

NATIONAL STANDARDS COMMISSION

FG

..../2

WEIGHTS & MEASURES (PATTERNS OF INSTRUMENTS) REGULATIONS

REGULATION 9

CERTIFICATE OF APPROVAL No 6/10A/2

This is to certify than an approval has been granted by the Commission that the pattern and variants of the

Avery Model 5109 ABH Road Weighbridge

submitted by Avery Australia Ltd 3-5 Birmingham Avenue Villawood, New South Wales, 2163

are suitable for use for trade.

The approval is subject to review on or after 1/12/85.

Instruments purporting to comply with this approval shall be marked NSC No 6/10A/2.

Relevant drawings and specifications are lodged with the Commission.

Conditions of Approval

- 1. The load cell is to be mounted in the headwork in accordance with Technical Schedule No 6/10A/2 Variation No 1 for every basework to which it is connected.
- 2. The load cells to be used in these instruments shall be subject to regular certification by the National Standards Commission.
- 3. Each indicator must blank independently at the maximum capacity of the basework to which it is attached.
- 4. The summing printer must print the reading from each indicator as well as the total.

Signed

Executive Director

Descriptive Advice

Pattern: approved 21/11/80

A non-self-indicating weighbridge of 41 t capacity.

Variants: approved 21/11/80

The pattern with baseworks in the following forms:

- . 5-lever 2-section maximum capacity 75 t,
- . 5-lever 3-section maximum capacity 100 t.

. 5-lever 4-section - maximum capacity 200 t.

The pattern and variant 1 with alternative swinging-link arrangements.

2/5/83

4. With additional transfer levers.

- 5. Non-self-indicating combination weighbridge, limited to one instrument -Serial No 67/W/4027.
- 6. Non-self-indicating combination weighbridge.
- 7. Self-indicating combination weighbridge.
- 8. The pattern and variants 1 to 3 with up to 7500 scale intervals.
- The pattern and variants fitted with a 1000 kg Hottinger Z3H load cell approved for up to 3000 scale intervals.
- 10. The load cell in variant 9 being replaced with other nominated load cells approved for up to 3000 scale intervals.
- 11. The baseworks of other Commission-approved patterns replacing the abovementioned baseworks.

Technical Schedule No 6/10A/2 dated 8/12/80 describes the pattern and variants 1 to 11.

Variants: approved 12/7/82

12. Self-indicating combination weighbridge with load cells in the balance lever fulcrum points.

13. The pattern or variant 12 with two or more Commission-approved baseworks.

Technical Schedule No 6/10A/2 Variation No 1 dated 28/7/82 describes variants 12 and 13.

Variant: approved 23/11/82

14. Variant 2 with longitudinal movement stays fitted to the basework.

Technical Schedule No 6/10A/2 Variation No 2 dated 2/5/83 describes variant 14.

Filing Advice

Certificate of Approval No 6/10A/2 dated 28/7/82 is superseded by this Certificate and may be destroyed. The documentation for this approval now comprises:

Certificate of Approval No 6/10A/2 dated 2/5/83 Technical Schedule No 6/10A/2 dated 8/12/80 (including Test Procedures and Table 1) Technical Schedule No 6/10A/2 Variation No 1 dated 28/7/82 Technical Schedule No 6/10A/2 Variation No 2 dated 2/5/83 Test Procedure No 6/10A/2 Variation No 1 dated 28/7/82 (including Table 2) Figures 1 to 3 and 5 to 14 dated 12/6/69 Figures 23 and 24 dated 13/10/72 Figures 31 and 32 dated 8/12/80 Figures 33 dated 2/5/83

2/5/83



NATIONAL STANDARDS COMMISSION

TECHNICAL SCHEDULE No 6/10A/2

Pattern: Avery 5109 ABH Road Weighbridge

Submittor: Avery Australia Ltd, 3-5 Birmingham Avenue, Villawood, New South Wales, 2163.

1. Description of Pattern

The pattern is a non-self-indicating weighbridge of 41 t capacity. It comprises a three-lever two-section basework connected to a steelyard resistant through an inter-mediate lever and two pullrods (Figures 1 and 5).

The basework has a platform which is slung above the load knife-edges on four swinging links. Each link (Figure 2) is straddled by a supporting yoke which is attached to the underside of the platform. The links allow longitudinal motion of the platform.

The two second-order main levers shown in Figure 1 have fulcrum knife-edges supported on four floor-mounted pedestals (Figure 3). The nose-end of each lever is connected (Figure 4) to a second-order transfer lever which transmits the load through a pullrod to the headwork.

All knife-edges in the basework are machined, and seat in grooves machined in the levers. Each knife-edge is fixed by a bolt which passes through the lever and screws into a tapped hole in the back of the knife-edge.

The bearings fit into recesses in the pedestals and swinging links. Each bearing is fitted with friction plates.

The headwork (see Figure 5) comprises a 41 t full-capacity steelyard resistant graduated in 1 t intervals on the major poise scale and in 5 kg intervals on the minor poise scale; each 1 t major poise scale graduation is notched. The steelyard is mounted on a cabinet which houses an intermediate lever and the headwork pullrod.

- 2. Description of Variants
- 1. The pattern with baseworks in the following forms:
 - (a) 5-lever 2-section basework (Figure 6), maximum capacity 75 t,
 - (b) 5-lever 3-section basework (Figure 7), maximum capacity 100 t,
 - (c) 5-lever 4-section basework (FIgure 8), maximum capacity 200 t.

On an instrument of capacity less than 40 t the intermediate headwork lever may be omitted.

- 2. The pattern and variant 1 with alternative swinging-link arrangements:
 - (a) Having the fulcrum knife-edges supported on swinging links suspended from bearing blocks fitted to a steel frame surrounding the basework. In this case the platform-supporting yokes fit directly on the load knife-edges (Figure 9).

8/12/80

(b) Having the fulcrum knife-edges supported on swinging links suspended on swinger plates (Figure 23) or from floor-mounted pedestals. The platform is supported directly on the load knifeedges by pedestals fitted with self-aligning bearings (Figure 24).

The knife-edges on the levers are machined, and seat in grooves machined in the levers. Each knife-edge is fixed by a bolt which passes through the lever and screws into a tapped hole in the back of the knife-edge. The bearings fit into recesses in the swinging links and are self-aligning.

- 3. The pattern and variant 1 having the basework fitted with vehicular rails, in which case buffers which limit the longitudinal movement of the basework are provided.
- 4. Having the headwork located in any reasonable position in relation to the basework, in which case one or more transfer levers may be used, provided that they are fully protected.
- 5. A non-self-indicating combination weighbridge having two identical twosection baseworks, each of 30 t capacity, connected to one steelyard resistant, enabling the baseworks to be used individually or in combination (Figure 10) with a combined capacity of 41 t.

On each basework the nose-ends of the main levers (Figure 11) connect to a longitudinal transfer lever which transmits the load to a final transfer lever located in the space between the baseworks.

The final transfer levers from the two baseworks are connected by separtate pullrods to the headwork.

The headwork (Figure 12) comprises a steelyard resistant similar to that described in the pattern, mounted on a cabinet. The pullrods from the baseworks are connected to two balancing levers contained in the cabinet. The balancing levers are coupled to the steelyard by a connecting link with bearings which engage with the balancing lever knife-edges. A leverlocking device disengages each balancing lever from the connecting link when required (Figures 13 and 14).

When both balancing levers are in the locked position the steelyard can be balanced separately from the baseworks.

Similarly, each basework is balanced independently of the steelyard by means of the adjustment provided on each balancing lever.

The following instructions are engraved on a plate fixed to the top surface of the cabinet:

"INSTRUCTIONS FOR BALANCING

- A. First balance the steelyard with both units out of gear.
- B. With steelyard in balance, place each unit in gear independently and balance by turning the corresponding balancing screw accessible through holes in end of cabinet.
- C. When in balance both moving pointers are in line with the fixed pointers."

When a platform is properly balanced, the balancing lever will vibrate between the limits of $\frac{1}{2}$ mm of the zero reference point of its balancing indicator, leaving clearance between the balancing lever knife-edges and the steelyard connecting-link bearings. When the steelyard and each

basework have been independently balanced, a closing force of up to 1 kg maximum on each platform will bring the knife-edges and bearings into contact.

6.

A non-self-indicating weighbridge having any two of the baseworks approved in this Certificate connected to one steelyard resistant through a headwork mechanism which allows each basework to be used independently or both in combination (Figures 15 and 16).

The two pullrods from the baseworks connect to their respective balancing levers in the headwork cabinet (Figures 15, 17 and 18). The balancing levers are connected to the steelyard by a link and pullrod. The link is fitted with bearings which contact the two balancing levers' knifeedges when the baseworks are engaged. The link is also fitted with two grooved pins which protrude from the side near each bearing. A small rider weight is deposited on each pin when a basework is disengaged. The two weights load the steelyard and it is balanced in this condition.

When a basework is engaged, its respective rider weight is automatically removed from the link. The steelyard is then used to indicate zero by the adjustment of the balancing lever. Positive contact of the balancing lever knife-edge and link bearing is maintained by the counterbalanced force made necessary by the removal of the rider weight.

Two lever-operated camshafts control the rider-weight depositing and balancing-lever arrestment mechanisms.

The following instructions are engraved on a plate fixed to the top surface of the cabinet:

"INSTRUCTIONS FOR BALANCING

- 1. First balance the steelyard with both units out of gear.
- 2. With steelyard in balance, place each unit in gear independently and balance by turning the corresponding balancing screw accessible through holes in the end of cabinet."
- 7.

A self-indicating combination weighbridge having the headwork of variant 6 replaced by a self-indicating headwork to which the two baseworks are coupled, either separately or in combination. The CLA spring-resistant mechanism is as described in Certificate No 6/9C/10.

The headwork cabinet fitted with the four or nine unit-weight depositing mechanism described in Certificate No 6/9C/10 contains basework-balancing levers, compensating weights and combining gear (Figures 19, 20 and 21).

Each of the transfer levers from the two baseworks has two headwork pullrods (Figures 20 and 22), pullrod 8 being coupled to the baseworkbalancing lever and pulllrod C to the intermediate lever, which is coupled permanently to the main headwork lever.

Each of the balancing levers is adjusted, by screw-operated balance weights, to balance the weight of the associated basework; the load on the platform is transmitted directly to the intermediate lever through pullrod C.

Two compensating weights (Figures 19 and 20), which are deposited on pullrod A between the intermediate lever and the main headwork lever, are moved by the levers which engage and disengage the baseworks (Figure 21).

The action of disengaging a basework causes the corresponding balancing lever to lift the transfer lever, disengaging the knife-edge from pullrod C bearing. The basework lever system is locked by this action and at the same time the corresponding compensating weight is deposited on pullrod A, compensating for the effect on the indicator of the positive force transmitted to the resistant mechanism while the platform is engaged.

A plate is mounted on the front of the cabinet giving instructions for balancing the instrument, as follows:

"INSTRUCTIONS FOR BALANCING

- 1. First balance the dial with both units out of gear.
- 2. With the dial in balance, place each unit in gear independently and balance by turning the corresponding balancing screw accessible through holes in side of cabinet."
- 8. The pattern and variant 1 with up to 7500 scale intervals; the major bar is notched and numbered and the minor bar is graduated.
- 9. The headworks of the pattern and variants fitted with a 1000 kg Hottinger (GDR) Z3H load cell and 8650 indicator; the load cell supports the fulcrum of the intermediate lever (Figures 25 and 26); the lever ratio is selected so that the force on the load cell is between 3900 N and 9800 N.

The electronic weight indicator, Avery 8650 (Figure 27), converts the output from the load cell into a digital mass indication of up to 3000 increments; the instrument will rezero automatically whenever it comes to rest within 0.25e of zero and the word ZERO will be illuminated; a tool-operated zero adjustment is provided on the front of the mass indicator for rezeroing the instrument when zero has changed by more than 0.5e.

A self-illuminated push-button displays TARE or GROSS when pressed so that, when TARE is displayed, a container is tared to within 0.25e; on removal of the container the value of the tare is indicated on the mass indicator prefixed by a minus sign; the tare is subtractive and of maximum effect equal to the capacity of the instrument; the tare is cancelled by pressing the TARE/GROSS button; the word GROSS will then be indicated and the instrument will gross weigh until a tare is selected.

The load cell is positioned so that its serial number is readily visible.

An output socket located inside the mass indicator may be used to provide mass information to peripheral devices which are not a part of the measuring instrument.* These supplementary devices, which may only be provided with the authorisation of the Weights and Measures Authorities of the State or Territory, may, for example, print receipts or store and process the data, etc. The output information is inhibited until the signal sampled in successive counting periods is the same, that is, the instrument is in equilibrium.

^{*} The measuring instrument examined and approved by the Commission is limited to the devices which determine the value of a physical quantity, control the measurement, and indicate the result of the measurement on a visual display, for example, a nixie-tube indicator or a seven-segment indicator.

10. The load cell in variant 9 being replaced by the following Hottinger (GDR) Z3H load cells:

Capacity	Force range
20 kg	75 N to 200 N
50 kg	195 N to 490 N
200 kg	780 N to 1 96 0 N
500 kg	1960 N to 4900 N

- 11. The baseworks of other Commission-approved patterns replacing the baseworks of the pattern and variants , provided that:
 - (a) the basework is of an instrument conventionally known as a platform weighing machine, weighbridge or hopper scale, etc., where the headwork and basework are separate assemblies connected by a mechanical linkage; and
 - (b) the capacity of the instrument is not more than the capacity approved for the basework; and
 - (c) additional transfer levers are used when required; and
 - (d) a levelling device and level indicator are fitted. The sensitivity of the level indicator shall be such that, when the instrument is tilted so that the bubble in the level indicator moves 2 mm, the zero will not change by more than two scale intervals, and when zero is reset in the tilted position the instrument will satisfy the accuracy requirements.

However, level indicators are not required for instruments installed in a fixed position, or for instruments which satisfy the accuracy requirements and tilt tests specified in Test Procedures when tilted to a slope of 1 in 20 in a longitudinal direction and a transverse direction; and

(e) the instrument is marked with the following approval numbers:

Headwork NSC No 6/10A/2 Basework NSC No

Sealing

Seals are provided over the adjusting cavity on the major and minor poises, and over the sensitivity adjuster on the balance weight (Figures 28 and 29); the minor bar, the notched bar and steelyard are engraved with the serial number of the instrument.

The mass indicator is retained in its cabinet by a lead-and-wire seal. The serial number of the load cell is sealed to the mass indicator by the sealing wire (Figure 30).

4. Marking

The instrument nameplate is marked with the following data:

Manufacturer's name	
Serial number	
NSC approval number in the form:	NSC No 6/10A/2
Accuracy class in the form:	(III)
Maximum capacity in the form:	Max*
Minimum capacity in the form:	Min*
Verification scale interval	
in the form:	d or d _d = e*
Maximum tare capacity in the form:	Τ =

* These markings are repeated on the reading face(s) of the instrument.

..../6

5. Test Procedures

- 1. Tilt tests for other baseworks
 - (a) Tilting at nc-load the zero indication should not vary more than
 2e when tilted to a slope of 1 in 20, the zero being first adjusted in the reference (level) position.
 - (b) Tilting when loaded the indication should not vary more than e when tilted to a slope of 1 in 20, the indication at zero being adjusted in the reference position before tilting and in the tilted position before reloading.

2. Sensitivity test for non-self-indicating instruments

A mass equal to the absolute value of the maximum permissible error, at the load considered, placed on the instrument, loaded or unloaded, shall cause a permanent displacement of the index of at least 5 mm.

3. Accuracy requirements

The maximum permissible error is:

± 0.5e for loads between zero and 500e inclusive;

- ± 1e for loads above 500e and up to 2000e; and
- ± 1.5e for loads above 2000e.

4. Tests for the digital indicator

(a) Zero balance - place a small weight equal to, say, 10 scale intervals (10dd) on the load receptor before checking zero. Two readings are taken at each applied load with the instrument equilibrium being disturbed before each reading.

With an additional load of 0.25 d_d , that is 10.25 d_d , on the load receptor, readings of 11 d_d and 10 d_d indicate that the alignment of the instrument is not correct, readings of 10 d_d and 11 d_d or 10 d_d and 10 d_d are acceptable.

With an additional load of 0.75 d_d, that is 10.75 d_d, on the load receptor, readings of 10 d_d and 10 d_d indicate that the alignment of the instrument is not correct, readings of 10 d_d and 11 d_d or 11 d_d and 11 d_d are acceptable.

- (b) $\frac{\text{Zero range} \text{the maximum range of operation of the zero device}}{\text{should not exceed 4% of the capacity of the instrument (<math>\pm 2\%$ approximately).
- (c) Load-cell creep leaving a maximum-capacity load on the load receptor for a period of 30 minutes should not cause the weight indicated to be incorrect, and on removal of the load the mass indicated should be zero.
- (d) Test loads the application of the test loads specified in Table 1 and the display of these loads within the applicable tolerance con be used to check that the instrument operates in accordance with the approved design.
- (e) <u>Range of indication</u> the maximum mass indicated should not exceed the maximum capacity (max); above this indicated mass the indicator should be blank.

TABLE 1

Test Load in % of Full Load Capacity *

1.5%	16.0% + 0.5 Scale Interval
2.4%	25.0% + 0.5 Scale Interval
4.0%	40.0% + 0.5 Scole Interval
6.3%	63.0%
10.0% + 0.5 Scale Interval	100.0%

-

*Test Load = % x Max Capacity

(rounded to the nearest 0.5 Scale Interval)

Note: The Test Load should include a test at capacity, less the tolerance and less 0.5 Scale Interval.



NATIONAL STANDARDS COMMISSION

TECHNICAL SCHEDULE No 6/10A/2

VARIATION No 1

Pattern: Avery 5109 ABH Road Weighbridge

Submittor: Avery Australia Ltd, 3-5 Birmingham Avenue, Villawood, New South Wales, 2163.

1. Description of Variants

1.1 Variant 12

A self-indicating combination weighbridge with two identical two-section baseworks each of 30 t capacity. The lever fulcrum of each balancing lever is replaced by an HBM Z6H2 beam load cell of an approved capacity (see Table 2), mounted as in Figure 31. The instrument may be used with either the steelyard or the digital indicators, in the latter case, with the steelyard locked.

1.2 Variant_13

The pattern or variant 12 with two or more Commission-approved baseworks, which may or may not be of equal capacities, replacing the baseworks of the pattern and variants.

1.3 Both variants 12 and 13

The baseworks may be used individually or in combination, with a combined capacity equal to the sum of the capacities of the individual baseworks.

The output from each load cell or basework is converted by an Avery 8650 indicator into a mass indication of up to 3000 increments, with individual readings and the total being printed by any summing printer which prints the reading from each indicator as well as the total.

Data from the indicators may be used to provide mass information to peripheral devices which may or may not be part of the approved measuring instrument.

1.4 Markings

In addition to the marking of the original pattern(s), the instrument is marked with the approval number(s) of each component, where approved separately.

TEST PROCEDURE No 6/10A/2

VARIATION No 1

Variants 12 and 13 are tested as described on page 6 of Technical Schedule 6/10A/2 dated 8/12/80, with the following changes:

4(c) Load-cell Creep - should now be deleted.

4(d) and 4(e) are replaced by

1.

4(d) Test loads - Test loads are to be applied to the instrument increasing to maximum capacity in not less than 5 equal steps, and followed by decreasing loads of not less than 5 equal steps.

<u>Note:</u> All load applications to the instrument should be in accordance with the Commission's recommended testing procedure for the elimination of rounding error as set out in Document 104.

The instrument should display these loads within the applicable tolerance as listed in Test 3.

<u>4(e)</u> Range of Indication – Apply a load of maximum capacity + 10e to each platform in turn; the respective indicators should blank.

2. Where multiple baseworks are installed, the baseworks are tested in accordance with their respective Certificates and Technical Schedules, as modified in 4(d) and 4(e) above.

Instruments with multiple baseworks are to be tested as though each individual basework is a separate instrument.

TABLE 2

Туре		НВМ	Z6H2	
Capacity	50 kg	100 kg	200 kg	500 kg
Maximum No. of Verifi- cation Scale Intervals	3000	3000	3000	3000
Minimum Scale Interval	0.01 kg	0.02 kg	0.03 kg	0.1 kg
Minimum Measuring Range	20 kg	40 kg	80 kg	200 kg
Maximum Measuring Range	50 kg	100 kg	200 kg	5 00 kg

HBM Model Z6H2 Load Cells - Approved Capacities



NATIONAL STANDARDS COMMISSION

TECHNICAL SCHEDULE No 6/10A/2

VARIATION No 2

Pattern: Avery Model 5109 ABH Road Weighbridge

<u>Submittor:</u> Avery Australia Ltd 3-5 Birmingham Avenue Villawood, New South Wales, 2163.

1. Description of Variant 14

The basework of variant 2 (as described in Technical Schedule No 6/10A/2 dated 8/12/80 paragraph 2(b)) fitted with stays (Figure 33) to prevent longitudinal movement of the platform.



NATIONAL STANDARDS COMMISSION

FG

NOTIFICATION OF CHANGE

CERTIFICATE OF APPROVAL No 6/10A/2

CHANGE No 1

The following change is made to the description of the Avery Model 5109 ABH Road Weighbridge given in Technical Schedule No 6/10A/2 Variation No 1 dated 28/7/82.

The ticket shown in Figure 32 should be amended by deleting the first 4 lines of type, i.e. the weighbridge company's name, address and telephone number.

Note: This amendment is being made to avoid conflict with State regulations for public weighbridge tickets.

Signed

Executive Director

27/9/82



FF



NATIONAL STANDARDS COMMISSION

NOTIFICATION OF CHANGE

CERTIFICATE OF APPROVAL No 6/10A/2

CHANGE No 2

The following change is made to the approval documentation for the

Avery Model 5109 ABH Road Weighbridge

submitted by Avery Australia Ltd 3-5 Birmingham Avenue Villawood New South Wales 2163

In Technical Schedule No 6/10A/2 dated 8/12/80, the first paraproph of the description of Variant 5 (one instrument with serial No 67/W/4027) given on page 2, is amended to read as follows:

A non-self-indicating combination weighbridge having two similar 2-section baseworks, connected to one steelyard resistant, enabling the baseworks to be used individually up to 40 t, or in combination (Figure 10) in which case the maximum capacity per basework is 30 t and the maximum combined capacity is 41 t.

Signed

Executive Director



Ň

12/6/69

FIGURE 6/10A/2 - 2



Swinging Link and Supporting Yoke



Main Lever Support Pedestal



F

Main Transfer Lever Nose-end Connections

22/6/71

FIGURE 6/10A/2 - 4



12/6/69





1204

12/6/69



FIGURE 6/10A/2 - 9



Main Lever Supporting Link and Platform Supporting Yoke 12/6/69



12/6/69





FIGURE 6/10A/2 - 12



12/6/69



Lever Locking Handles and Balance Indicators

12/6/69





Combination Weighbridge Headwork

22/6/71



FIGURE 6/10A/2 - 16

22/6/71



Combination Headwork - Cover Removed

22/6/71

FIGURE 6/10A/2 - 17



Combination Headwork



Combination Headwork Cabinet

FIGURE 6/10A/2 - 19



Schematic Diagram of Combination Headwork

30/5/72

FIGURE 6/10A/2 - 21



Balancing Lever-locking and Compensating Weight-depositing Mechanism and Zero-balancing Adjustment

30/5/72

FIGURE 6/10A/2 - 22



Pullrods from Basework Transfer Levers

30/5/72





Avery 5492 Basework — Main Lever Fulcrum with Platform Support Pedestal

31/10/72





8/12/80

Nov slf-indicating Headworks fitted with Load Cel





elf-indicating Headworks fitted with Load Cel

No,

FIGURE 6/10A/2 - 26



8/12/80



8/12/80



Sealing of Sensitivity Adjuster



8/12/80

FIGURE 6/10A/2 - 31

Headwork With HBM Z6H2 Load Cells

FIGURE 6/10A/2 - 32

PUBLIC RIDGE L'Auburn 182391			10,01 TONNES	12,00 TONNES	15,00 TONNES 37,01 TONNES	IG No. 12345	1400 HRS
STANDARD WEIGHB RAWSON SI PHONE 64	DATE: 17 APR 82	VEHICLE REG. No	PLATFORM 1	PLATFORM 2	PLATFORM 3 TOTAL WEIGHT	CONSECUTIVE WEIGHIN	TIME OF WEIGHING

Typical Ticket From A Three Basework System

Schematic Showing Location Of Movement Stays

