Ministry for the Environment
Manatū Mō Te Taiao

National Wood Burner Performance Review

Phase 1

Ministry for the Environment
in partnership with
Environment Canterbury and Nelson City Council

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Executive Summary

The Ministry for the Environment, partnered by Environment Canterbury and Nelson City Council, conducted a performance review of wood burners under the national environmental standards for air quality. This report details the results of Phase 1 of the review, which involved design verification of 35 wood burners during May to July 2006. Design verification testing is a physical inspection of a burner for comparison with its original design, as described in the emissions and efficiency test report.

The review revealed poor overall compliance, with 37% of burners inspected passing, 9% being undetermined and the remaining 54% failing. In all cases of failure, manufacturers undertook to resolve issues with both future and existing stock for sale. At the time of writing a number of issues have yet to be resolved.

The review was governed by a protocol developed with input from industry. This protocol specifies that serious failures be reported to the Commerce Commission. The Ministry intends to notify the Commerce Commission at completion of Phase 2 of the review.

In addition to the identified failures, a number of serious – and unanticipated – issues arose in relation to how burners are named. In response to this the Ministry, Environment Canterbury and Nelson City Council have improved their authorisation and listing processes to avoid such issues in the future.

Phase 1 of the performance review addressed the compliance of 35 burners. Almost certainly there will be other models not examined that will have faults similar to those identified in this review. Some of these will be examined in Phase 2 of the review, in which 10 wood burners were purchased for design verification and then full emissions and efficiency testing. A report on Phase 2 is expected in late 2007.

Key points for regulators

- Compliance was found to be poor, and future reviews are strongly recommended.
- Manufacturer responses to the review varied dramatically.
- Councils issuing building consents for wood burners are advised to consult the Ministry for the Environment web list of authorised burners. This list has been updated following the review and is the only national, independently verified, list available.
- A number of unanticipated issues that arose during this review could be avoided by tightening the wood burner authorisation processes. This would be further assisted by preparing guidance for applicants so they are clear about what is required, and by the formalisation or adoption of a nationally consistent authorisation process.

Key points for consumers

- The first review of performance of wood burners revealed poor compliance with respect to the national environmental standards for air quality. The Ministry and partner councils are working with industry to resolve the identified issues.
- People intending to purchase a wood burner are advised to consult the Ministry for the Environment web list of authorised burners. This list has been updated following the review and is the only national, independently verified, list available.
- The following burners passed first time *in this review*:

  BBQ Factory
  - Kent Astron CA

  Dallas Metals Industries
  - Kent Kiwi Radiant Clean Air / Milan Caldo Rustic Harmony Clean Air
  - Kent Logfire Max / Milan Harmony I/B
  - Milan Caldo C/A Harmony Series

  Hewitsons Enviro-Heat Ltd
  - Contessa EF with Water Heating
  - Lady Kitchener EF

  WH Harris
  - Nestor Martin R33
  - Woodsman Matai DVI – 165 Standard
  - Woodsman Miami – 165
  - Woodsman Pelorus – 165.
- The manufacturer Tropicair is commended in this report for their proactive, thorough and timely response to the performance review.

Key points for industry

- This review has revealed poor performance with respect to the national environmental standards for air quality.
- Government (both central and local) is committed to the national environmental standards and is likely to undertake more reviews in the future.
- These reviews reward not only compliance but also proactive, responsible behaviour in response to identified compliance issues.

1 Introduction

1.1 The national environmental standards

The *Resource Management (National Environmental Standards Relating to Certain Air Pollutants, Dioxins and Other Toxics) Regulations 2004* were promulgated on 6 September 2004. For the purposes of this report, these regulations will hereafter be referred to as either "the regulations" or "the NES".

The regulations require that from 1 September 2005 all new wood burners installed on properties less than two hectares must have a maximum particle emission of 1.5g/kg and a minimum efficiency of 65% when tested in accordance with AS/NZS 4012/4013. Under the Resource Management Act 1991 responsibility for enforcing the regulations is devolved to regional councils and unitary authorities.

Under the regulations, a wood burner is defined as:

> *(a) a domestic heating appliance that burns wood; but*
>
> *(b) does not include –*
>
> *i. an open fire; or*
>
> *ii. a multifuel heater, a pellet heater, or a coal burning heater; or*
>
> *iii. a stove that is –*
>
> *(A) designed and used for cooking; and*
>
> *(B) heated by burning wood.*

As noted, the regulations do not apply to burners installed in properties over two hectares. This means that it is not illegal to manufacture or sell non-compliant burners in New Zealand. It is however, illegal to sell or advertise that a wood burner meets the regulations if it does not.[1]

Two key drivers behind the introduction of the NES were to:

- reduce emissions to air – the emissions and efficiency limits are important tools for improving air quality and public health in urban New Zealand
- provide a level playing field for industry – setting a design standard for wood burners provides for competition in a fair environment.

[1] This is false or misleading representation under the Fair Trading Act 1986.

1.2 Design verification testing

In April 2006 the Ministry for the Environment (the Ministry) announced the commencement of a review of wood burners under the NES. The aim of the review was to provide consumers, retailers and installers with confidence that the products they are purchasing and installing are compliant with the regulations.

In designing the review, the Ministry was mindful of the regulatory history of wood burners in both New Zealand and Australia. The regulations introduced in 2005 build on a voluntary emissions limit of 4.0g/kg that was adopted in a joint New Zealand and Australian standard in 1999.[2] This emission limit has since been adopted as a mandatory standard in most states and territories of Australia. In 2003 the Department of Environment and Heritage (Federal Government of Australia) commissioned an audit of wood burners involving:[3]

- emissions and efficiency testing of 12 wood burners
- design verification testing of a further 35 models.

Design verification testing is a physical inspection of a burner for comparison with its original design as described in the emissions and efficiency test report. This test is much quicker and cheaper than a full emissions and efficiency test, which typically requires around four days test work in the laboratory.

Results from the Australian audit showed the extent of non-compliance was significant. An analysis of burners tested for emissions performance found the presence of engineering design faults was a good indicator of emissions non-compliance. These results provide confidence that the design verification test is a good indicator of whether or not a burner will comply with its stated emissions and efficiency.

1.3 New Zealand regulatory context

In New Zealand, wood burners are authorised for installation by either Environment Canterbury or Nelson City Council in accordance with the rules in their respective regional plans.[4]

Environment Canterbury requires burners have a maximum particle emission of 1.0g/kg and Nelson City Council requires 1.5g/kg.[5] To avoid duplication the two councils have an arrangement whereby Environment Canterbury authorises burners emitting less than 1.0g/kg and Nelson City Council adopts that list and also authorises burners emitting between 1.0 and 1.5g/kg. The Ministry for the Environment publishes a list of all wood burners authorised by both Environment Canterbury and Nelson City Council – this is called the 'authorised list'.

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2 Australian/New Zealand Standard AS/NZS 4013:1999, Domestic solid fuel burning appliances – Method for determination of flue gas emissions.

3 Department of the Environment and Heritage 2004, *National Woodheater Audit Program Report*, www.environment.gov.au/atmosphere/airquality/publications/audit-program.html.

4 These limits apply to specific areas for full details refer to Environment Canterbury: http://www.ecan.govt.nz/Our+Environment/Air/Approved+burners/Wood-burner-rules.htm; Nelson City Council: http://www.nelsoncitycouncil.co.nz/environment/air_quality/burners-approved-table.htm.

5 As measured in accordance with AS/NZS 4013:1999.

In addition to this, the Ministry published a 'tested list' of wood burners. These were burners for which a certificate had been provided to the Ministry by an accredited laboratory demonstrating emissions and efficiency in accordance with the national environmental standards.

The fundamental difference between the lists was that wood burners on the tested list have been tested by an approved laboratory, which, on the basis of those test results, provided a certificate to the Ministry that the burner meets the NES. (In some cases, however, the test certificate was based only on an opinion of the laboratory and not a full test. This provides no certainty that the burner was actually compliant.) Wood burners on the authorised list have undergone a more stringent approval process to be specifically approved by organisations such as Nelson City Council or Environment Canterbury. During this approval process, issues such as tamperability have been considered, as well as a physical inspection of the wood burner (design verification test) and a review of all its documentation (eg, installation and operating instructions).

Technically, a design verification test that reveals any departure from the authorised design therefore, indicates a burner that is *not* authorised for installation in that region.

1.4 Project overview

This performance review incorporated both design verification testing as well as full emissions and efficiency testing. The review consisted of two phases:

- **Phase 1:** design verification testing, in-store, of 35 wood burners
- **Phase 2:** purchase of 10 wood burners by the project partners, followed by design verification testing, and then emissions and efficiency testing in accordance with AS/NZS 4012/4013 in an accredited laboratory.

All burners were randomly selected for inclusion. This report describes the process and the results obtained for **Phase 1** of the performance review. A report on Phase 2 is expected in late 2007.

The project was initially managed by Glenn Seymour of Strategic Energy Ltd. Glenn also authored the first draft of this report. Design verification work was carried out by John Yolland of John Yolland and Associates, consulting engineers.

1.5 Project partners

Environment Canterbury and Nelson City Council are national leaders in regulating wood burners. It was, therefore, appropriate for the review to be carried out in partnership with these councils. The Ministry provided the funding for the project, with Environment Canterbury and Nelson City Council providing considerable resources in kind (staff with relevant expertise in the testing and approval of low-emission wood burners).

In undertaking such a review it was to be expected that compliance issues could arise, particularly considering the industry was previously unregulated in most areas of New Zealand (ie, there were no emission limits other than the voluntary limits present in AS/NZS 4013:1999). It was also important that such a review provide transparency and fairness to the industry. The Ministry met with the New Zealand Home Heating Association (NZHHA) executive and manufacturers in April 2006 to outline the intention to carry out a performance review. At that time a date for the review was not specified. Industry therefore had no warning other than general notice that a review would be undertaken at some stage in the next two years.

1.6 Industry input

The Ministry also extended the opportunity for NZHHA to provide technical input into the design of the review. The NZHHA formally endorsed the review and offered their support by providing:

- co-operation in making burners in retail showrooms available for inspection (design verification testing only)
- co-operation in making test reports available
- informing all members (particularly retailers) of the upcoming review
- technical input into the design of the review protocol.

In addition to this, a sub-committee was set up to help develop a protocol to govern the performance review (discussed in more detail in Section 2). The Ministry acknowledges that such input was at company expense and would like to thank the following participants for their time and input to the review protocol:

- Ed Hawkes, National Secretary, NZHHA
- Ian Gallaugher, Technical Manager, BBQ Factory
- Phil Allen, Technical Manager, MetalFab (now Glen Dimplex)
- Evan Harris, Managing Director, Harris Flame Technology.

2 Methodology

2.1 Overview

The project methodology involved a number of discrete processes, including:

- random selection of wood burners to test
- development of a protocol for verifying wood-burner compliance
- communication with interested parties
- design verification.

Each of these is discussed in more detail below.

2.2 Random selection of wood burners

Wood burners randomly selected for inclusion in the performance review were sourced from the lists of 'authorised' and 'tested' wood burners published on the Ministry website.

At the time the project began these lists contained 66 authorised and 44 tested wood burners, respectively. There were some wood burners on both lists that were clearly the same, and these duplicates were removed before the random sampling took place. Where there were any doubts as to whether a wood burner was duplicated it was initially assumed they were different.

The objective of the sampling process was to randomly select two lists, including a list of 40 wood burners for the design verification testing and a list of 10 wood burners for the full emissions testing process. Wood burners could potentially be selected to be on both lists.

Burners were selected randomly to provide fairness and transparency. Because all manufacturers were open to inspection via either the purchase of a burner for testing or the inspection of a model in retail showrooms, there was no 'targeting' of any specific product. This approach also avoids relying on the goodwill of manufacturers to provide a product for review.

The tested and authorised lists were merged to create an initial list for sampling, which included 90 wood burners. A random number was generated and associated with each wood burner on the list. This list of random numbers was then sorted and the wood burners associated with the lowest 40 random numbers were selected for the design verification phase.

An analysis was then carried out to compare the distribution of randomly selected burners by manufacturer with the numbers of wood burners they have on the tested and authorised lists. Overall, the distribution of burners across manufacturers selected for inclusion was similar to the distribution on the tested and authorised lists.

Once additional detail had been obtained on the wood burners selected, it became apparent that two of the wood burners were duplicated, namely the Kent Insert and the Milan Caldo. These duplicates were then replaced by selecting the wood burners associated with the next two lowest numbers on the list of random numbers. Lists of the wood burners selected are attached as Appendix 1.

2.3 Development of a protocol for verifying compliance

The protocol is the agreed process by which the design verification testing was carried out. This protocol was developed by John Yolland in association with the project partners and a working group supplied by the New Zealand Home Heating Association in April/May 2006. A copy is attached as Appendix 2.

The objectives of the protocol are to:

- introduce the rationale for the compliance verification project
- specify the basis for selecting wood burners for verification
- specify the dimensions that will be measured and the allowable tolerances
- provide examples of verification failure
- provide classifications of failure of the design verification phase and recommended remedial or punitive actions.

Given the potentially sensitive nature of this work it was considered to be important to have the support of the industry. The design protocol was reviewed by a working group of the New Zealand Home Heating Association before being finalised.

2.4 Communication with interested parties

As mentioned above, it was important to carry out this project in consultation and co-operation with interested parties. While the prime concern for the main project partners was to determine whether wood burners offered for sale match the wood burners for which approvals had been granted and/or test reports issued, it is also important for retailers to know that they are selling wood burners that are legally able to be installed in the various regions around New Zealand.

The NZHHA assisted in the process of communicating information about this project to member retailers and manufacturers.

2.5 Design verification

John Yolland was the project engineer for the design verification phase. This included developing the protocol and designing the information capture forms, as well as physically inspecting and reporting on each wood burner on the list.

John was supplied with details of test reports, manufacturer's drawings, installation instructions and relevant documentation for each wood burner. This provided the basis to confirm whether the wood burners in the retailers' showrooms matched the models for which approval had been granted and/or a test report issued.

John visited retailers in Auckland and Christchurch to locate the various wood burners on the list. He inspected each wood burner and measured relevant components and recorded the details. A brief report was then prepared on each wood burner. Verification was carried out between May and July 2006.

3 Design Verification

3.1 Results

Table 1 shows the results of the Phase 1 testing in terms of whether the wood burners passed or failed, and the seriousness of any failures. The pass/fail categories provided in Table 1 were developed as part of the protocol (see Appendix 2 for more detail).

Table 1: Summary of Phase 1 review results

Category of pass/fail	Number	% of total
Pass	13	37
Fail	19	54
Undetermined	3	9
Total	*35*	*100%*
Failure classification		
Minor	11	58
Moderate	2	11
Serious	6	32
Very serious	0	0
Total	*19*	*100%*

Table 2 shows the results of the Phase 1 testing in terms of outcomes (eg, pass first time) at time of writing. Full results for all burners are summarised overleaf in Table 3.

Table 2: Summary of Phase 1 review outcomes

Outcome	Number	% of total
Pass first time	13	37
Resolved or fixed	11	31
Unresolved	11	31
Total	*35*	*100%*
Unresolved issues		
Minor failure	1	9
Moderate failure	1	9
Serious failure	6	55
Undetermined	3	27
Total	*11*	*100%*

Table 3: Full design verification test results

Manufacturer	Model	Type	Water heater	Result	Grade	Outcome
BBQ Factory	Kent Astron CA	FS	No	Pass		Pass first time
Dallas Metal Industries Ltd	Kent Kiwi Radiant Clean Air / Milan Caldo Rustic Harmony Clean Air	FS	No	Pass		Pass first time
Dallas Metal Industries Ltd	Kent Logfire Max / Milan Harmony I/B	IB	No	Pass		Pass first time
Dallas Metal Industries Ltd	Milan Caldo C/A Harmony Series	FS	No	Pass		Pass first time
Dallas Metal Industries Ltd	Milan Milano	FS	No	Fail	Minor	Resolved or fixed
Hewitsons Enviro-Heat Ltd	Contessa AG with Water Heating	FS	Yes	Pass		Pass first time
Hewitsons Enviro-Heat Ltd	Contessa AG – Clean Air	FS	Yes	Fail	Serious	Unresolved
Hewitsons Enviro-Heat Ltd	Contessa AG – Clean Air	FS	No	Fail	Serious	Unresolved
Hewitsons Enviro-Heat Ltd	Firenzo Bay (with Forte fascia)	IB	No		Undetermined[a]	Unresolved
Hewitsons Enviro-Heat Ltd	Lady Kitchener EF	FS	Yes	Pass		Pass first time
Hewitsons Ltd	Bronte Top Outlet AG	FS	No	Fail	Minor	Unresolved
Hewitsons Ltd	Dante	FS	No	Fail	Moderate	Unresolved
Hewitsons Ltd	Deco SD Insert	IB	No		Undetermined[a]	Unresolved
Lansdowne Resource Ltd	Sintes Ethos FS101	FS	No	Fail	Minor	Resolved or fixed
Masport	Masport LE2000 Series 2	FS	No	Pass		
Masport	Masport Siena	FS	No	Pass		
Masport	Masport Verona	FS	No		Undetermined[a]	Unresolved
Masport	LE4000	IB	No	Pass		
MetalFab Industries Ltd	Logaire Atlanta	FS	No	Fail	Serious[b]	Unresolved
MetalFab Industries Ltd	Logaire Hestia Clean Air	FS	No	Fail	Serious[b]	Unresolved
MetalFab Industries Ltd	Logaire Micros	FS	No	Fail	Serious[b]	Unresolved
MetalFab Industries Ltd	Osburn 2200	FS	No	Fail	Serious[b]	Unresolved
Pioneer Manufacturing	Metro Eco (with Trend or Trad fascia options)	IB	No	Fail	Minor	Resolved or fixed
Pioneer Manufacturing	Metro Eco Pioneer Pedestal	FS	No	Fail	Minor	Resolved or fixed
Pioneer Manufacturing	Metro Eco Wee Rad	FS	No	Fail	Minor	Resolved or fixed

Manufacturer	Model	Type	Water heater	Result	Grade	Outcome
Pioneer Manufacturing Ltd	Metro ECO Aspire	FS	No	Fail	Minor	Resolved or fixed
Retail Links	Jayline Classic CA	FS	No	Fail	Minor	Resolved or fixed
The Fireplace	Quadra-Fire 2100 Millennium	FS	No	Fail	Minor	Resolved or fixed
The Fireplace	Quadra-Fire 4300 Millennium	FS	No	Fail	Minor	Resolved or fixed
Tropicair Heating Ltd	Tropicair Kowhai 2000 Mk III	FS	No	Fail	Moderate	Resolved or fixed
Tropicair Heating Ltd	Tropicair Tawa Mk III (with flue shield)	IB	No	Fail	Minor	Resolved or fixed
WH Harris Ltd	Nestor Martin R33	FS	No	Pass		Pass first time
WH Harris Ltd	Woodsman Matai DVI –165 Standard	IB	No	Pass		Pass first time
WH Harris Ltd	Woodsman Miami – 165	FS	No	Pass		Pass first time
WH Harris Ltd	Woodsman Pelorus – 165	FS	No	Pass		Pass first time

Notes

FS = freestanding burner

IB = inbuilt burner

a Due to a lack of access the burner was not able to be physically inspected and was classified as undetermined.

b A number of MetalFab/Masport burners were classified as moderate failures in the initial review. These were later upgraded to a serious classification due to a delayed response by the manufacturer. This action was in accordance with the protocol agreed to by industry before beginning the review.

Although 40 wood burners were selected for design verification (see Appendix 1), a number could not be located or checked in time. Table 4 shows the wood burners that were not located, along with relevant comments.

Table 4: Burners selected but not included in the performance review

Manufacturer	Appliance	Type	Water heater	Comment
MetalFab Industries Ltd	Osburn 2200	FS	Yes	Wetback version not found
MetalFab Industries Ltd	Jayline Spitfire	FS	No	Test report not available due to Applied Research Services not releasing it pending verification of drawings
Pioneer Manufacturing Ltd	Metro ECO Xtreme	FS	Yes	Can only locate a dry version
Reliance Engineering Co Ltd	Fisher Blenheim	FS	No	Unable to locate an example
Tropicair Heating Ltd	Tawa Mk III (with inner flue shield removed)	IB	No	Basic heater same as Tawa Mk III with flue shield
WH Harris Ltd	Nestor Martin X33	FS	No	Discontinued imported model

3.2 Review follow-up and outcomes

As can be seen from Table 3, 37% of wood burners selected for the review passed the design verification test and 54% failed. The majority of failures were classified as minor. Typical reasons for a minor failure included:

- the compliance label was missing or not specific to New Zealand conditions
- changes to the configuration of the air holes
- changes to the position of the flue.

Follow-up on the identified issues is discussed below.

3.2.1 Dallas Metal Industries Ltd

Table 5: Dallas Metal Industries burners: review results and outcomes

Model	Type	Water heater?	Result	Outcome
Kent Kiwi Radiant Clean Air / Milan Caldo Rustic Harmony Clean Air	Freestanding	No	Pass	Pass
Kent Logfire Max / Milan Harmony IB	Inbuilt	No	Pass	Pass
Milan Caldo C/A Harmony Series	Freestanding	No	Pass	Pass
Milan Milano	Freestanding	No	Fail – minor	Resolved

The minor failure identified for the Milan Milano was identified as unique to the prototype inspected, with current sale models consistent with the test report. The project partners were satisfied that the minor faults identified were not representative of the wider population of burners and required no further action.

3.2.2 Hewitsons

The results of Hewitsons burners reviewed are provided below. In accordance with the review protocol, burners with a moderate or serious failure classification were removed from the Ministry web lists of compliant burners. The protocol further requires that burners classified as a serious failure be notified to the Commerce Commission. The Ministry intends to notify the Commerce Commission at completion of Phase 2 of the review.

Table 6: Hewitsons burners: review results and outcomes

Model	Type	Water heater?	Result	Outcome
Contessa AG (A)	Freestanding	Yes	*Pass**	Unresolved
Contessa AG (B)	Freestanding	Yes	Fail – serious*	Unresolved
Contessa AG	Freestanding	No	Fail – serious	Unresolved
Firenzo Bay (with Forte fascia)	Inbuilt	No	Undetermined	Unresolved
Lady Kitchener EF	Freestanding	Yes	Pass**	Pass
Bronte Top Outlet AG	Freestanding	No	Fail – minor	Unresolved
Dante	Freestanding	No	Fail – moderate	Unresolved
Deco SD Insert	Inbuilt	No	Undetermined	Unresolved

* Two different burners with this name were identified in retail outlets in Christchurch (Burner A) and Auckland (Burner B) – see text below.

** Initial (minor) failure was later reclassified as a pass – see text below.

The test engineer encountered serious problems with the Hewitsons Contessa wood burner. This is marketed both with and without an integral water-heating booster, but there are also two alternative performance versions being sold in different parts of the country. Those burners that appear to be sold in the South Island, where the additional compliance with Environment Canterbury and Nelson City Council is required, are being manufactured to a format tested and subsequently approved by those organisations in 2003. However, there are currently versions being sold in the Auckland area that are being manufactured to an earlier configuration tested in 2000 (water heater version) and 2001 (dry version).

This proliferation of models of the Contessa has been further confused by the manufacturer's more recent change in the name of the wood burner from Contessa EF to Contessa AG. This confusion appears to have extended to the manufacturing process as well, as the two burners apparently assembled to the 2000/2001 format have major variances in key details of secondary air tube sizing. In addition to this, the product labels claimed that the models complied with the NES.

Problems with naming and variance in manufacture were not limited to the Contessa, with similar problems identified for the Bronte and Dante models.

Hewitsons met with the project partners on 9 November 2006. The company then undertook an extensive recall of existing product to remedy the identified faults. At the date of writing, Hewitsons had remedied issues and was awaiting re-verification (ie, completion of a design verification test to confirm that their actions had remedied the faults identified) for the following Bronte Top Outlet AG and Dante burners.

No action was proposed for burners sold since 1 September 2005, the numbers of which remain unknown. The problems with the Contessa remain unresolved.

Lady Kitchener

The minor faults identified on the Lady Kitchener were due to an error in the test report on which the design verification was based. The laboratory reissued the test report and the Lady Kitchener was then independently confirmed as being compliant.

Firenzo Bay and Deco SD Insert

These burners were classed 'undetermined' due to the inability of the test engineer to access the primary air inlets for inspection.

It should be noted that this is deemed an advantage because the lack of ready access to the primary air controls 'fool-proofs' the burner by minimising the likelihood of owners altering the minimum setting. The burners complied in all other respects.

Re-verification of these burners (ie, completion of a design verification test to confirm that the burner matches its test report) is scheduled for the near future.

3.3.3 Lansdowne Research Ltd

Lansdowne Research Ltd holds the authorisation of the Sintes Ethos FS101 burner, which was classified as a minor failure due to a missing label and the inability to access the primary air inlet controls for inspection.

The missing label was identified as unique to the unit inspected, with evidence provided that all current sale models are correctly labelled. The project partners were satisfied that the minor faults identified were not representative of the wider population of burners and required no further action. The overall outcome for this burner was 'resolved'.

3.2.4 Masport / MetalFab Industries Ltd

In late 2006 Masport and MetalFab Industries Ltd were bought out by Glen Dimplex Australasia Ltd. For the purposes of this report, and reflecting the legal title holding authorisation for these burners, the name MetalFab Industries Ltd will be used.

The results of the MetalFab Industries Ltd burners reviewed are provided below. In accordance with the review protocol, burners with a moderate or serious failure classification were removed from the Ministry's tested and/or authorised web lists of compliant burners. The protocol further requires that burners classified as a serious failure be notified to the Commerce Commission. The Ministry intends to notify the Commerce Commission at completion of Phase 2 of the review.

The Verona inspected was initially classified as a moderate failure due to over double the number of air holes in the secondary inlet tube (67 instead of 33) and a missing compliance label. It later transpired that the model inspected was an older Verona model installed in the shop for heating purposes and not indicative of current production. The project partners were however, concerned that other older models with the same name could be available for sale as there would be no discernible difference to the average consumer.

MetalFab Industries provided assurance that the only Verona models available for purchase were manufactured in accordance with Applied Research Services test report 01/625. The Verona was reinstated to the Ministry's tested and/or authorised web lists of compliant burners. At the time of writing, re-verification (ie, completion of a design verification test on a Verona available for sale) was scheduled to occur in the near future.

Table 7: MetalFab Industries Ltd burners: review results and outcomes

Model	Type	Water heater?	Result	Outcome
Masport LE2000 Series 2	Freestanding	No	Pass	Pass
Masport Siena	Freestanding	No	Pass	Pass
Masport Verona	Freestanding	No	Undetermined[a]	Unresolved
Masport LE4000 Provincial	Inbuilt	No	Pass	Pass
Logaire Atlanta	Freestanding	No	Fail – serious[b]	Unresolved
Logaire Hestia Clean Air	Freestanding	No	Fail – serious[b]	Unresolved
Logaire Micros	Freestanding	No	Fail – serious[b]	Unresolved
Osburn 2200	Freestanding	No[c]	Fail – serious[b]	Unresolved

a This burner was initially classified as a moderate failure but was later reclassified as undetermined. See text below for full details.

b All failures were initially classified as moderate but later upgraded to serious following a delayed response by the manufacturer. This action was in accordance with the protocol agreed to by industry before beginning the review.

c The wetback model could not be located so design verification was carried out on the dry model. This burner is manufactured by Stover Builder International and imported and distributed under licence by MetalFab Industries Ltd.

The Atlanta, Hestia, Micros and Osburn 2200 burners inspected all had significant changes to the configuration of the secondary air inlet to that outlined in the original test reports.

- The Atlanta's secondary air tube was installed transposed end for end (moderate failure).
- The Hestia's flue spigot was moved forward 15mm, the primary air inlet opening was increased and the compliance label was missing (three minor failures constitutes a moderate failure). There was also a further undetermined query over a secondary air tube rotated 20° relative to the original test position.
- The Micros had a secondary air tube 25° out of position, there was a 0.5mm increase in hole sizes, the primary air inlet opening was increased, and the compliance label was missing (four minor failures constitute a moderate failure).
- The Osburn 2200's primary air opening was significantly reduced, the secondary air supply was significantly increased, and the compliance label was insufficient (three minor failures constitute a moderate failure).

As noted above, due to a delayed response by MetalFab these failures were upgraded from moderate to serious.

MetalFab Industries met with the Ministry on 25 October 2006. At this meeting MetalFab queried internal discrepancies in the test report on which the design verification testing is based (differences between the descriptive explanation in the body of the test report and the drawing detail). The queries took just under six months to resolve, after which time MetalFab has undertaken to replace all secondary air tubes in the Atlanta, Hestia and Micros.

Following the initial meeting with the Ministry, the company initiated an internal audit to investigate the cause of the faults with the secondary air tube and to amend production processes to remove the potential for future error. MetalFab also undertook to update all compliance labels on all models available for sale.

MetalFab advised the project partners of the number of Atlanta burners sold since 1 September 2005.[6] Those still in stock were recalled for repair, but no action was taken on the remaining burners. No information was provided on the number of Hestia or Micros burners sold since 1 September 2005. MetalFab did advise that all Hestia burners available for sale as at 1 January 2007 were undergoing repairs.

At the date of writing MetalFab was awaiting re-verification (ie, completion of a design verification test to confirm that their actions had remedied the faults identified) for the Atlanta, Hestia and Micros burners. With respect to the Osburn 2200, MetalFab advised that a number of in-store units were recalled. No information has been provided on the number of Osburn 2200 burners sold since 1 September 2005, or on any proposed remedial actions.

3.2.5 Pioneer

The Metro Eco, Metro Eco Pioneer Pedestal and Metro Eco Wee Rad were classified as minor failures due to a 13% increase in the primary air plate maximum area and incorrect or missing data on the compliance labels. The increase in primary air controls was deemed to have a minor impact on emissions and/or efficiency by the independent testing engineer.

The Metro Eco Aspire was classified as a minor failure due to missing information on the compliance label.

Table 8: Pioneer burners: review results and outcomes

Model	Type	Water heater?	Result	Outcome
Metro Eco	Inbuilt	No	Fail – minor	Fixed
Metro Eco Pioneer Pedestal	Freestanding	No	Fail – minor	Fixed
Metro Eco Wee Rad	Freestanding	No	Fail – minor	Fixed
Metro Eco Aspire	Freestanding	No	Fail – minor	Fixed

Pioneer contacted their manufacturer immediately (within a day of notification) to resolve the issue of the primary air intake. They also immediately undertook a review and upgrade of *all* labels for these models. The company liaised with the project partners on the proposed label amendments and acted swiftly to ensure these were translated into remedies for existing burners in-store. The actions undertaken were clearly documented and evidence provided to the project partners that all 1400 burners in 70 stores were now compliant.

Following this, Pioneer undertook an internal audit and review of all other Pioneer burners. The company is to be commended on their swift and responsive actions in response to the performance review.

[6] This information is considered commercially sensitive and so is not reproduced here.

3.2.6 Retail Links

Retail Links hold the authorisation for the Jayline Classic, which was classified as a minor failure due to a changed configuration in the primary air inlet and a missing compliance label. It was further noted that the rear edge of the baffle plate was poorly placed and required a form of stop to prevent movement and subsequent bypass of the secondary combustion zone.

Retail Links advised the project partners that there were in fact two versions of the Jayline Classic – a clean-air version that complies with the NES and a non-clean-air version that does not. It appears that verification testing had been carried out on a non-clean-air version, which gave rise to the discrepancies outlined above.

Retail Links acted promptly to notify all stores of the potential for confusion and clarified to the project partners that three stores had both clean-air and non-clean-air versions of the Jayline Classic in stock. The company then undertook to provide clear marketing information so these models were clearly differentiated on the shop floor. They further notified their manufacturer of the need for a clear label for the non-clean-air burners (it is understood that clean-air burners were already correctly labelled). Retail Links then undertook a check of all stores nationwide to audit the point-of-sale tickets placed on all stock. The company further undertook to perform verification on a clean-air burner to demonstrate compliance to the project partners.

The project partners were concerned at the presence of two different models with the same name – a very serious complication that was not anticipated when preparing the review protocol. The project partners requested information on the number of non-clean-air burners currently in stock to better assess the extent of the problem. The partners further requested that *all* burners be labelled in a unique and identifiable manner, and that this be addressed by 26 November 2006.

Retail Links failed to respond to the project partners, and so, in accordance with the review protocol, the failure of the Jayline Classic was upgraded from minor to moderate. Also in accordance with the protocol, the burner was removed from the Ministry's web lists of compliant burners in late February 2007.

In April 2007 Retail Links successfully fulfilled all project partner requests, including the re-verification of a (renamed) Jayline Classic CA burner. The burner was immediately reinstated to the Ministry website of authorised burners. The overall outcome for this burner was 'resolved'.

3.2.7 The Fireplace

Table 9: The Fireplace burners: review results and outcomes

Model	Type	Water heater?	Result	Outcome
Quadra-Fire 2100 Millennium	Freestanding	No	Fail – minor	Fixed
Quadra-Fire 4300 Millennium	Freestanding	No	Fail – minor	Fixed

Both the Quadra-Fire 2100 Millennium and the Quadra-Fire 4300 Millennium were classified as minor failures due to a decrease in the primary air control opening and missing compliance labels (including serial numbers). The 3.3% decrease in primary air flow was deemed to have a minor impact on emissions and/or efficiency by the independent testing engineer.

Following notification, the Fireplace acted promptly to ensure all stock was labelled correctly.

3.2.8 Tropicair

Table 10: Tropicair burners: review results and outcomes

Model	Type	Water heater?	Result	Outcome
Tropicair Kowhai 2000 Mk III	Freestanding	No	Fail – minor	Fixed
Tropicair Tawa Mk III (with flue shield)	Inbuilt	No	Fail – moderate	Fixed

The Tropicair Kowhai 2000 Mk III was classified as a moderate failure due to the secondary air tube being installed incorrectly (180° out of phase) and a missing compliance label. The Tropicair Tawa Mk IIII (with flue shield) was classified as a minor failure due to discrepancies in the secondary air tube and a missing compliance label.

Tropicair responded immediately by contacting all owners of these burners installed since 2004, checking the models and rectifying any discrepancies with the secondary air tube. The company indicated that the missing labels were due to the models examined being showroom stock only (the company is small and retails direct from the factory showroom) and they have since been rectified. Successful re-verification was carried out on 15 November 2006.

In accordance with the review protocol, the Tropicair Kowhai 2000 Mk III was removed from the Ministry's web list of compliant burners temporarily, and then reinstated following verification. Tropicair are the only manufacturer in Phase 1 to have acted immediately to rectify issues involving both burners for sale and installed burners. Tropicair are to be commended for their prompt and thorough response.

3.3 General discussion of findings

The response by manufacturers varied significantly. Some were swift to fix identified faults and proactive in their response, whereas others were unresponsive and slow to take action. Delays in remedying identified faults further caused confusion for members of the public considering purchasing burners that were temporarily suspended from the Ministry website. (As an aside, complaints to the Ministry indicate that at least one manufacturer continued to advise potential customers that a suspended burner was compliant when no evidence had been presented to the Ministry to demonstrate this was in fact the case.) We also noted that many manufacturers continued to advertise appliances for sale before authorisation being granted.

In the case of serious non-compliance the protocol developed with industry specified notification to the Commerce Commission. The Ministry intends to notify the Commerce Commission at completion of Phase 2 of the review.

The review revealed a number of issues that were not anticipated during the design of the protocol. These issues offered an opportunity to review and improve the current authorisation procedures carried out by Environment Canterbury and Nelson City Council and the way the Ministry lists burners on its 'tested' and 'authorised' lists.

It rapidly became apparent that the authorisation process plays a vital role in ensuring that wood burners listed on the Ministry website are readily identifiable and compliant with the NES. When the review was undertaken, wood burners could appear on both the tested and authorised lists and were sometimes described differently on each list. This was due to different information being provided to different parties, and it resulted in much confusion.

The fundamental difference between these lists is that wood burners on the tested list have been tested by an approved laboratory, which, on the basis of those test results, provided a certificate to the Ministry that the burner meets the NES. (In some cases, however, the test certificate was based only on an opinion of the laboratory and not a full test. This provides no certainty that the burner was actually compliant.) Wood burners on the authorised list have undergone a more stringent approval process to be specifically approved by organisations such as Nelson City Council or Environment Canterbury. During this approval process, issues such as tamperability have been considered, as well as a physical inspection of the wood burner and a review of all its documentation (eg, installation and operating instructions).

The tested list was initially set up as an interim measure to provide time for manufacturers to obtain authorisation after the NES came into force on 1 September 2005. The problems identified above meant that this interim measure needed to come to an end. Accordingly, the Ministry gave industry six months notice and the tested list was removed on 1 April 2007.

In addition to this, a number of other concerning practices were identified during the review process. On 14 February 2007 the project partners wrote to all New Zealand manufacturers discussing these problems, proposing solutions and inviting comment on the intended approach. Details are provided below (Sections 3.3.1–3.3.2). In addition, Environment Canterbury has undertaken to prepare guidance for applicants. The aim of such guidance is to formalise the documentation and procedural aspects of the authorisation process so applicants are clear about what is required.

It is worth noting at this point that there is no nationally consistent authorisation process *per se*. Currently, Environment Canterbury and Nelson City Council carry out authorisation individually with a memorandum of understanding for the subset of burners (< 1.0g/kg) authorised by Environment Canterbury that are acceptable to Nelson City Council. The formalisation or adoption of a nationally agreed authorisation process would provide greater transparency to manufacturers and avoid some of the issues encountered during this review.

3.3.1 Proposed improvements to authorisation processes

The following is a list of identified issues and proposed solutions sent to all New Zealand manufacturers in February 2007.[7]

[7] cc Australian Home Heating Association.

Wood-burner nomenclature

1. Naming consistency

In some cases different variants of a name are being used in different parts of the authorisation application. The application includes the application form, the laboratory test report, the proposed label, the installation instructions, the marketing material and the appliance itself. In one example, five variants of a name appeared on each of the above application documents.

Proposed solution 1a

Require all parts of an application – including the application form, the laboratory test report, the proposed label, the installation instructions, any marketing material and the label on the burner itself – to use the same name. This name will then be used on Environment Canterbury, Nelson City Council and the Ministry websites if the appliance is authorised. Applicants will be asked to achieve this standard before applications are formally receipted and processed. In some cases this will mean applicants have to decide on a name earlier in the process than they have done previously.

Proposed solution 1b

If an appliance is to be marketed under two or more different names, then the proposed procedure applies.

1. The burner and application documents, including test reports, are prepared using one of the proposed names, and the same one on every document. These are submitted and, if successful, the appliance is authorised under this name, with a unique authorisation number.
2. A second set of application documents is prepared, being the application form, proposed label, operating instructions, and any marketing material, but no lab test. Authorisation is sought for this appliance, on the basis of a written assurance from the manufacturer that it is identical to the previous one. Provided the appliance is identical to the one already approved, with only a name change, no further lab test or opinion is required. The appliance can then be authorised under this second name, with a second unique authorisation number, and placed on the relevant website.

2. Different appliances sharing the same name

In some cases we found a 'clean air' version of an appliance sharing the same name as a 'non-clean-air' version, with significant differences in the specifications of key parts of these two versions (such as a low-burn air setting or secondary air supply).

Proposed solution 2

Require a declaration from applicants that the proposed name has not been used for any other wood burner in New Zealand, either currently or in the past.

3. Use of a suffix

In some cases there was a 'generic' name used for a non-clean-air model and the same name plus a suffix for a clean-air model. These suffixes were sometimes complete words (eg, Clean Air), but sometimes just letters or numbers (EF, CA, 165, etc). The obvious concern is that if the suffix is omitted at any point in either the authorisation or consent process it is not clear which appliance is being considered. One solution is to require *all* appliances using the same 'base' name to have an identifying suffix. Ideally, the suffix would designate compliance (or otherwise) status.

Proposed solution 3

Require a declaration from the applicants that any suffix such as 'clean air' or 'CA' is a part of the unique name, and that any other burner using the same 'base' name shall also have a suffix in all references to that model.

It should be noted that in accordance with Proposal 1a, all advertising material, instruction manuals, etc should similarly be named in a unique and consistent manner with the identifying suffix.

Tolerances

4. Many applications do not provide tolerances on drawings of the appliance

AS/NZS 4013 section 8.2 states that, in relation to the design plans of the appliance, "all dimensions shall be in millimetres and tolerances shall be stated".

Proposed solution 4

Enforce the requirement in the standard for all applications to include adequate design plans, including dimensions, and tolerances. Then only acknowledge receipt of applications once these drawings and tolerances have been provided. The test report is to be signed by the person who tested the appliance to confirm that the drawings reflect the physical appliance that was tested.

5. Appropriate tolerance designations

Clearly, if a large tolerance is proposed then subsequent appliances built after the original tested appliance could be built with dimensions that are within the stated tolerance, but whose performance is very different to the tested model. AS/NZS 4012 comments on this in note 2 of section 10, which advises:

> *... manufacturers making a statement of compliance with this ... standard ... are advised to ensure that such compliance is capable of being verified.*

In other words, manufacturers should ensure all examples of a particular model are capable of meeting the requirements of AS/NZS 4013.

Similarly, if a manufacturer claims that a specific appliance meets the NES, then they need to ensure the appliance can achieve 1.5g/kg and 65% efficiency. This means there is a need to ensure the manufacturing tolerances are such that all appliances manufactured are capable of meeting the criteria if tested to AS/NZS 4012 and 4013. Ideally, this would involve having the 'worst case' appliance tested and then, if it passed, assuming that all other appliances manufactured to that specification would also pass. In practice this is problematic, because it is not always obvious what combination of dimensions represents the worst case.

For the purpose of the current performance review, and in the absence of tolerances on most drawings accompanying applications, the following tolerances were used to determine whether a particular appliance could be considered to be the same as that which was originally authorised:

- firebox cabinet dimensions – tolerances ± 5mm
- pedestal height – tolerances ± 25mm
- overall firebox dimensions – tolerances ± 2mm
- firebox material thickness – tolerances ± 0.25mm
- position of flue spigot centre – tolerances ± 2mm
- primary air inlet control openings – number and size
  - height and width of slot – ± 0.5mm up to 20mm dimension
– ± 1mm above 20mm dimension
  - minimum opening – ± 0.5mm
- primary air inlet distributor – position ± 2mm
- secondary air distributor (s) – position ± 2mm
– angle
- number and size of holes – hole sizes ± 0.1mm
- baffle plate – dimensions, material thickness ± 2mm
– material, angle, position, shape, attachments
- refractory linings, insulation – material, number, position
- convection air distribution – dimensions of openings ± 5% of area
- firebox door – glass size and shape (± 2mm)
– door profile sloped or vertical
- wetback, heat recirculating fan or other accessory – type, associated controls, dimensions, position

Proposed solution 5a

Authorise only wood burners built within the tolerances specified above. If a manufacturer wishes to produce a line of appliances with a larger tolerance, they may supply a written opinion from the lab that any appliance built to those larger tolerances will still be capable of meeting the criteria (1.5g/kg and 65%). This is likely to require testing of 'worst case' models to support the opinion.

Proposed solution 5b

During compliance verification checks, reject any appliance whose dimensions are outside the tolerances provided with the application for authorisation of the appliance.

3.4 Co-operation from retailers

It was important to the success of this project that retailers co-operated with our engineer. We are pleased to report that retailers were generally most co-operative in this exercise and we would like to acknowledge this.

4 Conclusions

The Ministry, partnered by Environment Canterbury and Nelson City Council, conducted a performance review of wood burners under the national environmental standards for air quality. This report details the results of Phase 1 of the review, which involved design verification of 35 wood burners during May to July 2006. Design verification testing is a physical inspection of a burner for comparison with its original design, as described in the emissions and efficiency test report.

Phase 1 of the review revealed poor overall compliance, with 37% of burners inspected passing, 9% undetermined and the remaining 54% failing. Of the burners that failed, most were classified as 'minor' and were primarily due to small discrepancies in air controls or incomplete or missing label information.

In all cases of failure, manufacturers undertook to resolve issues with both future and existing stock for sale. Tropicair is to be highly commended for being the only manufacturer to action future production as well as contacting and remedying discrepancies in installed stock since 2004. At the time of writing a number of failures have yet to be resolved:

- Hewitsons (two serious, one moderate and one minor failure)
- MetalFab (four moderate/serious failures).

The review was carried out in accordance with a protocol developed in consultation with representative manufacturers from the New Zealand Home Heating Association. The protocol specifies that serious failures be reported to the Commerce Commission. The Ministry intends to notify the Commerce Commission at completion of Phase 2 of the review.

In addition to this, a number of serious – and unanticipated – issues arose in relation to how burners are named. In response to this the Ministry gave six months' notice for the removal of the "tested" list of wood burners. This list has now been removed. Environment Canterbury and Nelson City Council have committed to improving their authorisation processes to avoid such issues in the future and are consulting with manufacturers on proposed solutions. It is further recommended that a nationally agreed authorisation process be formalised and adopted to avoid similar issues in the future.

Phase 1 of the performance review addressed the compliance of 35 burners. Almost certainly there will be other models not examined that will have faults similar to those identified in this review. Some of these will be examined in Phase 2 of the review, in which 10 wood burners were purchased for design verification and then full emissions and efficiency testing. A report on Phase 2 is expected in late 2007.

4.1 Key points for regulators

- Compliance was found to be poor, and future reviews are strongly recommended.
- Manufacturer responses to the review varied dramatically.
- Councils issuing building consents for wood burners are advised to consult the Ministry for the Environment web list of authorised burners. This list has been updated following the review and is the only national, independently verified, list available.
- A number of unanticipated issues that arose during this review could be avoided by tightening the wood burner authorisation processes. This would be further assisted by preparing guidance for applicants so they are clear about what is required, and by the formalisation or adoption of a nationally consistent authorisation process.

4.2 Key points for consumers

- The first review of performance of wood burners revealed poor compliance with respect to the national environmental standards for air quality. The Ministry and partner councils are working with industry to resolve the identified issues.
- People intending to purchase a wood burner are advised to consult the Ministry for the Environment web list of authorised burners. This list has been updated following the review and is the only national, independently verified, list available.
- The following burners passed first time *in this review*:

  BBQ Factory
  - Kent Astron CA

  Dallas Metals Industries
  - Kent Kiwi Radiant Clean Air / Milan Caldo Rustic Harmony Clean Air
  - Kent Logfire Max / Milan Harmony I/B
  - Milan Caldo C/A Harmony Series

  Hewitsons Enviro-Heat Ltd
  - Contessa EF with Water Heating
  - Lady Kitchener EF

  WH Harris
  - Nestor Martin R33
  - Woodsman Matai DVI – 165 Standard
  - Woodsman Miami – 165
  - Woodsman Pelorus – 165.
- The manufacturer Tropicair is commended in this report for their pro-active, thorough and timely response to the performance review.

4.3 Key points for industry

- This review has revealed poor performance with respect to the national environmental standards for air quality.
- Government (both central and local) is committed to the national environmental standards and is likely to undertake more reviews in the future.
- These reviews reward not only compliance but also proactive, responsible behaviour in response to identified compliance issues.

Appendix 1: Wood Burner Lists for Testing

Ministry for the Environment – wood burner performance review

Design verification list

No.	Manufacturer	Appliance	Type	Water heater
1	Dallas Metal Industries Ltd	Kent Kiwi Radiant Clean Air / Milan Caldo Rustic Harmony Clean Air	FS	No
2	Dallas Metal Industries Ltd	Kent Logfire Max / Milan Harmony I/B	IB	No
3	Dallas Metal Industries Ltd	Milan Caldo C/A Harmony Series	FS	No
4	Dallas Metal Industries Ltd	Milan Milano	FS	No
5	Hewitsons Enviro-Heat Ltd	Contessa AG – Clean Air	FS	Yes
6	Hewitsons Enviro-Heat Ltd	Contessa AG – Clean Air	FS	No
7	Hewitsons Enviro-Heat Ltd	Firenzo Flush AG (with Forte fascia)	IB	No
8	Hewitsons Enviro-Heat Ltd	Lady Kitchener EF	FS	Yes
9	Hewitsons Ltd	Bronte Top Outlet AG	FS	No
10	Hewitsons Ltd	Dante	FS	No
11	Hewitsons Ltd	Deco SD Insert	IB	No
12	Kent	Kent Astron CA	FS	No
13	Lansdowne Resource Ltd	Sintes Ethos FS101	FS	No
14	Masport	Masport LE2000 Series 2	FS	No
15	Masport	Masport Siena	FS	No
16	Masport	Masport Verona	FS	No
17	Masport	LE4000	IB	No
18	MetalFab Industries Ltd	Logaire Atlanta	FS	No
19	MetalFab Industries Ltd	Logaire Hestia Clean Air	FS	No
20	MetalFab Industries Ltd	Logaire Micros	FS	No
21	MetalFab Industries Ltd	Osburn 2200	FS	No
24	Pioneer Manufacturing Ltd	Metro Eco (with Trend or Trad fascia options)	IB	No
25	Pioneer Manufacturing Ltd	Metro Eco Pioneer Pedestal	FS	No
26	Pioneer Manufacturing Ltd	Metro Eco Wee Rad	FS	No
27	Pioneer Manufacturing Ltd	Metro ECO Aspire	FS	No
30	Retail Links	Jayline Classic	FS	No
31	The Fireplace	Quadra-Fire 2100 Millennium	FS	No
32	The Fireplace	Quadra-Fire 4300 Millennium	FS	No

No.	Manufacturer	Appliance	Type	Water heater
33	Tropicair Heating Ltd	Tropicair Kowhai 2000 Mk III	FS	No
34	Tropicair Heating Ltd	Tropicair Tawa Mk III (with flue shield)	IB	No
36	WH Harris Ltd	Nestor Martin R33	FS	No
38	WH Harris Ltd	Woodsman Matai DVI –165 Standard	IB	No
39	WH Harris Ltd	Woodsman Miami – 165	FS	No
40	WH Harris Ltd	Woodsman Pelorus – 165	FS	No

Models on the design verification list that were not available to be inspected

No.	Manufacturer	Appliance	Type	Water heater
22	MetalFab Industries Ltd	Osburn 2200	FS	Yes
23	MetalFab Industries Ltd	Jayline Spitfire	FS	No
28	Pioneer Manufacturing Ltd	Metro ECO Xtreme	FS	Yes
29	Reliance Engineering Co Ltd	Fisher Blenheim	FS	No
35	Tropicair Heating Ltd	Tawa Mk III (with inner flue shield removed)	IB	No
37	WH Harris Ltd	Nestor Martin X33	FS	No

Emissions and efficiency testing list

No.	Manufacturer/distributor	Model	Type	Water heater
1	BBQ Factory	Kent Logfire Max	IB	No
2	BBQ Factory	Kent Quantum	FS	No
3	Hewitsons Enviro-Heat Ltd	Lady Kitchener EF	FS	No
4	Hewitsons Enviro-Heat Ltd	Contessa AG – Clean Air	FS	Yes
5	Hewitsons Enviro-Heat Ltd	Firenzo Bay (with Forte fascia)	IB	No
6	Masport Limited	LE4000	IB	No
7	MetalFab Industries Limited	Osburn 2200	FS	Yes
8	Pioneer Manufacturing	Metro Eco Wee Rad	FS	No
9	WH Harris Limited	Woodsman Matai ECR	FS	No
10	Yunca Gas	Yunca Finz	FS	No

Note: IB = inbuilt; FS = freestanding.

Appendix 2: Protocol

Second Draft Protocol
Compliance Verification of Wood Burners

(In response to a review by manufacturers 12 May 2006)

1.0 Compliance verification

1.1 Wood burners that have demonstrated compliance with the current efficiency and emissions requirements of the national environmental standards through testing by a laboratory in accordance with AS/NZS 4012:1999 and AS/NZS 4013:1999 may be required to demonstrate continuing compliance by means of random inspections. The compliance verification will verify that the design, materials and manufacture of a randomly selected production wood burner are not materially changed from the prototype that underwent the efficiency and emissions testing and that the tests undertaken accurately indicate compliance with the national environmental standards.

1.2 Compliance verification shall be conducted on wood burners on the basis of the following three aspects.

- Design verification testing shall be undertaken on a randomly selected number of production units that have current test reports indicating compliance with the national environmental standards, in accordance with the Design Verification Test outlined below.
- Assessment that the emissions test as described in the laboratory test report for the wood burner has been performed in compliance with the test procedure of AS/NZS 4013:1999. Further that the calculation and assessment of emmission levels has been accurately determined in accordance with the test procedure.
- Assessment that the efficiency test as described in the laboratory test report for the wood burner has been performed in compliance with the test procedure of AS/NZS 4012:1999. Further that the calculation and assessment of efficiency has been accurately determined in accordance with the test procedure.

2.0 Design verification test

2.1 Forty wood burners shall be chosen for the design verification test using a statistically valid, random selection. This shall be undertaken by an independent project manager. Wood burners shall be selected from the Ministry published website lists (tested and authorised).

2.2 Production model wood burners selected for the design verification test will be examined for reference against the design, materials, components and assembly of the wood burner that was originally tested to the emissions and efficiency standards.

2.3 The design verification examination shall be carried out by an independent testing engineer, with well-established experience in the field of both general product testing and the manufacture and testing of wood burners.

2.4 Verification examination shall be undertaken on production model wood burners identified and located by the independent testing engineer in accordance with the random selection process.

2.5 Wherever possible, production model wood burners shall be examined in locations away from the point of manufacture, preferably in the premises of a distributor or retailer. Prior to the examination taking place, the agreement of the retailer, distributor or manufacturer shall be obtained from either:

- the retailer, distributor or manufacturer directly; or
- a representative of the retailer, distributor or manufacturer (eg, the New Zealand Home Heating Association).

2.6 Verification examination shall be undertaken at an unspecified time but after 1 May 2006 and before 1 May 2008.

2.7 Compliance with the efficiency and emissions requirements is dependent on many factors in the design, materials and construction of a particular wood burner. Verification that the production model being examined is materially identical to the prototype tested is, therefore, essential.

2.8 Information on the design, materials, components and assembly of the prototype wood burner will be supplied by either the authorising agency or the test laboratory and will include:

i. test reports, including a detailed set of drawings of the prototype wood burner, that were certified by the test laboratory undertaking the efficiency and emissions as being an accurate representation of the design, materials and dimensions of the wood burner

ii. copies of the operating and installation instructions that were available for the prototype

iii. colour photographs of the prototype that were included in the test reports held by the test laboratory.

2.9 Critical parameters in achieving the required efficiency and emissions standards include the arrangement and dimensions of the combustion air systems, the firebox and the heat exchange sector. Verification of a production model wood burner against a prototype tested therefore requires an accurate assessment that the design parameters are within manufacturing tolerances.

2.10 The following construction details require to be measured and assessed against the dimensions and drawings in the test reports certified by the test laboratory undertaking the emissions and efficiency tests, with reference to photographs of the prototype as a cross-check:

- firebox cabinet dimensions – tolerances ± 5mm
- pedestal height – tolerances ± 25mm
- overall firebox dimensions – tolerances ± 2mm
- firebox material thickness – tolerances ± 0.25mm
- position of flue spigot centre – tolerances ± 2mm

• primary air inlet control openings	– number and size
– height and width of slot	– ± 0.5mm up to 20mm dimension – ± 1mm above 20mm dimension
– minimum opening	– ± 0.5mm
• primary air inlet distributor	– position ± 2mm
• secondary air distributor(s)	– position ± 2mm – angle
• number and size of holes	– hole sizes ± 0.1mm
• baffle plate	– dimensions, material thickness ± 2mm – material, angle, position, shape, attachments
• refractory linings, insulation	– material, number, position – size, thickness ± 2mm
• convection air distribution	– dimensions of openings ± 5% of area
• firebox door	– glass size and shape (± 2mm) – door profile sloped or vertical
• wetback, heat recirculating fan or other accessory	– type, associated controls, dimensions, position

2.11 Measurement of dimensions listed in 2.10 shall be undertaken with appropriate measurement equipment with traceable accuracy to national standards:

- dimensions greater than 100mm – approved make steel rule or certified steel tape
- dimensions up to 100mm – vernier or digital calliper calibrated against certified gauge blocks or bars.

Hole diameters less than 10mm using standard set of metric and/or imperial drills, checked against vernier or digital calliper.

2.12 The engineer shall critically examine the appliance against the test documents and photographs of the prototype, and note any obvious changes in the appearance, construction or design or the appliance and its components. The engineer shall accurately record all observations and measurements on a pro-forma test sheet, identifying any measurements that are outside of the agreed tolerances, and return a copy of this with his report to the project manager. The report shall further include an assessment on whether any variations in dimensions or changes in the appliance are significant and likely to vary the previous emissions and efficiency test compliances.

2.13 All details on the attached manufacturer's identification plate, including manufacturer's name and address, model and serial number shall be recorded. Where a separate identification plate is attached showing the current compliance certification details, this information shall also be recorded.

2.14 The engineer shall check emissions calculations provided in the test report.

2.15 The engineer shall check efficiency calculations provided in the test report.

2.16 The engineer shall check the heater was tested in accordance with manufacturer's instructions for the prototype, and whether current instructions contain any information that is contrary to the compliance of the appliance.

2.17 The engineer shall provide interpretation of any design features that may substantially impact upon emissions performance (tamperability, durability, etc).

2.18 Assessment Pass/Fail (refer section 4.0).

3.0 Emissions and efficiency testing

3.1 Ten wood burners shall be chosen for emissions and efficiency testing using a statistically valid, random selection. This shall be undertaken by an independent project manager. Wood burners shall be selected from the Ministry published website lists (tested and authorised).

3.2 Production model wood burners selected for emissions and efficiency testing will be purchased by the programme partners (Environment Canterbury, Nelson City Council) and sent to an accredited testing laborotory for the following tests:

- design verification test in accordance with the protocol outlined in section 2.0
- emissions testing in accordance with AS/NZS 4013:1999
- efficiency testing in accordance with AS/NZS 4012:1999.

3.3 Assessment Pass/Fail (refer section 4.0).

4.0 Review outcomes

4.1 All outcomes will be notified in writing to each manufacturer or distributor on an initially confidential basis (results will eventually be made public).

4.2 Examples of failures are provided in Table 11.

Table 11: Examples of failure

Failures	Example
Label errors	Either not on the model being checked, inaccurate (ie, different to label on test report) or inadequate (ie, fuel type not visible when opening door).
Quality of drawings	Exclusion of tolerances, specificity to enable correct identification of major design features for design verification.
Documentation	As required in Section 8.2 and 8.3 of AS/NZS 4013.
Installation instructions	Installation instructions do not match model.
Operating instructions	Appliance tested with wood oriented contrary to operating instructions (s5.4.2 and 6.2.2 of AS/NZS 4012). Variance between tested procedure and operating instructions (s6.7.1 of AS/NZS 4012). Reference to a wetback for a model which is not authorised to have one.
Physical dimensions	Number of holes, or their dimensions, in airtube different to that in tested report. Components of the appliance (eg, wrong airslide, fire bricks not in place).
Flue type	Change from manufacturer's specifications (eg, plain to crimped flue).
Wetbacks	Variation between model supplied in shop and what was authorised.

Failures	Example
Fitness and tamperability	'Looseness' of fit of moving parts; eg, variation in actual size of opening due to sloppy fit of air slide in its tracks. Alternatively a loose fit in an appliance that may be easily knocked out of position with a resulting change in the burn characteristics (eg, baffle plate).
Emissions test	Not meeting stated emission factor within ± 0.29g/kg. Not meeting NES design standard of 1.5 ± 0.29g/kg.
Efficiency test	Not meeting stated efficiency within ± 5%. Not meeting NES design standard of 65 ± 5%.

4.3 Failure may be classified in five ways as follows:

(i) Undetermined

(ii) Minor

(iii) Moderate

(iv) Serious

(v) Very serious.

Examples of different types of failure are provided in Table 12. Note that some of the failures compound or build on each other. So, for example, a couple of minor failures may add up to become a moderate failure. Similarly, tested emissions and efficiency results are graduated by where they are in relation to the minimum requirements. A minor failure is one that exceeds the NES and uncertainty of testing, and a very serious failure is defined as emissions above 4.0g/kg or efficiency below 50%.

Table 12: Example failure classification

Example	Failure type	Example
Undetermined	Test Test	Emissions above 1.5g/kg but below 1.79g/kg. Emissions substantially above stated emission factor but less than 1.5g/kg.
Minor	Design verification Test	Label on burner different to label on test report. Emissions above 1.79g/kg.
Moderate	Design verification Design verification Design verification Test	Tolerances out of spec (refer 2.10). Wetback on model different in dimensions to that in tested report. 1–2 minor failures that impact adversely on emissions/efficiency. Emissions above 2.0g/kg, or efficiency below 60%.
Serious	Design verification Test	2–3 moderate failures that impact adversely on emissions/efficiency. Emissions above 3.0g/kg, or efficiency below 55%.
Very serious	Design verification Test	4 or more moderate failures that impact adversely on emissions/efficiency. Emissions above 4.0g/kg or efficiency below 50%.

4.4 Sanctions, or actions taken following failure, are similarly graduated in response to the severity of failure. Depending upon the outcomes, the following sanctions would apply.

- Pass – the Ministry would prepare a letter notifying success.
- Undetermined – tested emissions or efficiency within uncertainty limits of test method. The Ministry would offer manufacturer an opportunity to retest (at the manufacturer's expense). Failure to respond to the request would then trigger sanctions for a minor failure.

- Minor failures – the Ministry would prepare a letter notifying the manufacturer of the failure and requesting it be fixed within 1 month. Failure to respond to the request within the month would then trigger sanctions for a moderate failure.
- Moderate failures – the Ministry would prepare a letter notifying the manufacturer of the failure and requesting immediate remedy action. The burner would be 'suspended' from published web-based lists until such time as remedy actions can be established to have occurred. Failure to respond to the request within five working days would then trigger sanctions for a serious failure.
- Serious failures – the Ministry would prepare a letter notifying the manufacturer of the failure and requesting immediate remedy action. The burner would be immediately removed from published web-based lists. The Commerce Commission would be notified of misleading advertising (ie, burner being advertised for sale does not meet the standard as claimed), who may choose to prosecute. Failure to respond to the request would then trigger sanctions for a very serious failure.
- Very serious failures – the Ministry would prepare a letter notifying the manufacturer of the failure and requesting immediate remedy action. The burner would be immediately removed from published web-based lists. Notification of the failure would be placed on the published websites and copied by letter to the New Zealand Home Heating Association with a request that all members be notified of the failure. The Commerce Commission would be notified of misleading advertising (ie, burner being advertised for sale does not meet the standard as claimed), who may choose to prosecute. Regional councils may require the fault be remedied in existing installations and may undertake prosecution action.

4.5 Depending upon the nature of the failure, remedy action may take the following forms:

- immediate cessation of production and sales of failed model until fault remedied
- recall of existing product
- repair all burners installed in contradiction of regulatory requirements
- removal and/or replacement of burners installed in contradiction of regulatory requirements.