

SCL-25.1

UR.3.1. Recommended Minimum Load
Table 8 Recommended Minimum Load

Why d, Not e!?!?



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UR.3.1. Recommended Minimum Load Table 8 Recommended Minimum Load

G-S.5.2.2.(c) - A digital value “rounds off” to the nearest minimum unit that can be indicated or recorded.

For example, a digital scale with 1 lb scale divisions (d) will round up to 0.5 lb.

When weighed on this scale;

An item that weighs 6.4 lb, would round down to 6 lb (-0.4 lb).

An item that weighs 6.5 lb, would round up to 7 lb (+0.5 lb).



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UR.3.1. Recommended Minimum Load

UR.3.1. Recommended Minimum Load. – A recommended minimum load is specified in Table 8. Recommended Minimum Load since the use of a device to weigh light loads is likely to result in relatively large errors.

4.4 Relative Error at Low Load Values

At low load values, the **uncertainty** of the indicated reading may produce a large relative error*

*Excerpt from a report titled “PROPOSED REGULATIONS FOR WEIGHING DEVICE TOLERANCES” by the SMA Expanded Tolerance Subcommittee, March 5, 1981 (1981 NCWM Annual Report)



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Table 8. Recommended Minimum Load
Uncertainty
e vs d

RML = 20	e	d	Max Rounded Value d (MRV)	uncertainty MRV ÷ RML (RML 20 d)	uncertainty MRV ÷ RML (RML 20 e)
e > d	1	0.1	0.05	2.50%	Inequitable 0.25%
e = d	1	1	0.5	2.50%	2.50%

$$\frac{0.05 d}{20 \times 1 e} = \frac{0.05 d}{20 e} = 0.025 \times 100 = 0.25 \%$$

$$\frac{0.05 d}{20 \times 0.1 d} = \frac{0.05 d}{2 d} = 0.25 \times 100 = 2.50 \%$$

$$\frac{0.5 e}{20 \times 1 e} = \frac{0.5 e}{20 e} = 0.25 \times 100 = 2.50 \%$$



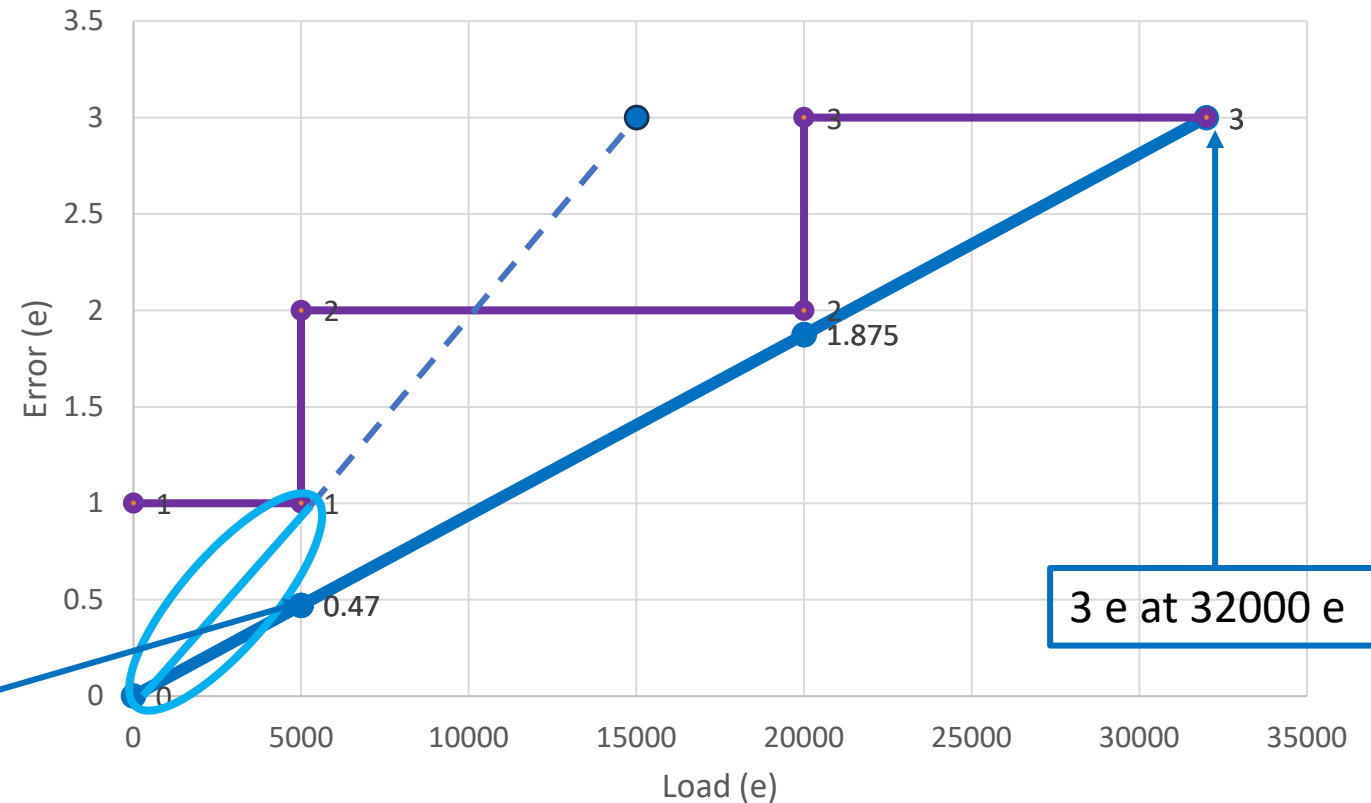
SCL-25.1 Table 8. Recommended Minimum Load Effect of Tolerance

$320\text{ g e} = 0.01\text{ g d} = 0.001\text{ g (n=32000)}$

Class II Tolerance (e)		
1	2	3
Test Load (e)		
0 – 5 000	5 001 – 20 000	20 001+

50.00[5] g

Error^P at 5000 e $\approx 0.5\text{ e}$
 5000 e = 50 g
 0.5 e = 0.005 g



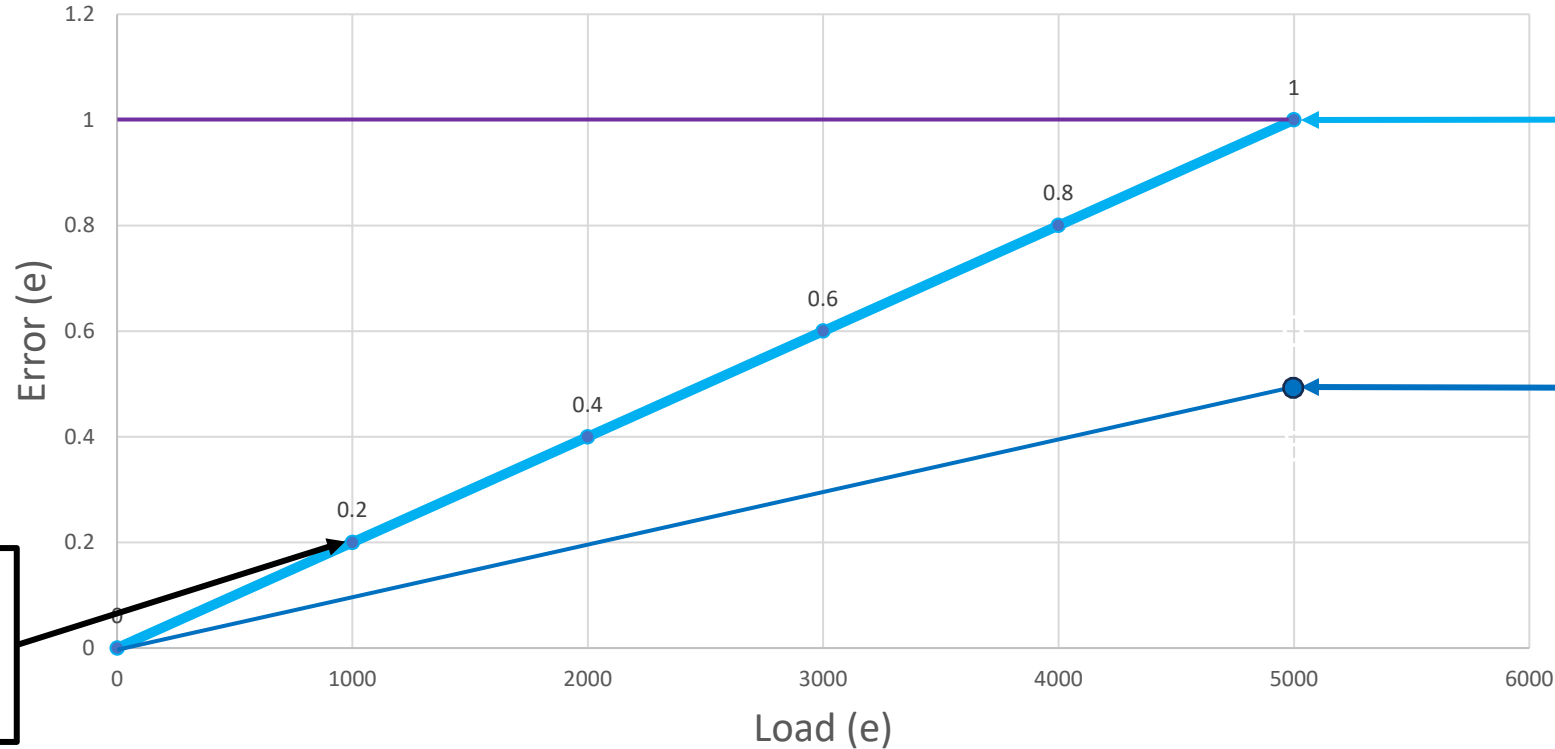
Error^P is the Potential Error



SCL-25.1 Table 8. Recommended Minimum Load

Effect of Tolerance

$320 \text{ g e} = 0.01 \text{ g d} = 0.001 \text{ g (n=32000)}$



10.00[2] g

Error^P at 1000 e $\approx$ 0.2 e
1000 e = 10 g
0.2 e = 0.002 g

5000 e (1 e)

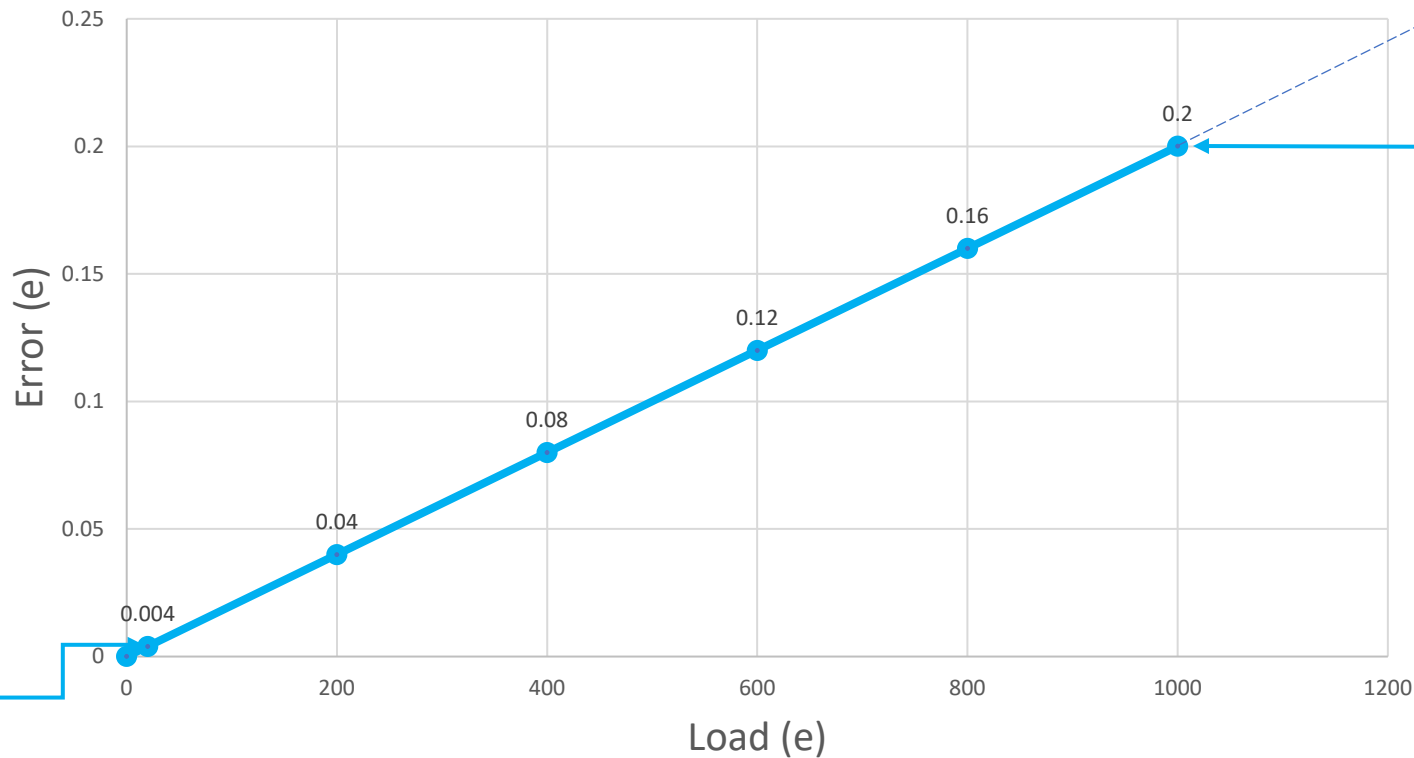
5000 e (0.5 e)

Error^P is the Potential Error



SCL-25.1 Table 8. Recommended Minimum Load Effect of Tolerance

$$320 \text{ g e} = 0.01 \text{ g d} = 0.001 \text{ g}$$



0.20[0]04 g

Error^P at 20 e $\approx$ 0.004 e
20 e = 0.2 g
0.004 e = 0.00004 g

Error^P at 1000 e $\approx$ 0.2 e
1000 e = 10 g
0.2 e = 0.002 g

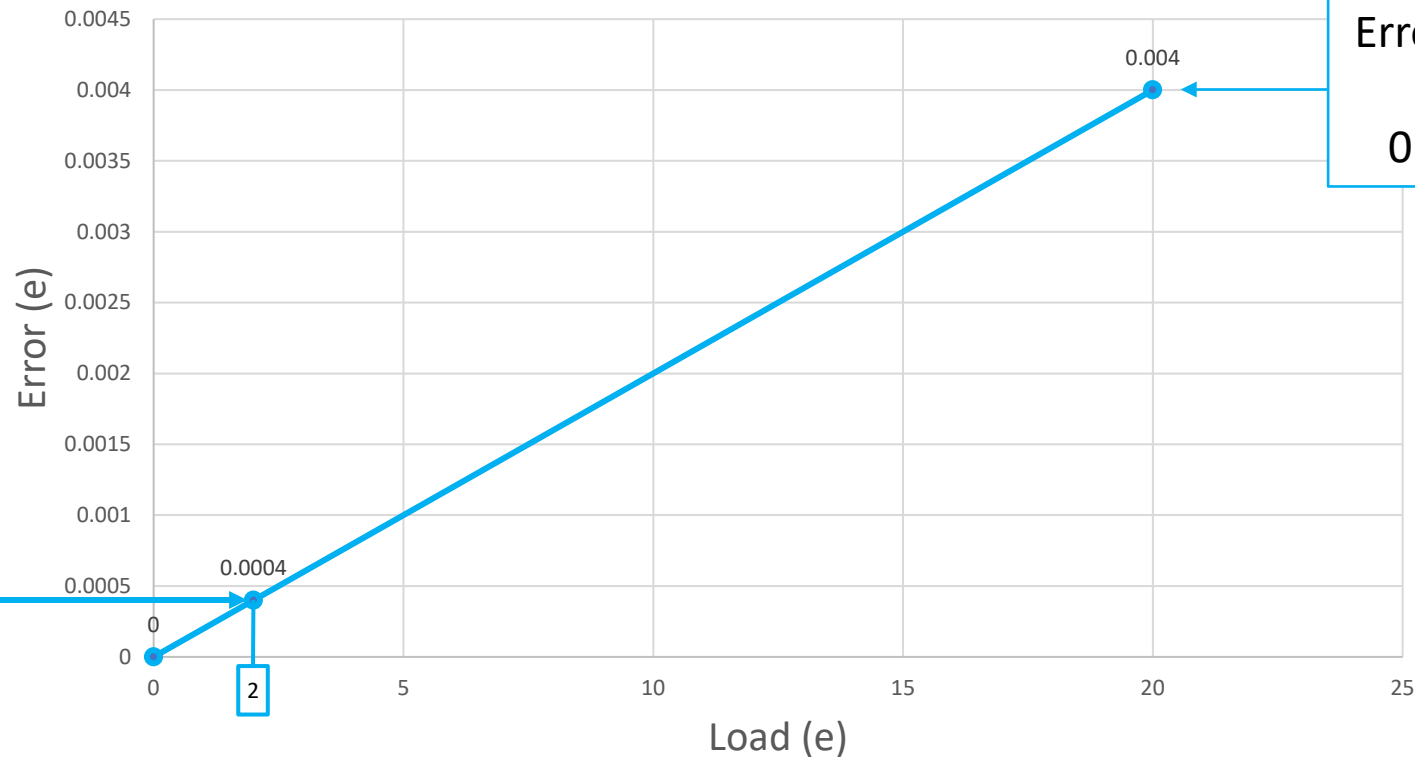
Error^P is the Potential Error



SCL-25.1 Table 8. Recommended Minimum Load

Effect of Tolerance

$320 \text{ g e} = 0.01 \text{ g d} = 0.001 \text{ g}$



0.02[0]004 g

Error^P at 20 e $\approx 0.004 \text{ e}$
 $20 \text{ e} = 0.2 \text{ g}$
 $0.004 \text{ e} = 0.00004 \text{ g}$

Error^P at 2 e (20 d) $\approx 0.0004 \text{ e}$
 $2 \text{ e} = 0.02 \text{ g}$
 $0.0004 \text{ e} = 0.000004 \text{ g} \approx 0 \text{ e (g)}$

Error^P is the Potential Error



SCL-25.1 Table 8. Recommended Minimum Load

Uncertainty and the Effect of Tolerance

- Table 8 was adopted to minimize the uncertainty associated with rounding of the scale division (d)
- If the Recommended Minimum Load (RML) is based on e , the standard applied to scales with $e > d$ would be inequitable (0.25 % uncertainty vs 2.50 % uncertainty)
- The linearity of errors results in insignificant errors at the lower weighing range (≈ 0)
- Referencing d in Table 8 is technically correct.

