	(264 MIN.)			
87	A-37330	330	320.4	361.8	316.8	49912	50280	(47416 - 52408)
88	A-37330	330	323.8	361.2	320.3		49707	
89	A-37330	330	320.6	359.8	317.7		49749	

SUMMARY BY : WILLIAM J. BEST
SENIOR PROJECT ENGINEER
DATE : 12 / 4 / 96 REV.1 1 / 21 / 97

CEESI

LABORATORY/OFFICE:
54043 County Rd. 37
Nunn, Colo. 80648
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FAX: 970-897-2710

COLORADO ENGINEERING EXPERIMENT STATION INC.

CERTIFICATE OF CALIBRATION

This calibration is traceable to the

NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY

Model: A-3455-SR3 Serial Number: 34-12C-1

For: Midland Manufacturing Order:

Data File: 96MMC094 Disc: 1096-054 Date: 22 October 1996

The uncertainty in indicated flowrate is estimated to be +/- 0.5 % of reading to 95% confidence.

The calibration identified by the above CEESI data file was performed using standards that are traceable to the National Institute of Standards and Technology.

This calibration was performed in accordance with the current revision of PROC-10 and MIL-STD 45662A.

This Calibration is: [ ] As Found [ ] As Left

Calibration performed by: [redacted]

[redacted]
Quality Assurance

[redacted]
Bill Johansen
Staff Engineer

Re-calibration is recommended to be no more than 12 months from the date of this Certificate

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COLORADO ENGINEERING EXPERIMENT STATION INC.

Calibration of a Relief Valve
Model: A-3455-SR3 Serial Number: 34-12C-1
For: Midland Manufacturing Order:
Data File: 96MMC094 Disc: 1096-054 Date: 22 October 1996
Inlet diameter: 12 inches
Test gas: AIR Standard density= .07636 lbm/cu-ft
  at standard conditions of 519.69 deg R, and 14.696 psia
Press: Inlet static pressure, pounds per square inch absolute
Temp: Exit temperature, degrees Rankine
Flow: Mass flowrate, pounds mass per second
SCFM: Mass flowrate in standard cubic feet per minute
P1: Discharge pressure, pounds per square inch absolute
Vapor tight pressure was 257.987 (245.9) pounds per square inch absolute
** Note: numbers in brackets are gauge pressure units

L	Press	Temp	Flow	SCFM	P1
1	283.53 (271.443)	486.79	46.703	36697	260.79 (248.703)
2	291.84 (279.753)	471.99	48.708	38272	260.79 (248.703)

Barometric pressure during test: 12.087 psia
Average values for above results:
Press: 287.69 psia Density: 1.641 lbm/cu-ft
Temp: 479.39 Deg R Viscosity: .00000094194 lbm/inch-sec
Compressibility factor: .98758

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CERTIFICATE OF CALIBRATION

This calibration is traceable to the

NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY

Model: A-34247-SR3 Serial Number: 34-12B-2

For: Midland Manufacturing Order:

Data File: 96MMC105 Disc: 1096-054 Date: 25 October 1996

The uncertainty in indicated flowrate is estimated to be +/- 0.5 % of reading to 95% confidence.

The calibration identified by the above CEESI data file was performed using standards that are traceable to the National Institute of Standards and Technology.

This calibration was performed in accordance with the current revision of PROC-10 and MIL-STD 45662A.

This Calibration is: [X] As Found [X] As Left

Calibration performed by: [redacted]

[redacted]
Quality Assurance

[redacted]
Bill Johansen
Staff Engineer

Re-calibration is recommended to be no more than 12 months from the date of this Certificate

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FAX: 970-897-2710

COLORADO ENGINEERING EXPERIMENT STATION INC.

Calibration of a Relief Valve
Model: A-34247-SR3 Serial Number: 34-12B-2
For: Midland Manufacturing Order:
Data File: 96MMC105 Disc: 1096-054 Date: 25 October 1996
Inlet diameter: 12 inches
Test gas: AIR Standard density= .07636 lbm/cu-ft
  at standard conditions of 519.69 deg R, and 14.696 psia
Press: Inlet static pressure, pounds per square inch absolute
Temp: Exit temperature, degrees Rankine
Flow: Mass flowrate, pounds mass per second
SCFM: Mass flowrate in standard cubic feet per minute
P1: Discharge pressure, pounds per square inch absolute
Vapor tight pressure was 257.475 (245.6) pounds per square inch absolute
** Note: numbers in brackets are gauge pressure units

L	Press	Temp	Flow	SCFM	P1
1	284.14 (272.265)	481.39	47.306	37171	262.08 (250.205)
2	292.92 (281.045)	477.09	49.03	38525	262.08 (250.205)

Barometric pressure during test: 11.875 psia
Average values for above results:
Press: 288.53 psia Density: 1.6456 lbm/cu-ft
Temp: 479.24 Deg R Viscosity: .00000094174 lbm/inch-sec
Compressibility factor: .98757

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CERTIFICATE OF CALIBRATION

This calibration is traceable to the

NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY

Model: A-34247-SR3 Serial Number: 34-12B-3

For: Midland Manufacturing Order:

Data File: 96MMC106 Disc: 1096-054 Date: 25 October 1996

The uncertainty in indicated flowrate is estimated to be +/- 0.5 % of reading to 95% confidence.

The calibration identified by the above CEESI data file was performed using standards that are traceable to the National Institute of Standards and Technology.

This calibration was performed in accordance with the current revision of PROC-10 and MIL-STD 45662A.

This Calibration is: [X] As Found [X] As Left

Calibration performed by: [redacted]

[redacted]
Quality Assurance

[redacted]
Bill Johansen
Staff Engineer

Re-calibration is recommended to be no more than 12 months from the date of this Certificate

CEESI

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COLORADO ENGINEERING EXPERIMENT STATION INC.

Calibration of a Relief Valve
Model: A-34247-SR3 Serial Number: 34-12B-3
For: Midland Manufacturing Order:
Data File: 96MMC106 Disc: 1096-054 Date: 25 October 1996
Inlet diameter: 12 inches
Test gas: AIR Standard density= .07636 lbm/cu-ft
  at standard conditions of 519.69 deg R, and 14.696 psia
Press: Inlet static pressure, pounds per square inch absolute
Temp: Exit temperature, degrees Rankine
Flow: Mass flowrate, pounds mass per second
SCFM: Mass flowrate in standard cubic feet per minute
P1: Discharge pressure, pounds per square inch absolute
Vapor tight pressure was 258.876 (247) pounds per square inch absolute
** Note: numbers in brackets are gauge pressure units

L	Press	Temp	Flow	SCFM	P1
1	293.89 (282.014)	472.99	49.364	38787	261.38 (249.504)
2	285.44 (273.564)	467.49	48.225	37893	261.38 (249.504)

Barometric pressure during test: 11.876 psia
Average values for above results:
Press: 289.66 psia Density: 1.686 lbm/cu-ft
Temp: 470.24 Deg R Viscosity: .00000092765 lbm/inch-sec
Compressibility factor: .9861