



July 2003

AMBSC Code Part 1 Issue 7 — A Practical Code or Black Magic?

Stuart Martyn takes a close look at the 2001 Boiler Code while building his own boiler and presents his experiences and opinions...

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For most of my working life I have been employed by various Engineering Consultants both in Australia and overseas as an Electrical Design Engineer in Power Generation and Distribution, Building Services, Security and Mining Industries, etc.

These tasks have caused me to become intimately involved with numerous Codes and to interpret them in such a manner as to provide a product that both complies with the appropriate Code and the client's requirements at the lowest possible cost.

At the time of writing, I'm in the process of building a copper boiler for my 5" Speedy. As Bob Brown has previously advised, LBSC's original boiler design falls somewhat short of the



Stuart Martyn and Clive Chapman preheating Stu's boiler for his "Speedy" outside the Club House. Photo: Ray Shersby

minimum requirements of AMBSC Code Part 1-Issue 7-2001 COPPER BOILERS. Curly's design calls for 5 x 3/4" superheater and 26 x 7/16" flue tubes. I've taken Brownies' advice and used 1/2" flue tubes (19 of them) and on my own initiative

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CALENDAR OF EVENTS

General Meeting	Club Meeting Room Vasto PI, Balcatta	8:00 pm	Friday 11 July
Club Run Day	Club Track Site Vasto PI, Balcatta	11:00 am—3:00 pm	Saturday 12 July
Public Run Day	Club Track Site Vasto PI, Balcatta	11:00 am—3:00 pm	Sunday 27 July
General Meeting	Club Meeting Room Vasto PI, Balcatta	8:00 pm	Friday 8 August
Club Run Day	Club Track Site Vasto PI, Balcatta	11:00 am—3:00 pm	Sunday 10 August

AMBSC Code — Practical Code or Black Magic?

by Stuart Martyn

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deleted the superheater altogether, figuring that short runs don't really give a superheater much of a go, and if I run it on LPG (forget about efficiency) I can always crank it up enough to get enough steam. Readers may be surprised to know that in spite of all these tubes crammed into the barrel and using the minimum ligament of 2.5mm [Clause 3.12 TUBE PLATES], the heating surface together with the flue area is only 75% of Curly's design! This arrangement of flue tubes together with the blower and steam supply line means the smoke box tube plate is somewhat crowded and precludes the use of normal longitudinal stays, so I've opted for the use of palm stays [Clause 3.4.3 LONGITUDONAL STAYS].

Enter the Gremlins. The plugs which hold the stays to the outer wrapper are quite large, their size being determined by the stay diameter [refer to Figure 3.4.3 TYPES OF LONGITUDINAL STAYS], and if more than two stays are used it becomes difficult to find space to mount them. The use of a doubling plate on the back head [Clause 3.6 DOUBLING PLATES FOR STAYED AREAS] permits the stay pitch to be increased by 1.5 times the diameter which enables me to get away with only two stays. Unfortunately the stay diameters must also be increased by one and a half which from Table 3.4.1.A gives a stay diameter of $5.5 \times 1.5 = 8.25\text{mm}$, which doesn't appear to be commercially available.

However if one uses the formulae in Clause 3.4.1.A instead of the tables, for a 3mm plate plus a 3mm doubling plate, i.e. a total plate thickness of 6mm and a working pressure of 700kPa, then Max Pitch "C" from Equation 3.4.1.7-1 = 55mm.

If I now select a smaller pitch "C"=40mm for the stays within the doubling plate area, which I know from using the "Advanced Design Techniques" in Appendix 5, in particular Clause A5.3.4, will pass through four points of support [Clause A5.3 DESIGN OF ROD STAYS IN IRREGULAR PATTERNS], and use this value of "C" in Equation 3.4.1.7-4 gives me a calculated value of 7.888mm diameter for the palm stays. This is near enough to 8mm dia. stay which is available from commercial stockists.

One question which arises is:- Should the hole in the top of the palm stay anchoring plug be completely filled with silver solder?

So now we've got the doubling plate sorted out and now have to fit bushes for the mounting of the sight glass, water feeds, blower etc., and look to Clause 3.13.3 [BUSHES AND MOUNTINGS], in particular

Table 3.13.3 [RECOMMENDED PROPORTIONS FOR THREADED MOUNTINGS] for some guidance on bush sizes. Oh Bugger! This clause only applies to the "shell" and since this term doesn't appear under Clause 1.3 DEFINITIONS, one can only hope it means the outside of the boiler including the flat part of the backhead. If we go with the philosophy that the cross-sectional area of hole in the plate (plate thickness x hole dia.) must be less than the cross sectional area of the bush (less the threaded section), does that mean that the bushes must be bigger than that called for in Table 3.13.3 to allow for the doubling plate as well as the original plate? It would be mighty strange if it did because if the doubling plate was to be placed clear of all these penetrations, that is use of a thinner section of the plate would allow a smaller bush size to be used!

By the way if we have a nominal thread of 9.5mm ($3\frac{3}{8}$ ") through a 4mm plate, using Table 3.13.3:- A=17 B=3.0 C=7 and D=12. (All measurements in mm). Cross-sectional area of bush = $(A \times B + C \times D) - \text{Nom. Thread Dia.} \times (B + C) = 40 \text{ sq. mm}$ The cross-sectional area of hole in the plate = $D \times \text{thickness of plate} = 12 \times 4 = 48 \text{ sq mm}$.

Doesn't exactly inspire a great amount of confidence in this Table does it? I don't expect many boiler builders would use 4mm plate but it's still a mistake unless my calculator is wearing out like it's owner!

Next problem is to resolve the spacing of the combustion stays. Clause 3.8.2 as a sub paragraph of Clause 3.8 [COMBUSTION CHAMBERS] states that spacing of stays over the combustion chamber shall comply with Clause 3.4.1. That's clear enough, but one would have thought that on a Belpaire type boiler where the outer wrapper is of a larger area than the firebox wrapper the outer wrapper would dictate the spacing of the stays on the inner wrapper. This raises in my mind how close can we put the stays together? The Code makes no mention of this. It's a shame that Figure 3.4.2B [CROWN STAYS IN BELPAIRE LOCOMOTIVE BOILERS] is not accompanied by a note stating that "Stays spaced as per Table 3.4.1 over WHOLE Outer Wrapper". As it exists on the same page as Fig. 3.4.2A [CROWN STAYS IN ROUND TOP LOCOMOTIVE BOILERS] where the stay spacing is dictated by the inner firebox, an old dumb bugger like myself could easily be misled into thinking that the firebox dictates the stay spacing. Not so!

Since the Boiler Code was developed to keep the Bureaucrats off our backs and also to provide some standardisation for building small boilers, why do we in

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AMBSC Code (continued...)

our Club persist in our own numbering system? Clause 7.0 [INSPECTION AND TESTING] Sub-Clause 7.1.4 clearly states the identification number shall be:- (State) (Club) (Year) (Serial number) in that order. There is no requirement for the letter "C" for copper boilers, but Part 2 of the Code definitely requires the letter "S" stamped after the serial number to denote a steel boiler.

Finally I should mention that although I'm not a boiler maker, I was taught during my apprenticeship by a very experienced Tradesman to silver solder and I see no reason why such a simple and elementary process should now be called silver brazing, other than to massage some Johnnie-come-lately's ego. From Collins Aust. Pocket Dictionary of the English Language, my edition 2001:- **BRAZE** [*breize*] *vb.* To join [two metal surfaces] by fusing brass between them [*Old French*]

SOLDER [*sauldza*] *n.* 1. An alloy used for joining two metal surfaces by melting the alloy so that it forms a thin layer between the surfaces. *vb* 2. to join or mend or be joined with solder [*Latin solidaire to strengthen*].

Before concluding this missive it would be remiss of me not to extend my heartfelt thanks to Clive Chapman who introduced me to the world of very hot copper, the use of citric acid (in lieu of the traditional sulphuric acid for pickling), the very neat trick of turning down the ends of the stays which prevents them from falling through into the guts of the firebox, and for provided me with invaluable help, tuition and a steadying hand when things tended to go awry (see below). Thanks mate.

I should also like to thank Brownie for his articles and talks on the building of small copper loco boilers which has helped to remove the "Black Magic" which I had concluded, in my mind, to be closely associated with the building of these boilers. Also thanks to Phil Gibbons for his practical help and advice. If Phil hadn't pointed it out in time for me to correct the error, I would have had a fire door sized to suit the Lilliputians!

Stu Martyn



Stu and Clive getting down to the job of "Brazing" a couple of missed stays.

Photo:
Ray Shersby

Committee Items

Thanks to George Palmer for the donation of a TV and microwave oven to the Society. We have a video player on the way so we will be able to have some light entertainment at our future meetings.

From the Committee:

It is unfortunate but a reality of current society that we need to be increasingly professional in the way we operate. We need to be able to demonstrate that we adhere to the AALS Code of Practice. To this end we will see more paperwork appearing. Key elements now in place are:-

- Requirement that all Members and visitors sign in and out of all Society activities.
- Duty Officer's log book.
- Driver licensing.
- Passenger car inspection and certification.
- Duty Officer to record train consist, driver and time on and off and confirm currency of certification.
- Incident report forms.
- Track and grounds safety inspection reports.

Your support of the Duty Officer on run days is essential as the task becomes more demanding.

Andrew Manning

Five children injured in festival ride accident

The following extract from a Queensland newspaper was forwarded by Kym Cramer. A further reinforcement of the Committee items noted above, and very relevant to recent comment and discussion on public liability:

BRISBANE, June 10 AAP - Five children were taken to hospital and a model train operator was charged with drink driving after an accident at a festival in far north Queensland.

A police spokeswoman said today the five children received minor injuries after the motorised miniature train they were in flipped off its rails and onto its side at about 9pm (AEST) on Sunday at the Cooktown Discovery Festival.

The children were taken to Cooktown Hospital with cuts and bruises. The train operator will face driving and drink driving charges after recording a blood alcohol level above the legal limit. He is due to appear in Cooktown Magistrates Court on July 8.

Apology

In the June issue of Steamlines, a picture of Steve Reeves and Bob Brown was published — however, Bob Brown was incorrectly identified as Milton Smith. Apologies to both gentlemen, hopefully neither of them have suffered too severe an identity crisis.



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June Run Day Report

by Ron Date

The most miserable day weather-wise we have had, yet almost half the club members signed on for at least some of the day. That is most pleasing.

Big Mike came along with "George" for the whole day even though he was going into hospital on the following Monday for a heart operation. As of Wednesday he was in a stable condition in intensive care at Fremantle Hospital. Best of luck Mike.

Ernie drove "Blowfly", all beautifully polished (the loco that is!) for the day, no hat, no raincoat – a real tough guy.

Brian Lawrie drove my C32 with ever increasing style and efficiency. Doug Baker installed his new switch on the tunnel signals and, rain and all, it worked 100%.

Needless to say we didn't expect any patrons at all, but much to our surprise we more than covered costs plus some. There were no incidents to note unless you count Milton Smith and myself being caught on the track at the conclusion of running by a deluge that almost drowned us as we headed for the steaming bay.

General Items — Steve Reeves brought along his newly made 5" tracks for the steaming bay of which one is already installed.

The steaming bay guttering has been cleaned out, it took 4 hours up the ladder using an old 12" rule and the hose to do it, something has to be done there as the guttering has a negative slope on it so it will never even faintly clean itself by natural flow.

Rain, or the threat of it, is delaying the last of the concreting around the building, after that the disabled lift and the floor covering upstairs virtually sees the job finished.

Project-wise this is still the No. 1 priority so for those itching to get on with other projects, let's get this one done so our full attention can be focused on the next project.

Ron Date

Coming Soon..

In the next issue of Steamlines, Phil Gibbons will continue his series of very informative 'how-to' articles, this time covering Gasket Making, with further 'useful thoughts' on Connecting and Coupling Rods.

Dick Langford also has an interesting article about the Powerhouse Museum, Sydney.

If you have an article or comment that you'd like to see in Steamlines, please send it in!

More AMRA Photos...



Left: Ed Brown taking a driver's turn with the ever-popular train rides at AMRA.

Below: Doug Baker and Vince Devine demonstrating stationary engines on the display stand.

Photos:
Ray Shersby



POSITIONS VACANT

Multi-skilled People — There's still some finishing work on the interior/exterior of the new Club House.

Also track maintenance, trimming, clearing etc., especially with the winter here.

Contact Ron Date for more details, or just come on down to the track site.