

The Revised NIOSH Lifting Equation for the Recommended Weight Limit

Overview:

The revised NIOSH lifting equation can be used to calculate the recommended weight limit for workers performing two-handed manual lifting.

recommended weight limit in kilograms = (load constant in kilograms) * (horizontal multiplier) * (vertical multiplier) * (distance multiplier) * (asymmetric multiplier) * (frequency multiplier) * (coupling multiplier)

Component	Metric	US Conventional Units
load constant	23 kg	51 lbs
horizontal multiplier	$25 / H$	$10 / H$
vertical multiplier	$1 - (0.003 * (V - 75))$	$1 - (0.0075 * (V-30))$
distance multiplier	$0.82 + (4.5 / D)$	$0.82 + (1.8 / D)$
asymmetric multiplier	$1 - (0.0032 * A)$	$1 - (0.0032 * A)$

where:

- each parameter is measured at the site of origin and at the destination
- distances are in centimeters or inches
 - H = horizontal location of hands from midpoint between the ankles measure in cm or in
 - V = vertical location of the hands from the floor measured in cm or in
 - D = vertical travel distance between the origin and the destination of the lift measured in cm or inches
 - A = angle of asymmetry; angular displacement of the load from the sagittal plane measured in degrees

Frequency Multiplier

Work Duration \leq 1 hour

average lifting frequency rate in lifts per minute	vertical location of hands from floor < 75 cm (30 in)	vertical location of hands from floor \geq 75 cm (30 in)
0.2	1.00	1.00
0.5	0.97	0.97
1	0.94	0.94
2	0.91	0.91
3	0.88	0.88
4	0.84	0.84
5	0.80	0.80
6	0.75	0.75
7	0.70	0.70
8	0.60	0.60
9	0.52	0.52
10	0.45	0.45
11	0.41	0.41
12	0.37	0.37
13	0.00	0.34
14	0.00	0.31
15	0.00	0.28
> 15	0.00	0.00

where:

- work duration assumes appropriate allowances for recovery

Work Duration > 1 and <= 2 hours

average lifting frequency rate in lifts per minute	vertical location of hands from floor < 75 cm (30 in)	vertical location of hands from floor >= 75 cm (30 in)
0.2	0.95	0.95
0.5	0.92	0.92
1	0.88	0.88
2	0.84	0.84
3	0.79	0.79
4	0.72	0.72
5	0.60	0.60
6	0.50	0.50
7	0.42	0.42
8	0.35	0.35
9	0.30	0.30
10	0.26	0.26
11	0.00	0.23
12	0.00	0.21
13	0.00	0.00
14	0.00	0.00
15	0.00	0.00
> 15	0.00	0.00

Work Duration > 2 and <= 8 hours

average lifting frequency rate in lifts per minute	vertical location of hands from floor < 75 cm (30 in)	vertical location of hands from floor >= 75 cm (30 in)
0.2	0.85	0.85
0.5	0.81	0.81
1	0.75	0.75
2	0.65	0.65
3	0.55	0.55
4	0.45	0.45
5	0.35	0.35
6	0.27	0.27
7	0.22	0.22
8	0.18	0.18
9	0.00	0.15
10	0.00	0.13
11	0.00	0.00
12	0.00	0.00
13	0.00	0.00
14	0.00	0.00
15	0.00	0.00
> 15	0.00	0.00

Coupling Multiplier

Couplings	vertical location of hands from floor < 75 cm (30 in)	vertical location of hands from floor >= 75 cm (30 in)
good	1.00	1.00
fair	0.95	1.00
poor	0.90	0.90

References:

Waters TR Baron SL et al. Evaluation of the revised NIOSH lifting equation. Spine. 1999; 24: 386-395. (Appendix A page 394)