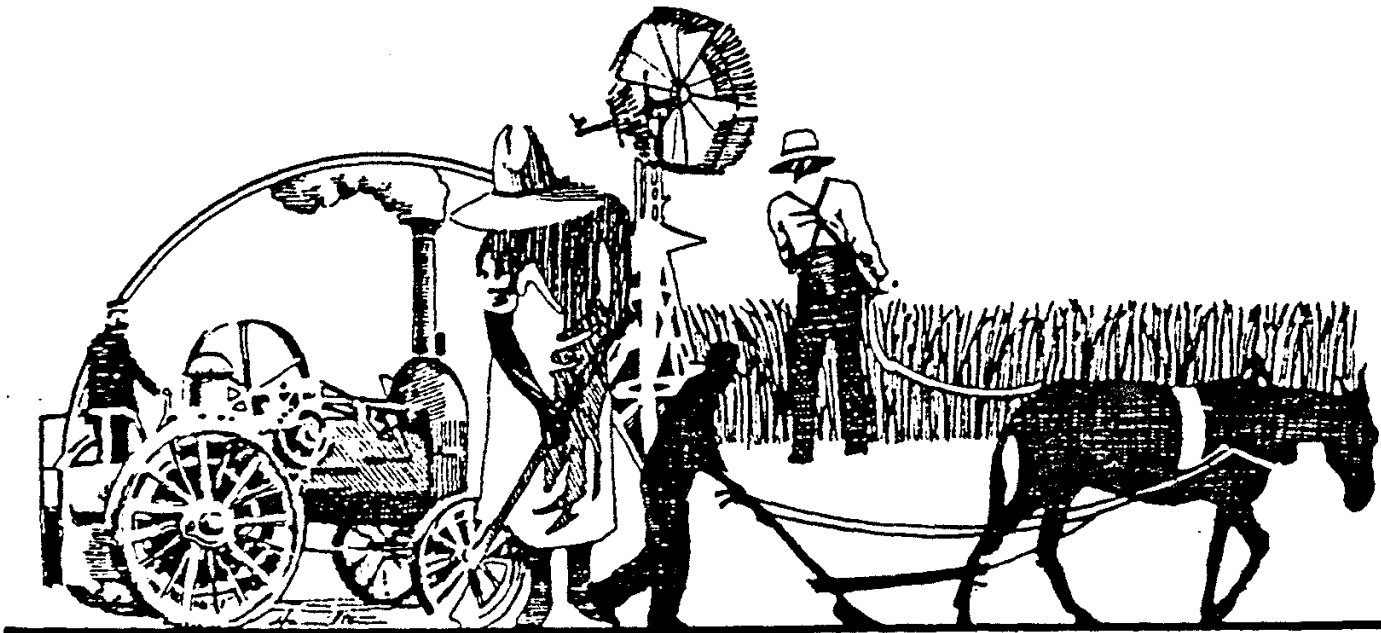


KANSAS ANTIQUE ENGINE SHOW SAFETY ASSOCIATION

BOILER SAFETY RULES AND REGULATIONS

Revision 2
March 2022



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This document, "KAESSA Boiler Safety Rules and Regulations", is incorporated as requirements and guidance by Bylaw # 31, effective March 10, 2001. Any change to this document requires a majority vote by the Board of Directors.

GENERAL HISTORY

The Kansas Antique Engine Show Safety Association, Ins. was incorporated March 30, 1976, as a non-profit Kansas corporation to establish and enforce rules and regulations for the inspection and operation of antique steam boilers as well as hobby and model boilers fired for public demonstration in the State of Kansas. Authorized by the Kansas legislature as part of the Kansas Boiler Safety Act, KSA 44-913, the Association's commissioned inspectors are licensed Special Inspectors by the State of Kansas.

PREAMBLE

The Kansas Antique Engine Show Safety Association is dedicated to the preservation of that part of America's agricultural and industrial heritage made possible by the extensive use of steam power. To ensure the safe demonstration and operation of original as well as replicas and model steam engines, these rules and regulations have been adopted by the Association. Other codes and historical sources of boiler information have been cited. These include the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code and the Kansas Boiler Safety Act.

The Kansas Antique Engine Show Safety Association was chartered by the Secretary of State as a not for profit corporation with the constitution and by-laws on record at that office. The purpose of the Association is to promote safety of the steam boiler, the operation of steam traction engines, gas tractors, stationary engines, related machinery, grounds and the serving of food, to promote uniform practices at all the participating association shows. The Corporation is governed by a Board of Directors composed of one member from each Association. Each Association is to have one vote.

THIS DOCUMENT COVERS BOILER SAFETY AND DOES NOT INCLUDE RULES PERTAINING TO ANY OTHER AREA MENTIONED ABOVE.

ENFORCEMENT

All owners and operators are required to have a boiler certified by an approved Association inspector in order to fire in the State of Kansas. Inspectors are required to report any violations of non-compliance of the Kansas Antique Engine Show Safety Association Rules and Regulations by means of a Safety Incidence Report (Section XVIII).

SECTION I
BARREL

- 1.1 The barrel will have a safety factor of 4:1.
- 1.2 Lap seam single row riveted barrel will have a calculated joint efficiency of 58%.
- 1.3 Lap seam double row riveted barrel will have a calculated joint efficiency of 74%.
- 1.4 Lap seam triple row riveted barrel will have a calculated joint efficiency of 79%.
- 1.5 Lap seam quadruple row riveted barrel will have a calculated joint efficiency of 84%.
- 1.6 Lap seam 5 row riveted barrel will have a calculated joint efficiency of 89%.
- 1.7 Butt, double strap, double row riveted barrel will have a calculated joint efficiency of 82%.
- 1.8 Butt, double strap, triple row riveted barrel will have a calculated joint efficiency of 88%.
- 1.9 Butt, double strap, quadruple row riveted barrel will have a calculated joint efficiency of 94%.
- 1.10 Seamless barrel will have a calculated joint efficiency of 100%.
- 1.11 If tensile strength is unknown on a curved plate or barrel, 55,000 psi will be used in the calculations for full sized boilers, 45,000 psi will be used when calculating the barrel for model boilers.
- 1.12 If tensile strength is known on a curved plate or barrel, its value will be placed in the equation.
- 1.13 Thickness of a curved plate or barrel will be determined by ultrasonic measurement and may be supplemented by mechanical or x-ray test methods.

SECTION II
FLAT PLATE

- 2.1 The flat plate will have a safety factor of 4:1.
- 2.2 If tensile strength is unknown on flat plate, 55,000 p.s.i. will be used in the calculations.
- 2.3 If tensile strength is known on flat plate, its value will be placed in the equation.
- 2.4 Thickness of the flat plate will be determined by ultrasonic and may be supplemented by mechanical or x-ray test methods.

SECTION III
CROWN SHEET

- 3.1 The safety factor of the crown sheet will be 4:1.
- 3.2 Crown sheet will be considered as flat plate unless a continuous radius exists in the construction.

SECTION IV
STAY BOLTS

- 4.1 The safety factor of the stay bolts will be 4:1.
- 4.2 The effective diameter of a stay bolt should be measured at its thinnest diameter.
- 4.3 Pitch distance should be measured center to center of adjacent stay bolts.
- 4.4 No stay bolt shall have the end completely welded over as to cover the end of the stay bolt.

SECTION V
HYDROSTATIC TESTING

- 5.1 Hydrostatic tests of boilers shall occur once a year or as directed by a KAESSA inspector.
- 5.2a For an initial inspection, a hydrostatic pressure test at 1.25 times MAWP, but in no case shall the test pressure be exceeded by more than 6%.
- 5.2b For recurring inspections, an annual hydrostatic test at a pressure at least equal to MAWP up to 1.25 times MAWP, but in no case shall the test pressure exceed 1.25 times MAWP by more than 6%.
- 5.3 Pressure shall be maintained for the duration of the inspection.
- 5.4 It is desirable to have the water temperature for hydrostatic test at 60 – 120 F.
- 5.5 Any leak from any joint from the boiler to the first valve will be immediately corrected or the engine will not be allowed to operate or generate steam pressure.

SECTION VI
SAFETY VALVES

- 6.1 Safety valves must have "V" or "VR" (ASME) stamp.
- 6.2 Safety valves must have a factory seal and be unaltered.
- 6.3 Safety valve capacity (pounds per hour) and the pressure relief setting shall be calculated by boiler heating surface area and condition of the boiler.
- 6.4 The proper safety valve requirements will be calculated by the Chief or local Inspector upon completion of the inspection.
- 6.5 Safety valves must have a trip lever.
- 6.6 In the case of a boiler of such physical size and construction that an ASME rated safety valve cannot be purchased, the performance of the pressure relief valve will be demonstrated and approved by the Chief or local Inspector.
- 6.7 No valve of any type may be placed between the boiler and the safety valve nor in the safety valve outlet.
- 6.8 The piping between the boiler and the safety valve shall be at least as large as the safety valve inlet and be as short as practical. No reduction is allowed at the safety valve outlet.
- 6.9 Weighted-lever safety valves shall not be used. Safety valves which have either the seat or disk of cast iron shall not be used.
- 6.10 The operation of the safety valve shall be demonstrated only with live steam.

SECTION VII
FUSIBLE PLUGS

- 7.1 Fusible (soft) plugs will be removed and cleaned during a boilers annual inspection to visually observe the ASME rating of the plug and condition of the threads in the crown sheet and fusible plug.
- 7.2 Fireside fusible (soft) plug must protrude a minimum of one (1) inch into the water.
- 7.3 Waterside fusible (soft) plug may not protrude into the fire area more than one (1) inch.
- 7.4 All boilers shall have a fusible (soft) plug unless equipped and operated with automatic controls.

- 7.5 Model engine soft plug requirements. A model boiler of such physical size and construction that ASME fusible plug cannot be used, low water protection shall be demonstrated to the approval of the Chief or local Inspector.
- 7.6 All scale shall be removed from the fusible plug at annual inspection.

SECTION VIII PIPING

- 8.1 Threaded openings shall follow accepted standard plumbing practices as determined by the Inspector.
- 8.2 All piping from the boiler to the first valve to be replaced and dated by means of stamp or stenciling on pipe or if not feasible, recorded on permanent engine records.
- 8.3 New nipples or piping will be considered acceptable for 20 years after installation.
- 8.4 Black pipe is to be used on the high pressure side.
- 8.5 Galvanized pipe may be used on cold feed water lines to the injectors.
- 8.6 Schedule 80, black pipe (SA-53 GR. A or B types ERW or Seamless; SA-106 GR A,B,C) shall be used for boiler pressure piping from the vessel to the first valve.
- 8.7 Steam piping components shall be used in the manner for which they were designed and shall not exceed manufacturer's pressure rating. Malleable iron Class 300 threaded fittings per ASME 816.3 are acceptable for use. The use of malleable iron class 150 is not recommended. Forged threaded fittings per ASME 816.11 classes 2000-6000 are acceptable for use.
- 8.9 Model boilers of such physical size and construction that cannot comply with the above rules, shall have acceptable and effective plumbing to pass. This will be at the inspector's discretion.
- 8.10 All threaded plugs shall be removed and inspected during the dry inspection. They shall be dated by the methods described in 8.2. Any screwed fitting into a boiler shall have three full threads of engagement.
- 8.11 All piping shall be adequately supported.

SECTION IX
OPERATORS

- 9.1 Each person operating a full size or model steam boiler shall have in his/her possession an operator's card issued by the KAESSA.
- 9.2 The local member association will recommend each candidate who will be issued an Operator's Test booklet (see Appendix 1) consisting of a four category test and accompanying illustrations and information. The open-book written test shall consist of 40 questions. Acceptable performance is 80% or better. The practical test consists of 10 parts. Every part selected by the examiner must be completed satisfactorily. The test shall be administered by an Inspector or Chief Inspector.
- 9.3 If an applicant fails any part of the test, he/she shall be permitted to take the test over again after 30 days.
- 9.4 Upon satisfactory completion of the test, the examiner shall forward the Record sheet to the Secretary who shall file it in permanent records and shall issue an operator's card bearing the two letter prefix and the next sequential number for that association. Both the Secretary and the examiner shall sign the operator's card.
- 9.5 All owners and operators are required to comply with KAESSA Rules and Regulations. Failure to comply with Rules and Regulations may be referred to the Kansas Fire Marshall for enforcement as outlined in K.S.A. 44-913 et seq.
- 9.6 A Operators license issued by KAESSA may be suspended or revoked, after due investigation and approval by the KAESSA executive board.

SECTION X
INSPECTORS

- 10.1 The KAESSA inspection system shall consist of two tiers of inspectors, local Inspectors and two or more supervising Chief Inspectors. A local Inspector shall be a person that is voted on by the local member association as someone competent and knowledgeable in the inspection, calculating and analyzing of safety of antique and hobby boilers. A resume of qualification shall be

forwarded to KAESSA for consideration and the candidate must hold a valid KAESSA operator's card. In addition, a candidate must have witnessed at least two boiler inspections by a KAESSA inspector.

- 10.2 Each new candidate shall take the Inspector's Test (see Appendix 2), a written and practical test covering the general knowledge required of inspectors and the skill and knowledge to perform ultrasonic measurements. The test shall be administered by one of the Chief Inspectors. After completion of the test with a minimum score of 80%, the examiner shall forward the Record sheet to the Secretary who shall file it in permanent records.
- 10.3 The Board of Directors of the KAESSA shall vote annually upon each and every inspector before his/her application is forwarded to the State for authorization as a Special Inspector for the State. Inspectors should attend the annual Inspector Workshop conducted after the annual meeting.
- 10.4 The list of recommended Special Inspectors shall be forwarded each year to the Chief State Boiler Inspector for issuing cards as soon as practical after the annual meeting.
- 10.5 The local Inspectors shall have, as a minimum, the responsibility of performing all required inspections, completing boiler inspection certificates, ultrasonic thickness surveys, calculations of maximum allowable working pressure, and completion of Boiler Inspection reports and Safety Incidence Reports. Boiler Inspection reports shall be forwarded to the Secretary within thirty (30) days after the completion of the inspection. Each inspector shall be required to forward to the Secretary a written report of an incident involving safety within 24 hours and that report will include the operator's name, engine description and boiler number. The Secretary will forward to all inspectors a copy of this report as soon as practical. All incidents reported shall be reviewed at the annual meeting of the KAESSA. The Safety Incidence Report form shall be used. (see Section XVIII)
- 10.6 Two or more Chief Inspectors shall be selected from past or current local Inspectors by a majority vote at each annual meeting. The Chief Inspectors will spot check that all rules of the Association are complied with and may inspect any show at any time. The Chief Inspectors shall, between them, attend three shows per year to be randomly selected. All shows shall be inspected at least once every four years. The two Chief Inspectors shall be the final authority in any disputes except that a decision may be appealed to the Board of Directors and can be overruled by a two-thirds vote.

- 10.7 Inspectors who are boiler owners may not perform a certificate inspection of their own boilers unless such inspection is witnessed by a licensed, experienced operator who shall sign the certificate of inspection as a witness.
- 10.8 An Inspector certificate may be suspended or revoked, after due investigation, by the State Fire Marshall according to the procedures in Section 44-921 of the Kansas Boiler Safety Act.

SECTION XI BOILER INSPECTION

- 11.1 The intent of this section is to achieve compliance, as a minimum and as appropriate, with the National Board of Boiler and Pressure Vessel Inspectors' Non-mandatory Appendix C, "Historical Boilers".
- 11.2 Every full size and model boiler to be operated within the State shall be subject to an annual Certificate Inspection consisting of dry internal and external visual inspections and a hydrostatic pressure test. Furthermore, every such boiler shall be subjected to an ultrasonic thickness survey every five years or more often as deemed appropriate by the Inspector, except that each boiler stored outside shall be subject to an ultrasonic survey every year. Boilers new in the state must be ultrasonically inspected every year for three years and then may be placed on the five year cycle. Non-resident engines which are brought into the state yearly will be left to the discretion of the show inspector as to whether it must be ultrasonic tested each year or can be classified as a resident engine.
- 11.3 Every full size and model boiler presented for Certificate Inspection shall have the local association two letter prefix and the assigned KAESSA number permanently stamped above the firebox door, or alternatively stamped on a corrosion resistant metal plate securely attached to the engine near the operators controls.
- 11.4 Adequate and sufficiently sized inspection openings are required on all boilers. At the discretion of the Inspector, jacketing may be required to be removed to complete the inspection. At the discretion of the Inspector, bolted-on castings to the pressure vessel may be required to be removed.
- 11.5 Annual boiler inspections shall be performed with the aid of a checklist (see Appendix 3) modified as appropriate for the type of boiler and the individual application.

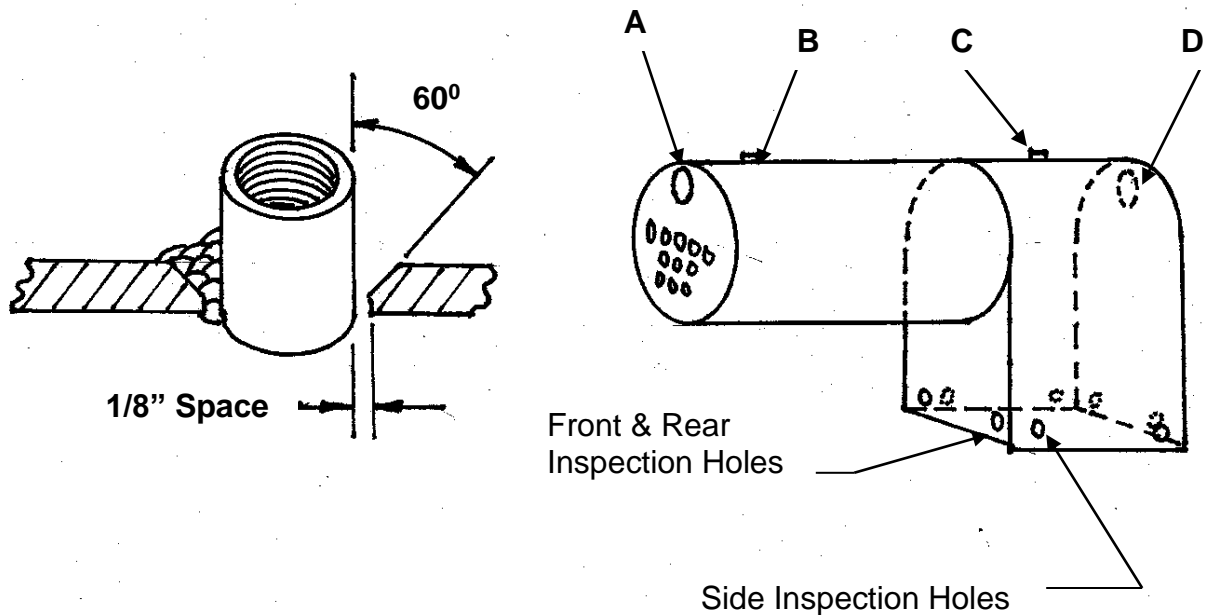
- 11.6 KAESSA Inspection Reports with the KAESSA boiler association prefix and number shall be completed by the Inspector and two copies are to be submitted to the Secretary within thirty days after the completion of the inspection. One copy shall be filed by the Secretary in the KAESSA permanent records and one copy forwarded by the Secretary to the Chief State Boiler Inspector. The Inspector shall present a copy of the Inspection Report and, if passed, a completed Certificate to the owner/operator. The Boiler – Report of Inspection (see Section XIX) and Boiler Inspection Certificate (see Section XX) shall be used. The Boiler Inspection Certificate shall be displayed on the boiler, engine or close to the boiler in plain view.
- 11.7 The Inspector shall use the results of the ultrasonic thickness survey and Section XIV to determine the maximum allowable working pressure. The calculated safety factor shall be 4:1 and the maximum allowable working pressure shall be based on the weakest component of the boiler. Ultrasonic results in areas of generalized thinning (3 inches in diameter or greater) or where groove thinning is noted (2 inches in length or greater) are to be used in calculating MAWP.
- 11.8 All boiler repairs and alterations shall require prior approval from the Inspector concerning materials selection and proper procedure. Any Inspector may defer to the Chief Inspectors for decisions on repairs and alterations. At the discretion of the Inspector, a repair may be required to be performed by a National Board certified shop. All boiler welding shall be performed by a qualified welder. Longitudinal seam cracks shall be cause for rejection.
- 11.9 All pressure gages are to be tested annually with a dead weight tester or compared to a calibrated and certified test gage. The gage shall have a range at least 1½ times the maximum allowable working pressure. A siphon is required before the pressure gage. A valve-cock between the pressure gage and the boiler is allowable provided that the handle indicates “open” when parallel with the line, or the valve is wired in the open position.
- 11.10 All water sight glasses are to be checked to let the owner/operator know how much water covers the crown sheet at the bottom of the sight glass. The minimum distance from the highest point of the crown sheet to the bottom of the sight glass is 2½ inches for a full scale boiler, 1½ inch for a half scale boiler and 1 inch for a quarter scale boiler. This information shall be noted on the Inspection Report. Try-cocks shall be checked for proper location, operation and for leaking.
- 11.11 Each boiler shall have two operational means of getting water into the boiler while the boiler is under working pressure.

11.12 The blowoff valve shall be plugged or capped during the time that the boiler is under pressure, or to be piped to a safe discharge point. The boiler shall meet the requirements of Section I through Section VIII.

11.13 (Refer to illustration next page.) Recommended location of inspection openings and recommended method of attaching threaded nozzles to shell on scale size and model boilers.

An opening at point "A" with a second opening at point "B" will allow one to clean out the bottom of the barrel with the front of the boiler elevated to almost a vertical position with no problems in washing out the barrel. At the same time, a light can be dropped through point "B" with a visual inspection of the interior being possible. Through point "A", the crown sheet and stay bolts can be inspected in the same manner. Another possibility for crown sheet inspection would be points "C" or "D".

The sketch of the nozzle shows a high pressure half-coupling welded to the shell showing more passes than would be used but it represents the pattern that would be used. The first two passes should be made with a 6010 rod and finished with a 7018 rod, removing completely all slag between passes. The high pressure half coupling is used not for the pressure, but to reinforce the opening and to preserve the integrity of the plates. A minimum of 3/4 inch coupling should be used on the smaller boilers and probably a one (1) inch on the larger models. On smaller applications 3/32 size rod is much easier to handle.



SECTION XII
STORAGE OF BOILERS

- 12.1 Boilers stored outside shall be completely inspected every year; ultrasonic, visual and hydrostatic inspection will be performed.
- 12.2 Boilers stored inside will be visually inspected internally and externally and hydrostatic tested every year.

SECTION XIII
PREPARATION FOR INSPECTION

Owners/operators are responsible for preparing their boilers for inspection. Inspectors need your help and support on this inspection procedure. It is being done for the benefit of all. Inspection fees are as follows: \$25.00 per hour plus mileage charged at the current state rate, payable to the Inspector performing the inspection upon completion. It will take 2 to 4 hours to perform both dry and wet inspections. The more help and cooperation from owner will lessen the inspection time and expense by having his boiler prepared for inspection. Helpful suggestions are as follows:

- 13.1 The ultrasonic test is better if the surface to be tested is clean.
- 13.2 Please have boilers thoroughly cleaned out and free of all scale and loose material.
- 13.3 Have flues cleaned.
- 13.4 Remove grates and ash pan.
- 13.5 Remove fusible plug.
- 13.6 Remove all threaded pipe plugs from the boiler.
- 13.7 Have smoke and fire box clean.
- 13.8 Water and electricity should be readily available.
- 13.9 If you have a wet bottom boiler you may have to remove the fire door ring casting so the Inspector can crawl inside.
- 13.10 Any repairs done in accordance with Section 11.8 must be reviewed by the Inspector.
- 13.11 The plumbing requirements (Section VIII) should be satisfied before the arrival of the Inspector.
- 13.12 Have a supply of handhole gaskets available.
- 13.13 Have all handhole plates removed.

Owner to provide all labor, hand tools and materials to complete certification inspection as directed by the Inspector.

SECTION XIV

MAXIMUM ALLOWABLE WORKING PRESSURE TABLES (1 – 6)

In an effort to simplify the calculation of a reasonable working pressure for various boilers, the following tables have been tabulated for use by owners, inspectors and operators. The equations used to calculate these numbers were taken from Section I, of the ASME Pressure Vessel Code. In all cases, a safety factor of four was used, as was a material tensile strength of 55,000 psi. This number is recommended by the ASME code for second hand boilers in which the steel composition is not known. These tables are to be used as guidelines only. The final determination of a safe working pressure for a given boiler rests with the individual inspector after considering all known factors about the boiler.

The first three tables deal with boiler shell thickness, shell diameter and the joint efficiency. A note at the top of each page lists the shell joint type. That is, seamless, butt strap or lap seam.

The fourth table deals with stayed surfaces. Staybolt pitch can be easily measured and plate thickness may be determined by visual inspection when possible or by ultrasonic or X-ray. This table is to determine if the plate is adequate.

The fifth table also deals with stayed surfaces but an effective staybolt diameter must be determined, probably by visual observation and measuring. This table is to determine if the staybolts are of adequate diameter.

The sixth table deals with curved surfaces that are supported with staybolts. The radius of curvature of several crown sheets on different makes of engines was measured and all of them had a radius of about 25 inches. The table was then made up from the Code book equation for a curved, stayed surface of 25 inch radius. Staybolt pitch is to measured at the crown sheet and not at the outer wrapper sheet. This table is to determine if the plate is adequate.

KAESSA Boiler Equations (55,000 psi assumed ultimate tensile strength, UTS; tables are invalid if UTS is different from this figure)

Tables 1 thru 3	MAWP =	$\frac{(2) (55,000) (E) (t)}{FS (D - 0.8 t)}$	E = joint efficiency t = shell thickness in inches D = shell diameter in inches FS = factor of safety of 4
Table 4	MAWP =	$\frac{(2.1) (55,000) (t^2)}{FS (p^2)}$	p = staybolt pitch or average pitch in inches
Table 5	MAWP =	$\frac{\pi (d^2) (55,000)}{FS (4) (p^2)}$	d = staybolt diameter at thread root or narrowest in inches
Table 6	MAWP =	$\frac{(2) (55,000) (t) (E')}{(FS) (2R)} + \frac{(1.3) (55,000) (t^2)}{FS (p^2)}$	E' = (p - d) / p R = sheet radius of curvature in inches

TABLE 1
MAXIMUM ALLOWABLE WORKING PRESSURE IN BOILER SHELL
 Joint efficiency = 1.0, seamless tube (welded), Assume 55,000 psi UTS

SHELL THICKNESS	SHELL DIAMETER IN INCHES																
	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40
0.10	347	222	185	158	138	123	110	100	92	85	79	74	69	65	61	58	55
0.11	382	305	254	217	190	169	152	138	127	117	108	101	95	89	84	80	76
0.12	418	333	277	237	207	184	166	151	138	127	118	110	103	97	92	87	83
0.13	453	361	301	257	225	200	180	163	150	138	128	120	112	105	100	94	90
0.14	488	389	324	277	242	215	194	176	161	149	138	129	121	114	107	102	97
0.15	523	418	347	297	260	231	207	189	173	159	148	138	129	122	115	109	103
0.16	559	446	371	317	277	246	221	201	184	170	158	147	138	130	123	116	110
0.17	594	474	394	337	295	262	235	214	196	181	168	157	147	138	130	123	117
0.18	630	502	418	357	312	277	249	226	207	191	178	166	155	146	138	131	124
0.19	666	531	441	377	330	293	263	239	219	202	188	175	164	154	146	138	131
0.20	702	559	465	397	347	308	277	252	231	213	198	184	173	163	153	145	138
0.21	737	587	488	418	365	324	291	265	242	224	207	194	181	171	161	153	145
0.22	773	616	512	438	382	339	305	277	254	234	217	203	190	179	169	160	152
0.23	809	644	535	458	400	355	319	290	266	245	227	212	199	187	177	167	159
0.24	845	673	559	478	418	371	333	303	277	256	237	221	207	195	184	175	166
0.25	881	702	583	498	435	386	347	315	289	266	247	231	216	203	192	182	173
0.26	918	730	606	518	453	402	361	328	301	277	257	240	225	212	200	189	180
0.27	954	759	630	539	470	418	375	341	312	288	267	249	234	220	207	197	187
0.28	990	788	654	559	488	433	389	354	324	299	277	259	242	228	215	204	194
0.29	1027	816	678	579	506	449	403	366	336	309	287	268	251	236	223	211	201
0.30	1063	845	702	600	523	465	418	379	347	320	297	277	260	244	231	218	207
0.31	1100	874	725	620	541	480	432	392	359	331	307	287	268	253	238	226	214
0.32	1136	903	749	640	559	496	446	405	371	342	317	296	277	261	246	233	221
0.33	1173	932	773	661	577	512	460	418	382	353	327	305	286	269	254	240	228
0.34	1210	961	797	681	594	527	474	430	394	363	337	315	295	277	262	248	235
0.35	1247	990	821	702	612	543	488	443	406	374	347	324	303	285	269	255	242
0.36	1284	1019	845	722	630	559	502	456	418	385	357	333	312	294	277	263	249
0.37	1321	1049	869	742	648	575	516	469	429	396	367	343	321	302	285	270	256
0.38	1358	1078	893	763	666	591	531	482	441	407	377	352	330	310	293	277	263
0.39	1395	1107	918	784	684	606	545	495	453	418	387	361	338	318	301	285	270
0.40	1432	1136	942	804	702	622	559	507	465	428	397	371	347	327	308	292	277
0.41	1470	1166	966	825	719	638	573	520	476	439	407	380	356	335	316	299	284
0.42	1507	1195	990	845	737	654	587	533	488	450	418	389	365	343	324	307	291
0.43	1545	1225	1014	866	755	670	602	546	500	461	428	399	374	351	332	314	298
0.44	1582	1254	1039	887	773	686	616	559	512	472	438	408	382	360	339	321	305
0.45	1620	1284	1063	907	791	702	630	572	523	483	448	418	391	368	347	329	312
0.46	1657	1313	1088	928	809	717	644	585	535	494	458	427	400	376	355	336	319
0.47	1695	1343	1112	949	827	733	659	598	547	504	468	436	409	384	363	344	326
0.48	1733	1373	1136	969	845	749	673	611	559	515	478	446	418	393	371	351	333
0.49	1771	1402	1161	990	863	765	687	624	571	526	488	455	426	401	378	358	340
0.50	1809	1432	1185	1011	881	781	702	637	583	537	498	465	435	409	386	366	347
0.51	1847	1462	1210	1032	899	797	716	650	594	548	508	474	444	418	394	373	354
0.52	1886	1492	1234	1053	918	813	730	663	606	559	518	483	453	426	402	380	361
0.53	1924	1522	1259	1074	936	829	745	676	618	570	529	493	462	434	410	388	368
0.54	1962	1552	1284	1094	954	845	759	689	630	581	539	502	470	442	418	395	375
0.55	2001	1582	1308	1115	972	861	773	702	642	592	549	512	479	451	425	403	382
0.56	2039	1612	1333	1136	990	877	788	715	654	603	559	521	488	459	433	410	389
0.57	2078	1642	1358	1157	1008	893	802	728	666	614	569	531	497	467	441	418	396
0.58	2117	1673	1383	1178	1027	910	816	741	678	625	579	540	506	476	449	425	403
0.59	2155	1703	1407	1199	1045	926	831	754	690	636	589	549	515	484	457	432	410
0.60	2194	1733	1432	1220	1063	942	845	767	702	647	600	559	523	492	465	440	418
0.61	2233	1764	1457	1241	1081	958	860	780	713	658	610	568	532	501	472	447	425
0.62	2272	1794	1482	1263	1100	974	874	793	725	669	620	578	541	509	480	455	432
0.63	2311	1824	1507	1284	1118	990	889	806	737	680	630	587	550	517	488	462	439

TABLE 2

MAXIMUM ALLOWABLE WORKING PRESSURE IN BOILER SHELL

Joint efficiency = 0.875, butt strap, triple row rivets, Assume 55,000 psi UTS

SHELL THICKNESS	SHELL DIAMETER IN INCHES																
	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40
0.10	304	243	202	173	151	134	121	110	101	93	86	80	75	71	67	63	60
0.11	335	267	222	190	166	148	133	121	111	102	95	88	83	78	74	70	66
0.12	365	292	243	208	182	161	145	132	121	111	103	97	91	85	80	76	72
0.13	396	316	263	225	197	175	157	143	131	121	112	105	98	92	87	83	78
0.14	427	341	283	243	212	188	169	154	141	130	121	113	106	99	94	89	84
0.15	458	365	304	260	227	202	182	165	151	139	129	121	113	107	101	95	91
0.16	489	390	324	278	243	215	194	176	161	149	138	129	121	114	107	102	97
0.17	520	415	345	295	258	229	206	187	171	158	147	137	128	121	114	108	103
0.18	551	439	365	313	273	243	218	198	182	168	155	145	136	128	121	114	109
0.19	583	464	386	330	288	256	230	209	192	177	164	153	144	135	128	121	115
0.20	614	489	406	348	304	270	243	220	202	186	173	161	151	142	134	127	121
0.21	645	514	427	365	319	283	255	231	212	196	182	169	159	149	141	134	127
0.22	677	539	448	383	335	297	267	243	222	205	190	177	166	157	148	140	133
0.23	108	564	468	401	350	311	279	254	232	214	199	186	174	164	155	146	139
0.24	740	589	489	418	365	324	292	265	243	224	208	194	182	171	161	153	145
0.25	771	614	510	436	381	338	304	276	253	233	216	202	189	178	168	159	151
0.26	803	639	531	454	396	352	316	287	263	243	225	210	197	185	175	166	157
0.27	835	664	551	471	412	365	328	298	273	252	234	218	204	192	182	172	163
0.28	866	689	572	489	427	379	341	309	283	261	243	226	212	199	188	178	169
0.29	898	714	593	507	443	393	353	321	294	271	251	234	220	207	195	185	175
0.30	930	740	614	525	458	406	365	332	304	280	260	243	227	214	202	191	182
0.31	962	765	635	542	474	420	378	343	314	290	269	251	235	221	209	198	188
0.32	994	790	656	560	489	434	390	354	324	299	278	259	243	228	215	204	194
0.33	1026	816	677	578	505	448	402	365	335	309	286	267	250	235	222	210	200
0.34	1059	841	698	596	520	461	415	377	345	318	295	275	258	243	229	217	206
0.35	1091	866	719	614	536	475	427	388	355	327	304	283	266	250	236	223	212
0.36	1123	892	740	632	551	489	439	399	365	337	313	292	273	257	243	230	218
0.37	1156	917	761	650	567	503	452	410	376	346	321	300	281	264	249	236	224
0.38	1188	943	782	668	583	517	464	421	386	356	330	308	288	271	256	243	230
0.39	1221	969	803	686	598	531	477	433	396	365	339	316	296	279	263	249	236
0.40	1253	994	824	704	614	544	489	444	406	375	348	324	304	286	270	255	243
0.41	1286	1020	845	722	630	558	502	455	417	384	357	332	311	293	277	262	249
0.42	1319	1046	866	740	645	572	514	466	427	394	365	341	319	300	283	268	255
0.43	1351	1072	888	758	661	586	526	478	437	403	374	349	327	307	290	275	261
0.44	1384	1097	909	716	677	600	539	489	448	413	383	357	335	315	297	281	267
0.45	1417	1123	930	794	692	614	551	500	458	422	392	365	342	322	304	288	273
0.46	1450	1149	952	812	708	628	564	512	468	432	401	374	350	329	311	294	279
0.47	1483	1175	973	830	124	642	576	523	479	441	409	382	358	336	317	301	285
0.48	1517	1201	994	848	740	656	589	534	489	451	418	390	365	344	324	307	292
0.49	1550	1227	1016	866	755	670	601	546	499	460	427	398	373	351	331	314	298
0.50	1583	1253	1037	885	771	684	614	557	510	470	436	406	381	358	338	320	304
0.51	1616	1279	1059	903	787	698	626	568	520	480	445	415	388	365	345	326	310
0.52	1650	1306	1080	921	803	712	639	580	531	489	454	423	396	373	352	333	316
0.53	1683	1332	1102	939	819	726	651	591	541	499	462	431	404	380	358	339	322
0.54	1717	1358	1123	958	835	740	664	602	551	508	471	439	412	387	365	346	328
0.55	1751	1384	1145	976	851	754	677	614	562	518	480	448	419	394	372	352	335
0.56	1784	1411	1166	994	866	768	689	625	572	527	489	456	427	402	379	359	341
0.57	1818	1437	1188	1013	882	782	702	637	583	537	498	464	435	409	386	365	347
0.58	1852	1464	1210	1031	898	796	714	648	593	547	507	473	443	416	393	372	353
0.59	1886	1490	1232	1049	914	810	727	659	603	556	516	481	450	423	400	378	359
0.60	1920	1517	1253	1068	930	824	740	671	614	566	525	489	458	431	406	385	365
0.61	1954	1543	1275	1086	946	838	752	682	624	575	534	497	466	438	413	391	371
0.62	1988	1570	1297	1105	962	852	765	694	635	585	542	506	474	445	420	398	378
0.63	2022	1596	1319	1123	978	866	778	705	645	595	551	514	481	453	427	404	384

TABLE 3

MAXIMUM ALLOWABLE WORKING PRESSURE IN BOILER SHELL

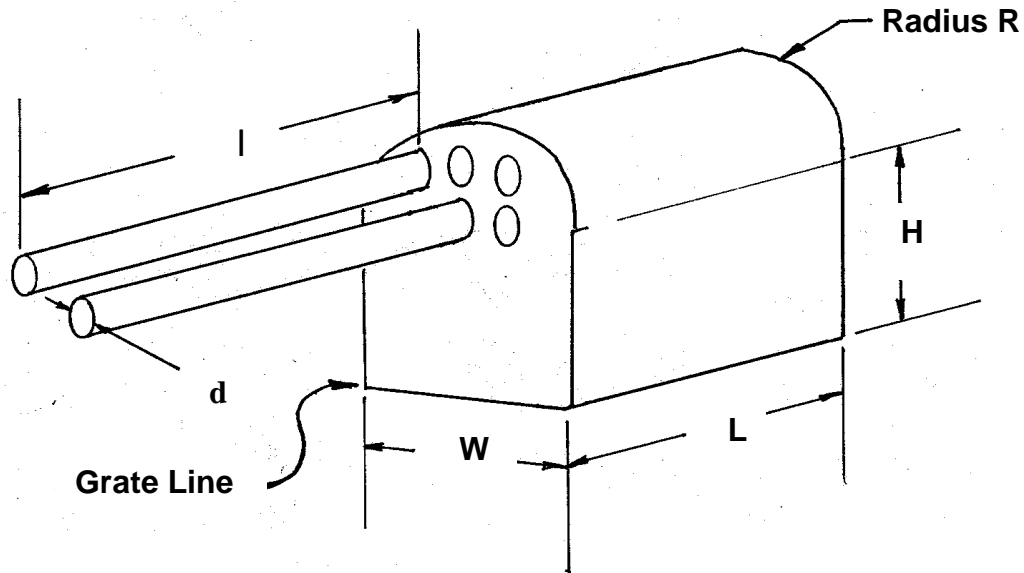
Joint efficiency = 0.739, lap seam, double row rivets, Assume 55,000 psi UTS

SHELL THICKNESS	SHELL DIAMETER IN INCHES																
	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40
0.10	257	205	170	146	128	113	102	93	85	78	73	68	64	60	57	54	51
0.11	283	226	188	161	140	125	112	102	93	86	80	75	70	66	62	59	56
0.12	309	246	205	175	153	136	123	111	102	94	87	82	76	72	68	64	61
0.13	335	267	222	190	166	148	133	121	111	102	95	88	83	78	74	70	66
0.14	361	288	239	205	179	159	143	130	119	110	102	95	89	84	79	75	71
0.15	387	309	257	220	192	170	153	139	128	118	109	102	96	90	85	80	76
0.16	413	329	274	234	205	182	164	149	136	126	117	109	102	96	91	86	82
0.17	439	350	291	249	218	193	174	158	145	134	124	116	108	102	96	91	87
0.18	466	371	309	264	231	205	184	167	153	141	131	123	115	108	102	97	92
0.19	492	392	326	279	244	216	195	177	162	149	139	129	121	114	108	102	97
0.20	518	413	343	294	257	228	205	186	170	157	146	136	128	120	113	107	102
0.21	545	434	361	309	270	239	215	195	179	165	153	143	134	126	119	113	107
0.22	571	455	378	323	283	251	226	205	188	173	161	150	140	132	125	118	112
0.23	598	476	396	338	296	262	236	214	196	181	168	157	147	138	131	124	117
0.24	625	497	413	353	309	274	246	224	205	189	175	164	153	144	136	129	123
0.25	651	518	431	368	322	285	257	233	213	197	183	170	160	150	142	134	128
0.26	678	540	448	363	335	297	267	242	222	205	190	177	166	156	148	140	133
0.27	705	561	466	398	348	309	277	252	231	213	197	184	173	162	153	145	138
0.28	732	582	483	413	361	320	268	261	239	221	205	191	179	168	159	151	143
0.29	759	603	501	428	374	332	298	271	248	229	212	198	186	175	165	156	148
0.30	786	625	518	443	387	343	309	280	257	237	220	205	192	181	170	161	153
0.31	813	646	536	458	400	355	319	290	265	245	227	212	198	187	176	167	158
0.32	840	667	554	473	413	367	329	299	274	253	234	219	205	193	182	172	164
0.33	867	689	571	488	426	378	340	309	283	261	242	226	211	199	188	178	169
0.34	894	710	589	503	439	390	350	318	291	269	249	232	218	205	193	183	174
0.35	921	732	607	518	452	401	361	327	300	277	257	239	224	211	199	189	179
0.36	949	753	625	534	466	413	371	337	309	285	264	246	231	217	205	194	184
0.37	976	775	642	549	479	425	382	346	317	293	271	253	237	223	211	199	189
0.38	1003	796	660	564	492	436	392	356	326	301	279	260	244	229	216	205	195
0.39	1031	818	678	579	505	448	403	365	335	309	286	267	250	235	222	210	200
0.40	1058	840	696	594	518	460	413	375	343	317	294	274	257	241	228	216	205
0.41	1086	861	714	609	532	471	424	384	352	325	301	281	263	247	234	221	210
0.42	1114	883	732	625	545	483	434	394	361	333	309	288	270	254	239	227	215
0.43	1141	905	750	640	558	495	445	404	369	341	316	295	276	260	245	232	220
0.44	1169	927	768	655	571	507	455	413	378	349	323	302	283	266	251	238	226
0.45	1197	949	786	670	585	518	466	423	387	357	331	309	289	272	257	243	231
0.46	1225	971	804	686	598	530	476	432	396	365	338	315	296	278	262	248	236
0.47	1253	992	822	701	611	542	487	442	404	373	346	322	302	284	268	254	241
0.48	1281	1014	840	716	625	554	497	451	413	381	353	329	309	290	274	259	246
0.49	1309	1036	858	732	638	566	508	461	422	389	361	336	315	296	280	265	251
0.50	1337	1058	876	747	651	577	518	470	431	397	368	343	322	302	285	270	257
0.51	1365	1081	894	763	665	589	529	480	439	405	376	350	328	309	291	276	262
0.52	1393	1103	912	778	678	601	540	490	448	413	383	357	335	315	297	261	267
0.53	1422	1125	930	793	692	613	550	499	457	421	391	364	341	321	303	287	272
0.54	1450	1147	949	809	705	625	561	509	466	429	398	371	348	327	309	292	277
0.55	1478	1169	967	824	718	637	571	518	474	437	406	378	354	333	314	298	283
0.56	1507	1191	985	840	732	648	582	528	483	445	413	385	361	339	320	303	288
0.57	1536	1214	1003	855	745	660	593	538	492	453	421	392	367	345	326	309	293
0.58	1564	1236	1022	871	759	672	603	547	501	462	428	399	374	351	332	314	298
0.59	1593	1258	1040	886	772	684	614	557	510	470	436	406	380	358	337	320	303
0.60	1621	1281	1058	902	786	696	625	567	518	478	443	413	387	364	343	325	309
0.61	1650	1303	1077	917	799	708	635	576	527	486	451	420	393	370	349	330	314
0.62	1679	1326	1095	933	813	720	646	586	536	494	458	427	400	376	355	336	319
0.63	1708	1348	1114	949	826	732	657	596	545	502	466	434	407	382	361	341	324

TABLE 4
MAXIMUM ALLOWABLE PRESSURE
For stayed flat plate, Assume 55,000 psi UTS

PLATE THICKNESS	STAYBOLT PITCH IN INCHES																
	2.00	2.25	2.50	2.75	3.00	3.25	3.50	3.75	4.00	4.25	4.50	4.75	5.00	5.25	5.50	5.75	6.00
0.10	72	57	46	38	32	27	24	21	18	16	14	13	12	10	10	9	8
0.11	87	69	56	46	39	33	29	25	22	19	17	15	14	13	12	11	10
0.12	104	82	67	55	46	39	34	30	26	23	21	18	17	15	14	13	12
0.13	122	96	78	65	54	46	40	35	30	27	24	22	20	18	16	15	14
0.14	141	112	91	75	63	54	46	40	35	31	28	25	23	21	19	17	16
0.15	162	128	104	86	72	62	53	46	41	36	32	29	26	24	21	20	18
0.16	185	146	118	98	82	70	60	53	46	41	37	33	30	27	24	22	21
0.17	209	165	134	110	93	79	68	59	52	46	41	37	33	30	28	25	23
0.18	234	185	150	124	104	89	76	67	58	52	46	41	37	34	31	28	26
0.19	261	206	167	138	116	99	85	74	65	58	51	46	42	38	34	32	29
0.20	289	228	185	153	128	109	94	82	72	64	57	51	46	42	38	35	32
0.21	318	252	204	168	141	121	104	91	80	70	63	56	51	46	42	39	35
0.22	349	276	224	185	155	132	114	99	87	77	69	62	56	51	46	42	39
0.23	382	302	244	202	170	145	125	109	95	85	75	68	61	55	50	46	42
0.24	416	329	266	220	185	157	136	118	104	92	82	74	67	60	55	50	46
0.25	451	356	289	239	201	171	147	128	113	100	89	80	72	65	60	55	50
0.26	488	386	312	258	217	185	159	139	122	108	96	87	78	71	65	59	54
0.27	526	416	337	278	234	199	172	150	132	117	104	93	84	76	70	64	58
0.28	566	447	362	299	252	214	185	161	141	125	112	100	91	82	75	68	63
0.29	607	480	389	321	270	230	198	173	152	134	120	108	97	88	80	73	67
0.30	650	513	416	344	289	246	212	185	162	144	128	115	104	94	86	79	72
0.31	694	548	444	367	308	263	227	197	173	154	137	123	111	101	92	84	77
0.32	739	584	473	391	329	280	241	210	185	164	146	131	118	107	98	89	82
0.33	786	621	503	416	349	298	257	224	197	174	155	139	126	114	104	95	87
0.34	834	659	534	441	371	316	272	237	209	185	165	148	134	121	110	101	93
0.35	884	699	566	468	393	335	289	252	221	196	175	157	141	128	117	107	98
0.36	936	739	599	495	416	354	305	266	234	207	185	166	150	136	124	113	104
0.37	988	781	632	523	439	374	323	281	247	219	195	175	158	143	131	120	110
0.38	1042	824	667	551	463	395	340	297	261	231	206	185	167	151	138	126	116
0.39	1098	868	703	581	488	416	359	312	274	243	217	195	176	159	145	133	122
0.40	1155	913	739	611	513	437	377	329	289	256	228	205	185	168	153	140	128
0.41	1213	959	777	642	539	460	396	345	303	269	240	215	194	176	160	147	135
0.42	1273	1006	815	674	566	482	416	362	318	282	252	226	204	185	168	154	141
0.43	1335	1055	854	706	593	505	436	380	334	296	264	237	214	194	176	161	148
0.44	1398	1104	894	739	621	529	456	398	349	309	276	248	224	203	185	169	155
0.45	1462	1155	936	773	650	554	477	416	365	324	289	259	234	212	193	177	162
0.46	1527	1207	978	808	679	578	499	434	382	338	302	271	244	222	202	185	170
0.47	1595	1260	1021	843	709	604	521	454	399	353	315	283	255	231	211	193	177
0.48	1663	1314	1064	880	739	630	543	473	416	368	329	295	266	241	220	201	185
0.49	1733	1369	1109	917	770	656	566	493	433	384	342	307	277	252	229	210	193
0.50	1805	1426	1155	955	802	683	589	513	451	400	356	320	289	262	239	218	201
0.51	1878	1484	1202	993	834	711	613	534	469	416	371	333	300	272	248	227	209
0.52	1952	1542	1249	1032	868	739	637	555	488	432	386	346	312	283	258	236	217
0.53	2028	1602	1298	1073	901	768	662	577	507	449	401	359	324	294	268	245	225
0.54	2105	1663	1347	1113	936	797	687	599	526	466	416	373	337	305	278	255	234
0.55	2184	1725	1398	1155	971	827	713	621	546	484	431	387	349	317	289	264	243
0.56	2264	1789	1449	1197	1006	857	739	644	566	501	447	401	362	329	299	274	252
0.57	2345	1853	1501	1241	1042	888	766	667	586	519	463	416	375	340	310	284	261
0.58	2428	1919	1554	1284	1079	920	793	691	607	538	480	431	389	352	321	294	270
0.59	2513	1985	1608	1329	1117	952	821	715	628	556	496	445	402	365	332	304	279
0.60	2599	2053	1663	1375	1155	984	849	739	650	576	513	461	416	377	344	314	289
0.61	2686	2122	1719	1421	1194	1017	877	764	672	595	531	476	430	390	355	325	298
0.62	2775	2193	1776	1468	1233	1051	906	789	694	615	548	492	444	403	367	336	308
0.63	2865	2264	1834	1515	1273	1085	936	815	716	634	566	508	458	416	379	347	318

SECTION XV
CALCULATION OF BOILER HEATING SURFACE
AND SAFETY VALVE CAPACITY



- 1) Calculate the Tube Area $= N (3.1416 d) l$
 where N = number of tubes
 d = outside diameter of tube
 l = length of tube
- 2) Plus calculate the Firebox area $= 2HL + 2HW$
 where H = firebox height
 L = firebox length
 W = firebox width
- 3) Plus calculate the curved crown sheet $= 3.14 RL$ OR flat crown sheet $= WL$
 where R = radius of the crown sheet
 L = firebox length
 W = firebox width
- 4) Plus calculate the area at ends $= 3.14 R^2$ OR none for a flat crown sheet
 where R^2 = radius of the crown sheet, squared
- 5) Subtract the Tube sheet holes $= (3.14/4) d^2 N$
 where d^2 = outside diameter of tube, squared
 N = number of tubes
- 6) And subtract the Fire door area $= \text{height} \times \text{width}$

Be sure to keep the units of measurement consistent, either inches or feet. Convert square inches to square feet by dividing by 144 in² per square foot.

Calculate the steam generation $= 5 \text{ lb / hr ft}^2 \times ? \text{ ft}^2$. Compare to the lb/hr rating of the safety valve.

SECTION XVI

WORKSHEET FOR BOILER HEATING SURFACE

BOILER NUMBER _____

1) Number of flues _____ X Flue Diameter _____ X 3.1416 = _____
 SAMPLE => 40 2" 251.328"
 X length _____ = _____ divided by 144sq in/sq ft = _____
 48" 12063.744 sq in 83.766 sq ft

2a) Sides of firebox, Height _____ (from grate to start of crown sheet bend)
 SAMPLE => 30"
 X Length _____ = _____ X 2 (for the other side)
 48" 1440 sq in
 = _____ divided by 144sq in/sq ft = _____
 2880 sq in 20 sq ft

2b) Ends of fire box, Height _____ (from grate to start of crown sheet bend)
 SAMPLE => 30 "
 X width _____ = _____ X 2 _____ (for the other end)
 36" 1080 sq in 2160 sq in
 divided by 144sq in/sq ft = _____
 15 sq ft

3a) Curved CROWN Sheet radius _____ X 3.1416 = _____ X
 SAMPLE => 9" 28.2744"
 Length _____ = _____ divided by 144sq in/sq ft" = _____
 48" 357.1712 sq in 9.425 sq ft

3b) Flat CROWN sheet Width _____ X Length _____ = _____ divided
 by 144sq in/sq ft _____

4) Upper half of Flue sheet end and upper half of Rear Fire Box end

Diameter _____ divided by 2 = Radius _____ X Radius _____ =

SAMPLE \Rightarrow 18" 9" 9"

_____ X 3.1416 = _____ divided by 144sq in/sq ft _____

81" 254.4696 sq in 1.767 sq ft

5) Subtract flue holes Diameter _____ X Diameter _____ = _____

SAMPLE \Rightarrow 2" 2" 4 sq in

X 3.1416 / 4 = _____ X Number of flues _____ = _____

3.1416 sq in 40 125.664 sq in

divided by 144sq in/sq ft = _____

0.873 sq ft

6) Subtract the fire box door Height _____ X Width _____ = _____

divided by 144sq in/sq ft = _____

SECTION XVII
 WORKSHEETS FOR ULTRASONIC MEASUREMENTS

Date _____ KAESSA # _____
 Owner _____

Front tube sheet

barrel dia

Exterior left side

Staybolt pitch

X

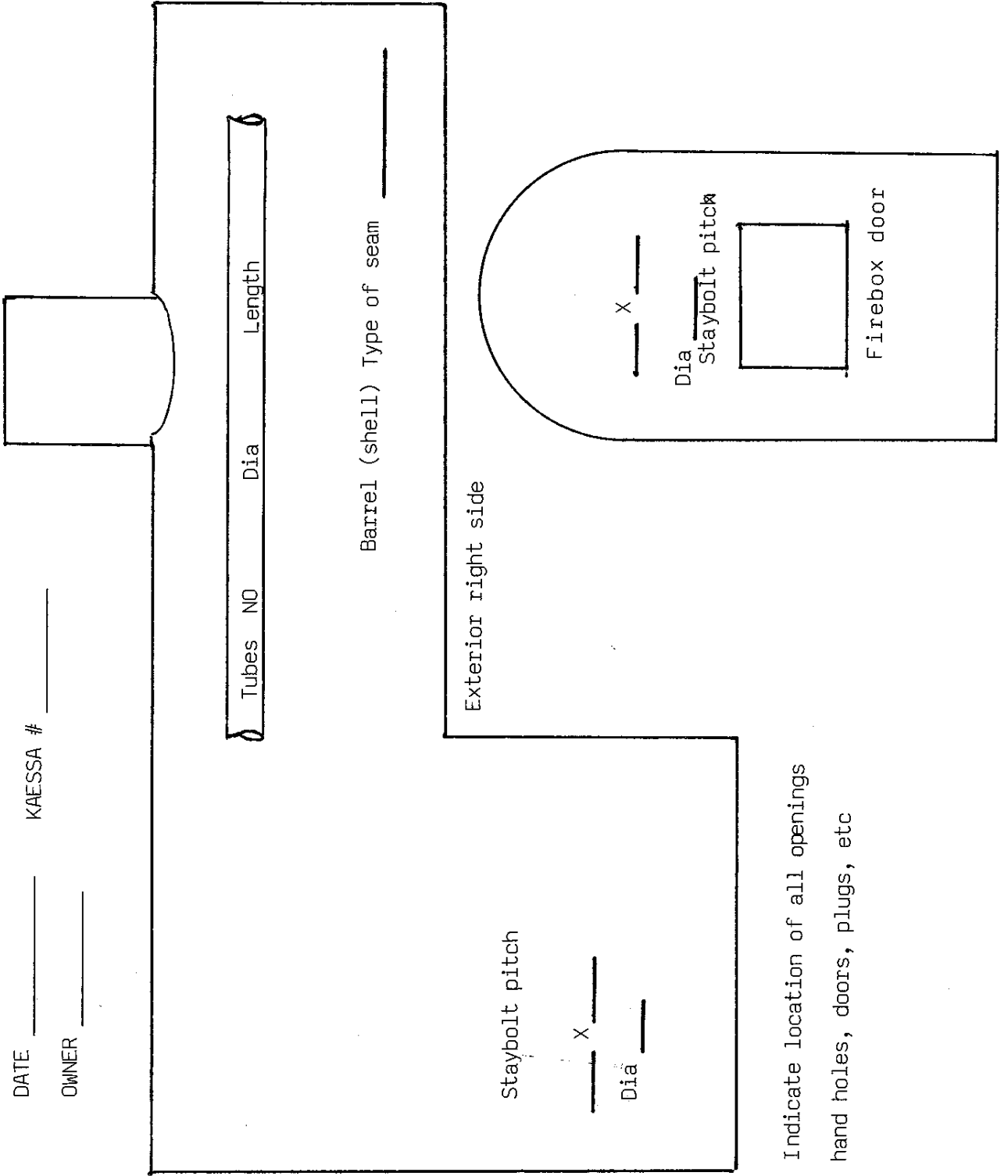
Dia

Throat sheet

Indicate location of all openings
 hand holes, doors, plugs, etc

DATE _____ KAESSA # _____

OWNER _____

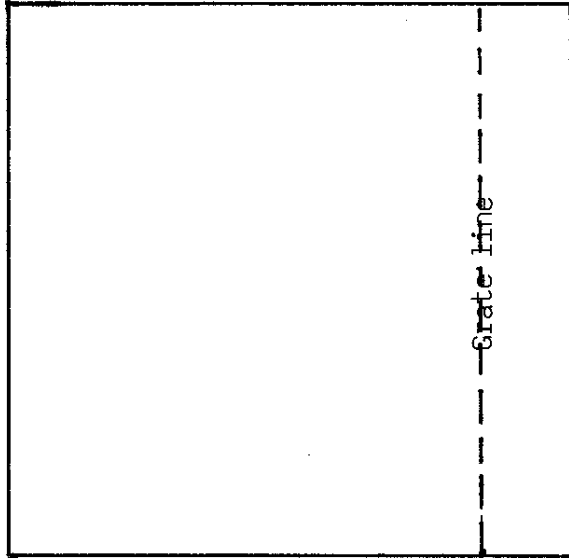


Indicate location of all openings
hand holes, doors, plugs, etc

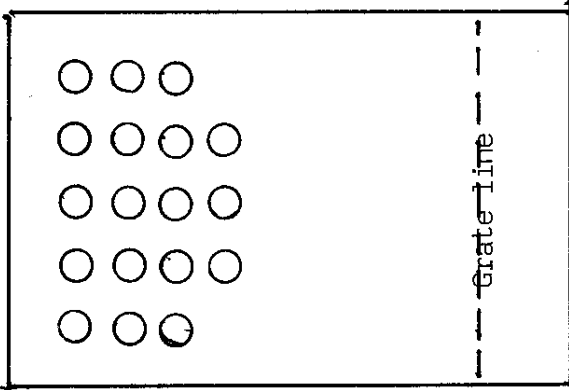
DATE _____

KAESSA # _____

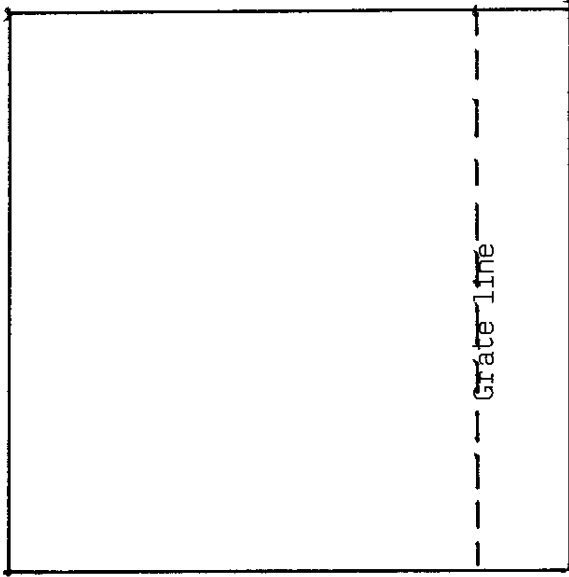
Owner _____



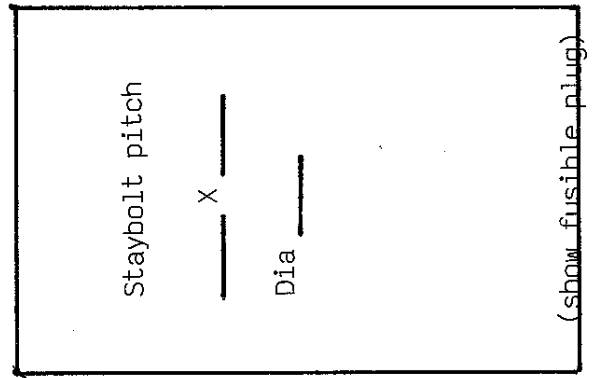
Left water leg



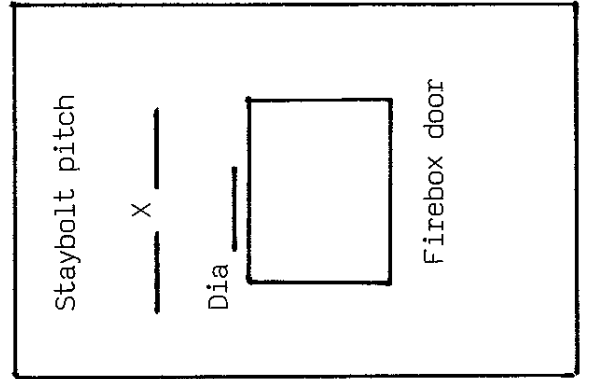
Rear tube sheet



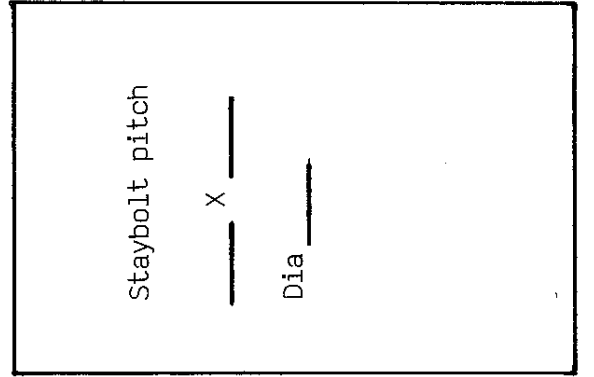
Right water leg



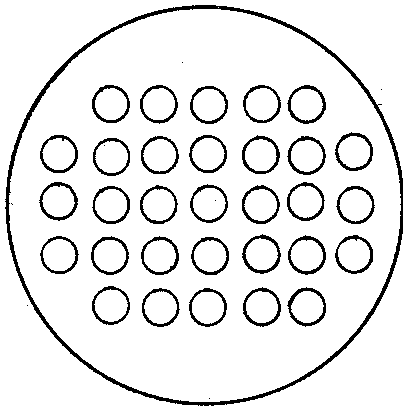
Crown sheet



Rear head



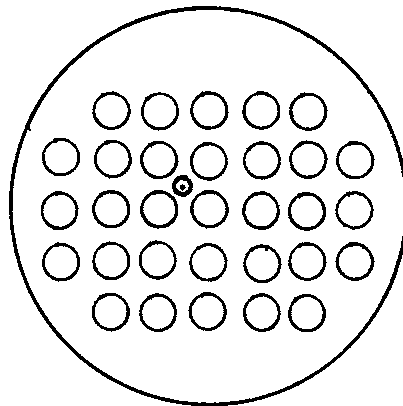
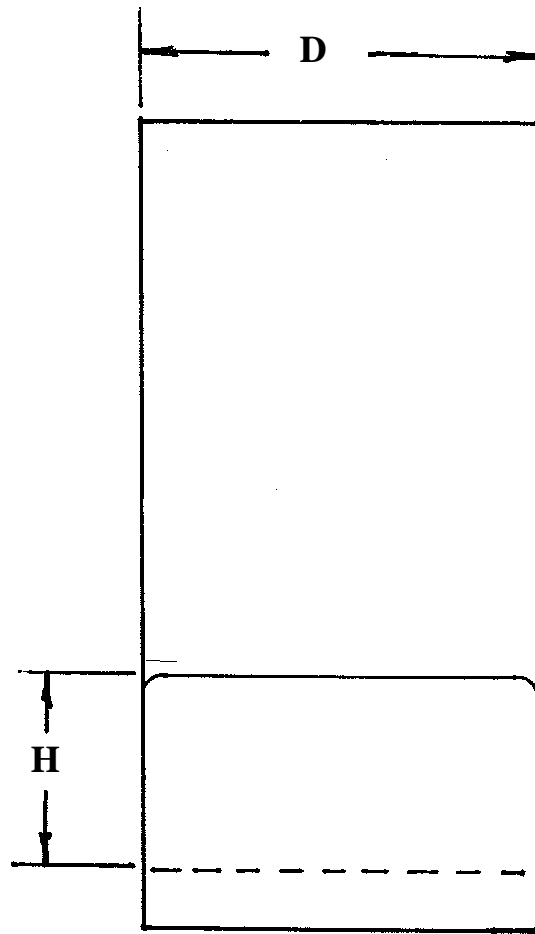
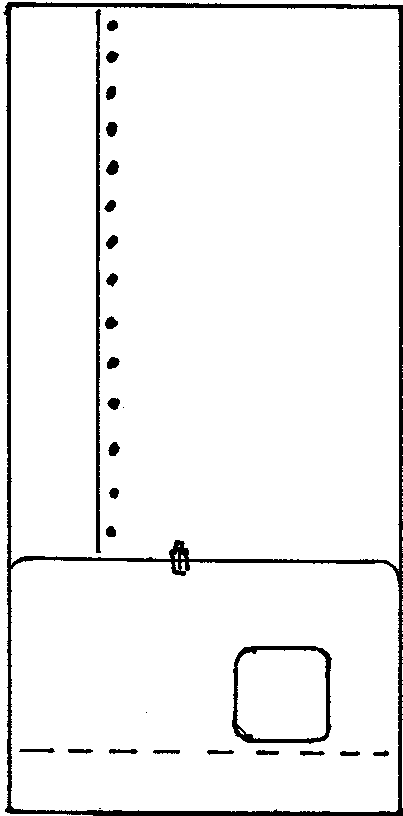
Wet bottom (two sheets)



Date _____

Owner _____

KAESSA # _____



Tubes

Number N _____

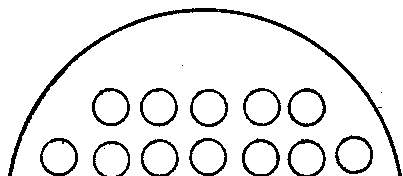
Diameter **d** _____

Length **L** _____

Heating Surface =

$$\pi D H$$

$$+ \pi D^2/4 - N \pi d^2/4$$

$$+ N \pi d L$$


KAESSA
SAFETY INCIDENT REPORT
SECTION XVIII

Note: *This report shall be forwarded to the current KAESSA Secretary within 24 hours.*

This report is required by the Bylaws of the KAESSA. Any incident that relates to the unsafe operation of a pressure steam boiler under the regulations established by that association shall be recorded and sent to the KAESSA Secretary within 24 hours so that information may be disseminated to all of the other KAESSA inspectors. All reports shall be reviewed at the annual KAESSA meeting. This form may also be used to record any safety related incident unrelated to steam boilers.

DATE OF INCIDENT: _____

BOILER OPERATOR: _____

BOILER DESCRIPTION: _____

KAESSA BOILER NO: _____

INCIDENT LOCATION: _____

SUBMITTED BY: _____

Describe the incident including the factors that contributed to the incident, any other people involved in the incident, whether the inspector witnessed the incident, any other witnesses, how the incident was resolved, whether the operation of the engine was shut down, the damage to the engine or property, any suggestions to prevent such incidents, etc.

SECTION XIX
BOILER INSPECTION REPORT

KANSAS ANTIQUE ENGINE SHOW & SAFETY
ASSOCIATION, INC.

BOILER -- REPORT OF INSPECTION

1	DATE INSPECTED	KAES-SA NO.	STATE OR CITY NO.	NATL. BOARD OR STANDARD AND NO.	MANUFACTURER'S OR SHOP NO.
2	USER-OWNER (If user is not the owner, give the names and addresses of both user and owner. If ownership has been changed, give name on posted certificate)				NATURE OF BUSINESS (Store, laundry, etc.)
3	ADDRESS (No.) (Street) (City) (County) (State)				
4	LOCATION OF OBJECT (No.) (Street) (City) (County) (State) (Zip)				
5	KIND OF INSPECTION <input type="checkbox"/> INT <input type="checkbox"/> EXT	CERTIFICATE INSP. <input type="checkbox"/> YES <input type="checkbox"/> NO	TYPE OF OBJECT (E.T., V.T., W.T., C.T., Tank, Kettle, etc.)		MADE BY
					YEAR BUILT
6	FUEL USED (Coal, Oil, Gas, Pulv., etc.) (Note change, if any)			METHOD OF FIRING (Hand, Stoker, Automatic Burner, etc.)	
7	USED FOR (Power, Heat Process, etc.)			PRESSURE GAGE TESTED <input type="checkbox"/> YES <input type="checkbox"/> NO	HYDRO. TEST APPLIED <input type="checkbox"/> YES <input type="checkbox"/> NO
8	PRESSURE ALLOWED (This inspection)		(Previous inspection)	EXPLAIN IF PRESSURE CHANGES	
9	CURRENT CERTIFICATE POSTED <input type="checkbox"/> YES <input type="checkbox"/> NO		IS CONDITION OF OBJECT SUCH THAT CERTIFICATE MAY BE ISSUED (if No, explain fully) <input type="checkbox"/> YES <input type="checkbox"/> NO		SAFETY VALVES SET AT
	HEATING SURFACE			HORSEPOWER	

10 **CONDITIONS:** *With respect to the internal surfaces, describe and state location of any scale, oil or other deposits. Give location and extent of any corrosion and state whether active or inactive. State location and extent of any erosion, grooving, bulging, warping, cracking or similar condition. Report on any defective rivets, bowed, loose or broken stays. State condition of all tubes, tube ends, coils, nipples, etc. Describe any adverse conditions with respect to pressure gage, water column, gage glass, gage cocks, safety valves, etc. Report condition of setting, linings, baffles, supports, etc. Describe any major changes or repairs made since last inspection.*

11 **REQUIREMENTS (List code violations and repairs)***

12 **NAME AND TITLE OF PERSON TO WHOM REQUIREMENTS WERE EXPLAINED**

I hereby certify that this is a true report as a result of my inspection:
SIGNATURE OF INSPECTOR

In my best judgement this boiler is in safe condition and inspector shall be held faultless.

State Commission # _____

Commission Expires _____ / _____ / _____
Mo. Day Yr.

*The repairs indicated on this report are necessary to put your boiler in a safe operating condition. Please fill out this report, giving the work done on the boiler. If any patching is done, give size of patch, size of rivets, pitch of rivets and thickness of plate used. If new stays are applied give size of the stay that is used. Give a list of all new material that is used. WELDING ON A BOILER shall be in accordance with recommendations of the National Board of Boiler and Pressure Vessel Inspectors for repair of power boilers.

SECTION XX
BOILER INSPECTION CERTIFICATE

The Kansas Antique Engine Show Safety Association, Inc.

Boiler Inspection Certificate

*Registered Office — McPherson, Kansas
This Boiler has been inspected in accordance with the
Boiler Safety Act of Kansas*

_____	_____ PSIG
KAES— SA Boiler No.	Pressure Allowed
_____	_____
MARCH 31,	Inspected By
Expiration Date	

	MARCH 31,
	Commission Expires