WEIGHTS

Suggestions to improve iron weights of OIML R 47 and R 52

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Abstract

The author has been engaged exclusively in the design and development of cast iron weights since 1961, and has been following the relevant OIML International Recommendations since 1973. He has noted what he considers to be certain shortfalls in OIML R 47 *Standard weights for testing of high capacity weighing machines* and R 52 *Hexagonal weights - Metrological and technical requirements*. In the author's opinion, while in some cases sufficient design details of weights are not provided in the Recommendation, in other cases the existing design technically exposes the weights to the possibility of alteration of their calibration accuracy without this being properly visible. This can lead to a lack of confidence amongst users.

In this paper the author endeavors to highlight some of these perceived shortfalls, along with his suggestions to improve them with the aim of serving the best interests of society by shifting the adjustment cavity to the top surface instead of the bottom surface, providing a lifting provision for heavy cylindrical weights to facilitate their handling and transportation from one place to another, and also by working out the dimensional parameters of various weights.

1 Introduction

Weights play a vital role in society. The metric weighing and measuring system was adopted by many countries to overcome two main problems, notably i) to adopt a uniform weighing and measuring system throughout the world to better develop mutual understanding, and ii) to protect the interests of both producers and consumers.

As an example, before the adoption of the metric system in India, about 150 different systems of weights were used across the various regions of the country. Even when the same nomenclature was used, the actual weight varied. For instance, more than 100 kinds of maunds[1] were in use, ranging from a 280 tolas[2] weight to a 8320 tolas weight, compared to the standard maund of 3200 tolas. In certain regions and in certain kinds of transactions, the unit of weight, a seer or a maund, varied one from the other. When a trader purchased a commodity from a producer he used one value of weight, and when he resold the same commodity to the consumer, he employed a different value. In both transactions the trader benefited, whereas producers and consumers should be protected since they are the backbone of a nation's economic development.

Although most countries in the world have adopted the Metric System, the interests of producers and consumers are still not necessarily protected.

The OIML has recommended the use of hexagonal weights from 100 g to 50 kg (R 52) for normal use in trade and commerce and from 100 kg to 5000 kg standard weights for testing high capacity weighing machines (R 47).

A brief description of the author's opinion of some possible shortfalls in these weights and suggestions for incorporating certain modifications to develop them in the best interests of society are given below.

2 OIML R 52 *Hexagonal weights - Metrological and technical requirements*

R 52 provides the adjusting cavity at the bottom of the weight, and the control mark as required by law is placed on the lead cast in the adjusting cavity. The accuracy of these weights is equivalent to class M_3. People are concerned mostly with these weights in their day to day life. As the control mark is placed at the bottom of the weights, it is not visible to the consumer and does therefore not create confidence for the user concerning its accuracy.

In view of the above, a model diagram and legend have been drawn with a loading hole located at the centre of the upper surface of the hexagonal commercial weights of 50 g to 2 kg as shown in Figure 1. This provides:

[1] The "maund" is a traditional unit of weight in India and throughout South Asia. During the period of British rule in India it was standardized at about 82.286 pounds or 37.3242 kilograms. The maund is divided into 40 seers.

[2] The "tola" is a weight of British India. The standard tola is equal to 180 grains (1 grain = 64.779 milligram)

- complete visibility of the control mark without any effort while in use;
- comfortable gripping, and also the weights can properly nest on one-another;
- design of the adjusting cavity on the top surface of the weights such that the question of accumulation of dust/foreign particles does not arise;
- marking of the denomination on the top surface of the weights for easy recognition of their nominal value of mass, whereas the manufacturer's trade mark has been engraved on the bottom surface to minimize the chances of scraping/turning of the bottom surface, which can be done by unscrupulous traders.

If necessary, drawings can also be developed for weights in denominations of 5 kg to 50 kg along similar lines with the adjusting cavity at the top.

By changing the adjusting cavity from the bottom to the top of the weights, we can create confidence concerning the accuracy of the weights amongst the users.

3 OIML R 47 *Standard weights for testing of high capacity weighing machines*

OIML R 47 *Standard weights for testing of high capacity weighing machines* covers rectangular and cylindrical shaped weights in the denominations 100 kg, 200 kg, 500 kg, 1000 kg, 2000 kg, and 5000 kg.

R 47 provides dimensional measurements for 500 kg and 1000 kg rectangular shaped and for 500 kg cylindrical shaped weights only. The dimensional measurements of other weights are not provided. We have calculated the dimensional measurement for other weights from 100 kg to 1000 kg which are shown in Figures 2 and 3.

The cylindrical weights of R 47 do not have any lifting provision. We have diverted the adjusting cavity of the weights from the top of the weights to the bottom, for adjustment. Another small cavity for the control mark at the top and the lifting handle at the top of the weights has been provided as per Figure 4.

4 Further suggestions

We have also developed I-shaped weights in denominations of 100 kg to 1000 kg. The shape and dimensional measurements are given in Figure 5. These weights are very convenient for lifting by crane or forklift.

5 Conclusions

Changing the adjusting cavity of hexagonal weights (normal commercial weights) from the bottom to the top will create confidence in the accuracy of the weights amongst users.

The dimensional details provided in Figures 2 and 3 will provide uniformity in shape for weights produced by different manufacturers.

The provision of a handle in the cylindrical weights (Figure 4) will make them suitable for lifting by crane, which is essential for such high denominational weights.

The I-shaped standard weights are very convenient to handle by crane or forklift, and these weights are now gaining a high degree of popularity in the overseas markets. ■

6 References

[1] Metric Change in India by Dr. Lal C. Verman & Sri Jainath Kaul

[2] OIML R 52 *Hexagonal weights - Metrological and technical requirements*, OIML, 2004

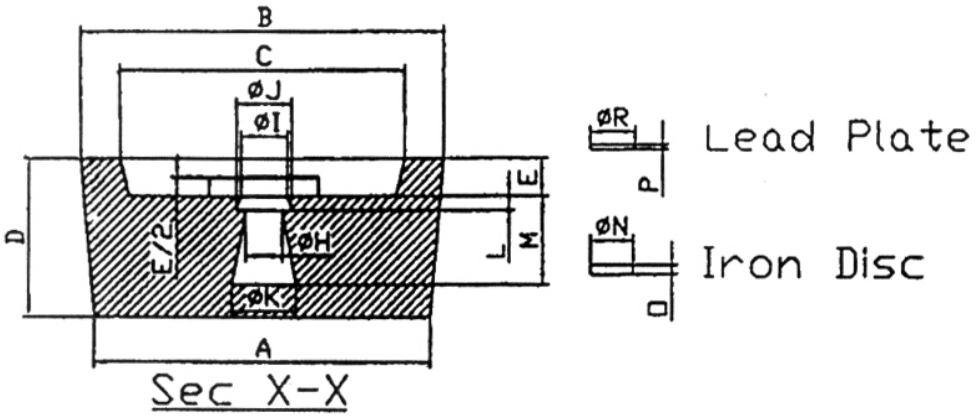
[3] OIML R 47 *Standard weights for testing of high capacity weighing machines*, OIML, 1979

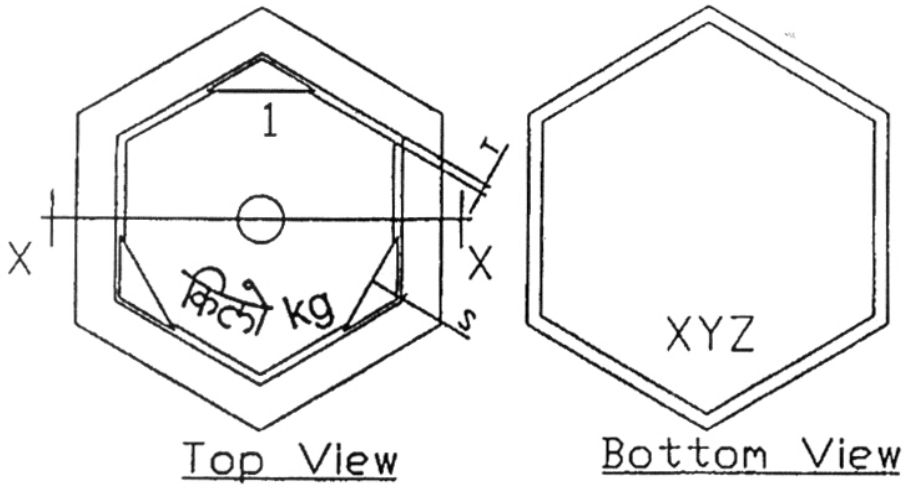
[4] OIML R 111 *Weights of classes* E_1, E_2, F_1, F_2, M_1, M_{1-2}, M_2, M_{2-3} *and* M_3, OIML, 2004

[5] Standards of W and M (General) Rules 1987

Figure - 1

Model Diagram and Legend with Loading Hole located at the Centre of Upper Face of Commercial Weights





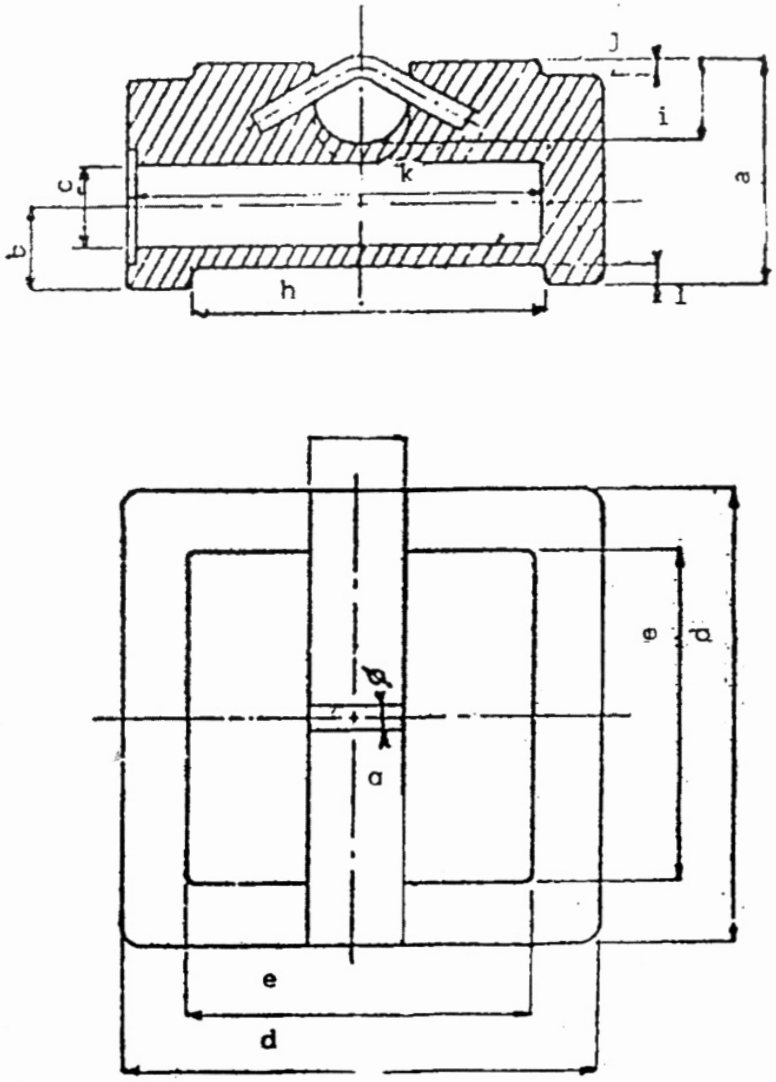
	A	B	C	D	E	H	I	J	K	L	M	N	O	P	R	S	T
2kg	94	101	78	41	10	8	10	12	15	3	22	9.5	2	1	10	9	2
1kg	73	79	62	34	8	8	10	12	14	3	19	9.5	2	1	10	8	2
500g	57	62	47	27	6	8	10	12	13	3	16	9.5	2	1	10	6	2
200g	42	48	38	21	6	8	10	12	12	3	13	9.5	2	1	10	4	1
100g	33	38	31	17	5	8	10	12	11	3	10	9.5	2	1	10	3	1
50g	27	31	24	12	3	8	10	12	10	3	7	9.5	2	1	10	3	1

ALL DIMENSIONS IN MILLIMETERS
NOTE : ASSUMED DENSITY = 7.1g/cc

	1000kg	500kg	200kg	100kg
a	504	273	218	210
b	120	100	60	60
c	140	100	44	30
d	560	560	400	295
e	400	400	280	210
f	110	110	100	100
g	30	30	25	25
h	410	410	300	220
i	100	100	100	100
j	20	20	15	15
k	480	480	350	260
l	25	25	20	20

Figure - 2

RECTANGULAR STANDARD WEIGHTS
(Dimensions in mm)
Suitable for stacking & lifting



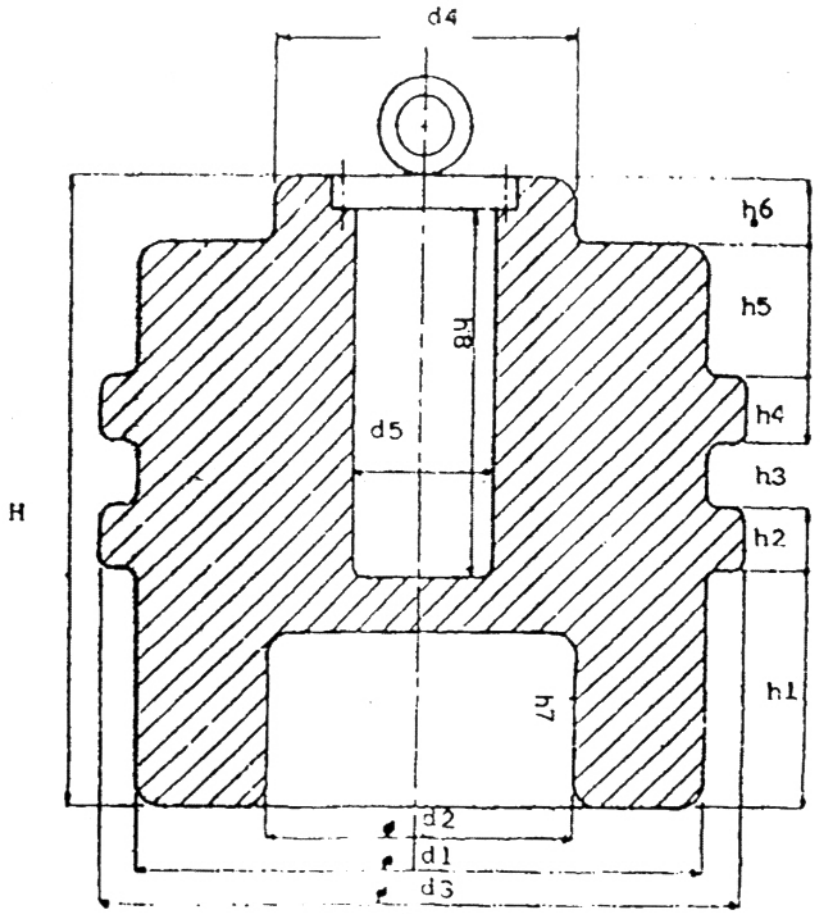
	1000kg	500kg	200kg	100kg
d1	575	450	330	265
d2	315	251	185	170
d3	650	510	375	315
d4	310	249	180	165
d5	145	115	85	75
h1	240	190	140	100
h2	65	50	35	30
h3	65	50	35	30
h4	65	50	35	30
h5	130	105	80	65
h6	65	50	35	30
h7	190	95	50	50
h8	355	312	230	180
H	630	495	360	285

NOTE : ASSUMED DENSITY = 7.1g/cc

Figure - 3

Cylindrical Standard Weight

Suitable for Stacking & Rolling



r = 10
R = 20

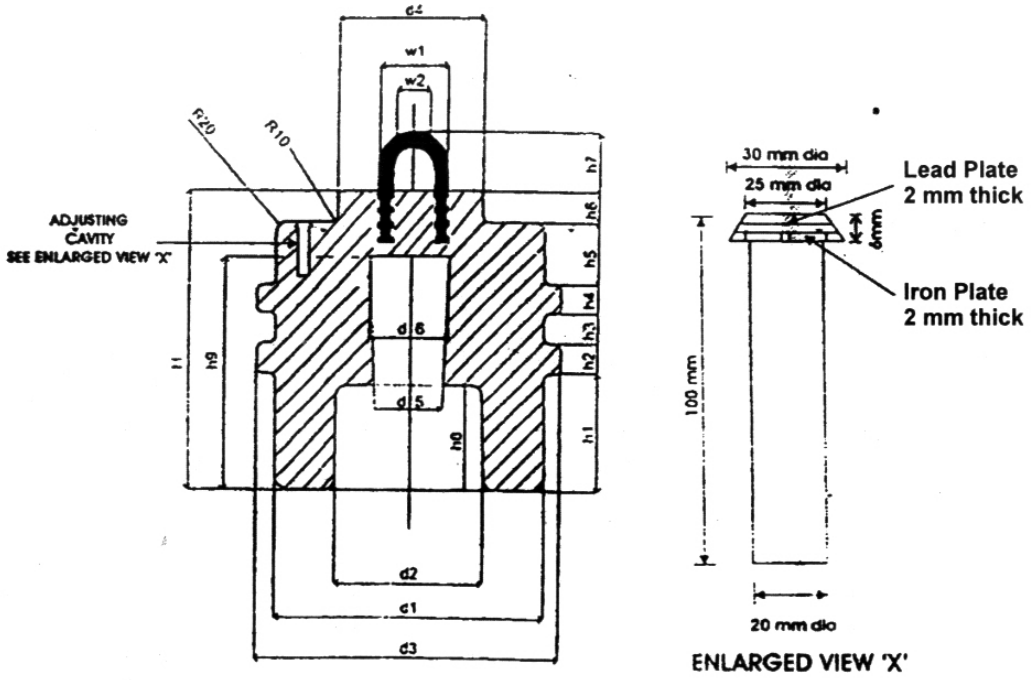
DIMENSION IN MILLIMETRES

	1000kg	500kg	200kg	100kg
d1	575	460	340	265
d2	315	251	185	170
d3	650	520	385	310
d4	310	249	180	165
d5	145	115	85	75
d6	165	135	105	95
h1	240	190	145	130
h2	65	50	35	30
h3	65	50	35	30
h4	65	50	35	30
h5	130	105	80	65
h6	65	50	35	30
h7	100	100	75	75
h8	200	170	130	130
h9	490	390	280	250
H	630	495	365	315
w1	120	120	100	100
w2	70	70	50	50

NOTE : ASSUMED DENSITY = 7.1g/cc

Figure - 4

CYLINDRICAL STANDARD WEIGHT
SUITABLE FOR STAKING ROLLING AND LIFTING

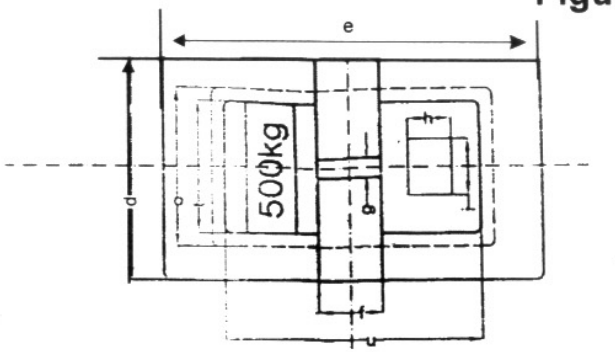


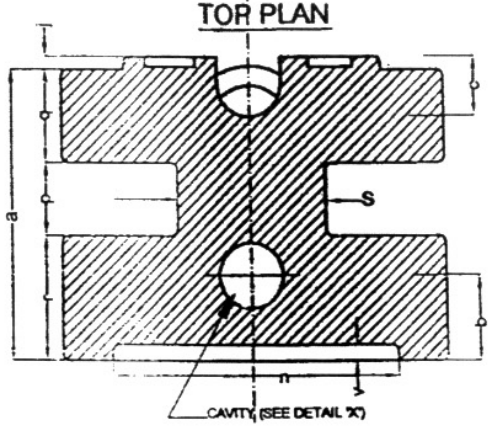
I-SHAPED STANDARD WEIGHTS
SUITABLE FOR STACKING AND LIFTING
BY CRANE OR FORK LIFT

ALL DIMENSIONS IN MILLIMETRES

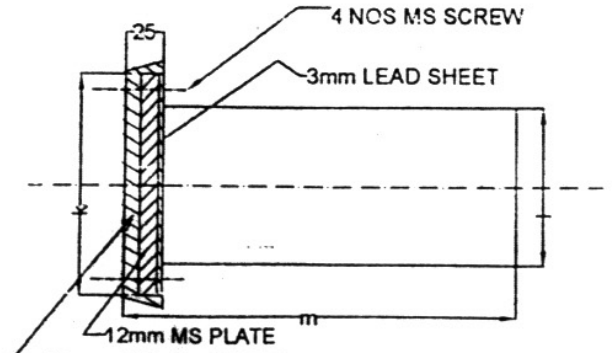
	1000kg	500kg	200kg	100kg
a	600	460	350	300
b	150	130	90	90
c	90	90	90	90
d	440	340	270	220
e	650	590	450	360
f	100	100	100	100
g	30	30	25	25
h	65	65	65	65
i	85	85	85	85
j	20	20	20	20
k	160	140	110	100
l	120	100	70	60
m	350	250	200	180
n	440	440	340	290
o	290	240	190	160
p	115	110	110	110
q	200	140	90	70
r	265	190	130	100
s	290	230	150	120
t	250	200	150	120
u	400	400	300	250
v	25	25	25	25

Figure - 5





SECTIONAL ELEVATION



DETAIL 'X'