



EXCEL REPORT USER'S GUIDE -NIOSH METHOD-





User Manual



In this document, a guide for using the report exported from your NawoLive software allowing the analysis of data related to the NIOSH equation method.

In the first section, a presentation of the NIOSH load lifting equation with the different calculation parameters as well as the values related to the multiplication factors of each analyzed parameter.

Section I: When is it possible to use the NIOSH load lifting equation?

You can use the lifting equation to evaluate two-handed lifting and lowering tasks performed by a standing person.

The NIOSH method, using the lifting equation, allows you to predict the risk associated with lifting operations.

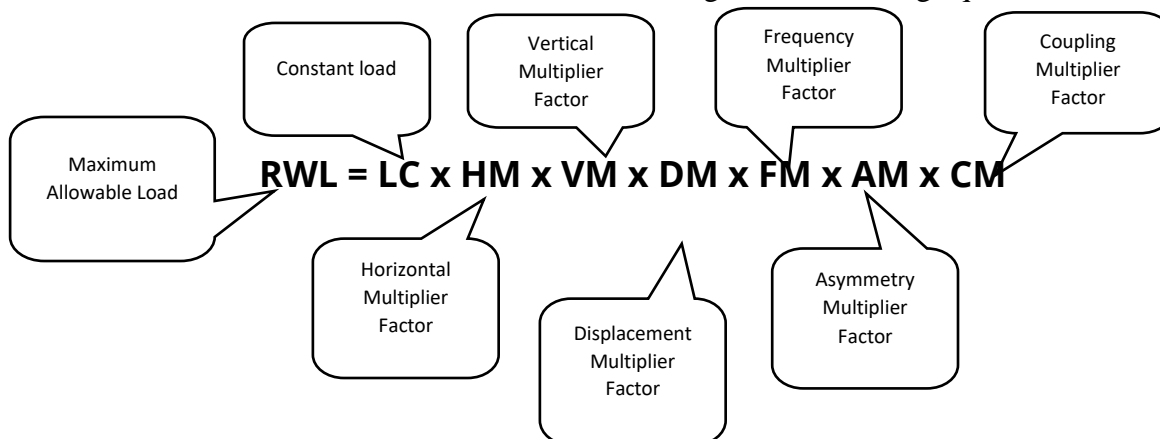
The lifting equation defines a lifting index to calculate the recommended weight limit for specific lifting tasks that most operators could perform during an 8H workday without increasing the risk of developing low back pain.

The result obtained from the method allows to calculate the maximum allowable load taking into consideration 6 critical measures of load lifting tasks.

The calculation takes into consideration:

- The horizontal distance (The distance of the hands on the load from the midpoint between the pegs, which is called H)
- Starting height of the hands from the ground (Vertical position, called V)
- Vertical displacement distance of the lift, called D
- Time between lifts or frequency of lifts, called F
- Angle of the load in relation to the body, called A
- The quality of the grip or grasp according to the available handles, called C

The maximum allowable load is calculated according to the following equation



I. Constant load LC

The load constant in the NIOSH lifting equation is defined as a fixed weight of 23 kg. This load is considered the maximum load that almost all healthy male or female operators should be able to lift under optimal conditions

II. Horizontal Multiplier Factor

The horizontal distance (H) represents the distance between the body of the person and the load to be lifted, more precisely it is the distance between the middle of the ankles and the hands once the load is gripped.

The values are summarized in the following table:

H in cm	HM
<=25	1.00
28	0.89
30	0.83
32	0.78
34	0.74
36	0.69
38	0.66
40	0.63
42	0.60
44	0.57
46	0.54
48	0.52
50	0.50
52	0.48
54	0.46
56	0.45
58	0.43
60	0.42
63	0.40
>63	0.00

a. Restrictions

If the horizontal distance is less than 25 cm, H is considered equal to 25 cm by default. Although most objects can be carried or held within 25cm of the ankles, these objects cannot be lifted without interference with the abdomen or shoulder extension. Although this distance can be limiting for smaller operators, especially when lifting asymmetrical objects.

III. Vertical Multiplier Factor

The vertical distance V is defined as the distance from the ground to the hands at the beginning of the load.

In order to determine the vertical multiplier (VM), the following formula is used

$$VM = 1 - 0.003|V - 75|$$

With:

75 cm the distance considered optimal for subjects of average height of 165 cm.

In the case where V equals 75 cm, VM=1

V in cm	VM
0	0.78
10	0.81
20	0.84
30	0.87
40	0.90
50	0.93
60	0.96
70	0.99
80	0.99
90	0.96
100	0.93
110	0.90
120	0.87
130	0.84
140	0.81

150	0.78
160	0.75
170	0.72
175	0.70
>175	0.00

IV. Displacement Multiplier Factor

The displacement multiplier DM is calculated from the distance variable D.

The Vertical Distance variable (D) is defined as the vertical hand travel distance between the origin and destination of the lift.

To calculate the lift travel distance, D can be calculated by subtracting the vertical position (V) at the origin of the final lift position from the corresponding V at the lift destination (i.e., D is equal to the vertical distance of the lift).

Restrictions

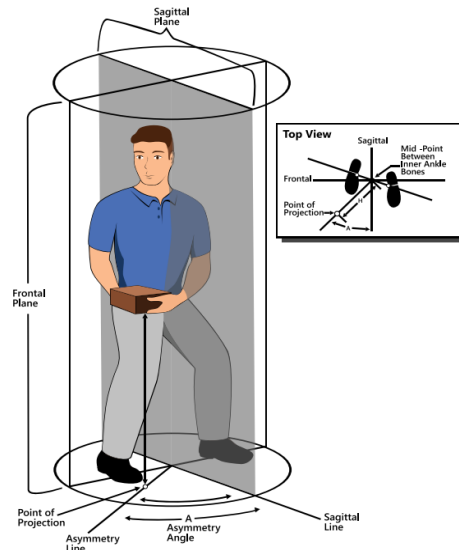
The displacement distance D is assumed to be at least 25 cm (10 inches) and not more than 175 cm (175 inches).

If the vertical travel distance is less than 25 cm (10 inches), D must be set to the minimum distance of 25 cm.

D in cm	DM
≤ 25	1.00
40	0.93
55	0.90
70	0.88
85	0.87
100	0.87
115	0.86
130	0.86
145	0.85
160	0.85
175	0.85
≥ 175	0.00

V. Asymmetry Factor Multiplier

The angle of asymmetry (A) is operationally defined as the angle between the line of asymmetry and the mid-sagittal line.



The asymmetric angle is operationally defined as the angle between the line of asymmetry and the sagittal midline.

The asymmetry angle is not defined by the foot position or the torso twist angle, but by the location of the load relative to the worker's sagittal midline.

The angle A is limited to the range between 0° and 135°. If $A > 135^\circ$, AM is zero, resulting in an RWL of zero, or zero load.

A in °	AM
0	1.00
15	0.95
30	0.90
45	0.86
60	0.81
75	0.76
90	0.71
105	0.66
120	0.62
135	0.57
>135	0.00

VI. Frequency Factor Multiplier

The frequency multiplier is defined by the number of lifts per minute (frequency), the time spent on the lifting activity, and the vertical height from the ground.

The lifting frequency F is the average number of lifts performed per minute, measured over a 15-minute period.

The lifting frequency F for repetitive lifting can range from 0.2 lifts/min to a maximum frequency that depends on the vertical location of the object V and the duration of the operation.

The FM value depends on the average number of lifts/min (F), the vertical position (V) of the hands at the original position, and the duration of the continuous lift.

For lifting tasks with a frequency of less than 0.2 lifts per minute, set the frequency to 0.2 lifts/minute. For infrequent lifting (i.e., $F < 0.1$ lifts/minute), the recovery period will generally be sufficient to use the 1-hour duration category.

Frequency of lifts/ min	Work Duration					
	<=1 Hour		>1 et <=2 Hour		>2 et 8 Hour	
	V<30	V>=30	V<30	V>=30	V<30	V>=30
<=0.2	1	1	0.95	0.95	0.85	0.85
0.5	0.97	0.97	0.92	0.92	0.81	0.81
1	0.94	0.94	0.88	0.88	0.75	0.75
2	0.91	0.91	0.84	0.84	0.65	0.65
3	0.88	0.88	0.79	0.79	0.55	0.55
4	0.84	0.84	0.72	0.72	0.45	0.45
5	0.80	0.80	0.60	0.60	0.35	0.35
6	0.75	0.75	0.50	0.50	0.27	0.27
7	0.70	0.70	0.42	0.42	0.22	0.22
8	0.60	0.60	0.35	0.35	0.18	0.18
9	0.52	0.52	0.30	0.30	0.00	0.15
10	0.45	0.45	0.26	0.26	0.00	0.13
11	0.41	0.41	0.00	0.23	0.00	0.00
12	0.37	0.37	0.00	0.21	0.00	0.00
13	0.00	0.34	0.00	0.00	0.00	0.00
14	0.00	0.31	0.00	0.00	0.00	0.00
15	0.00	0.28	0.00	0.00	0.00	0.00
>15	0.00	0.00	0.00	0.00	0.00	0.00

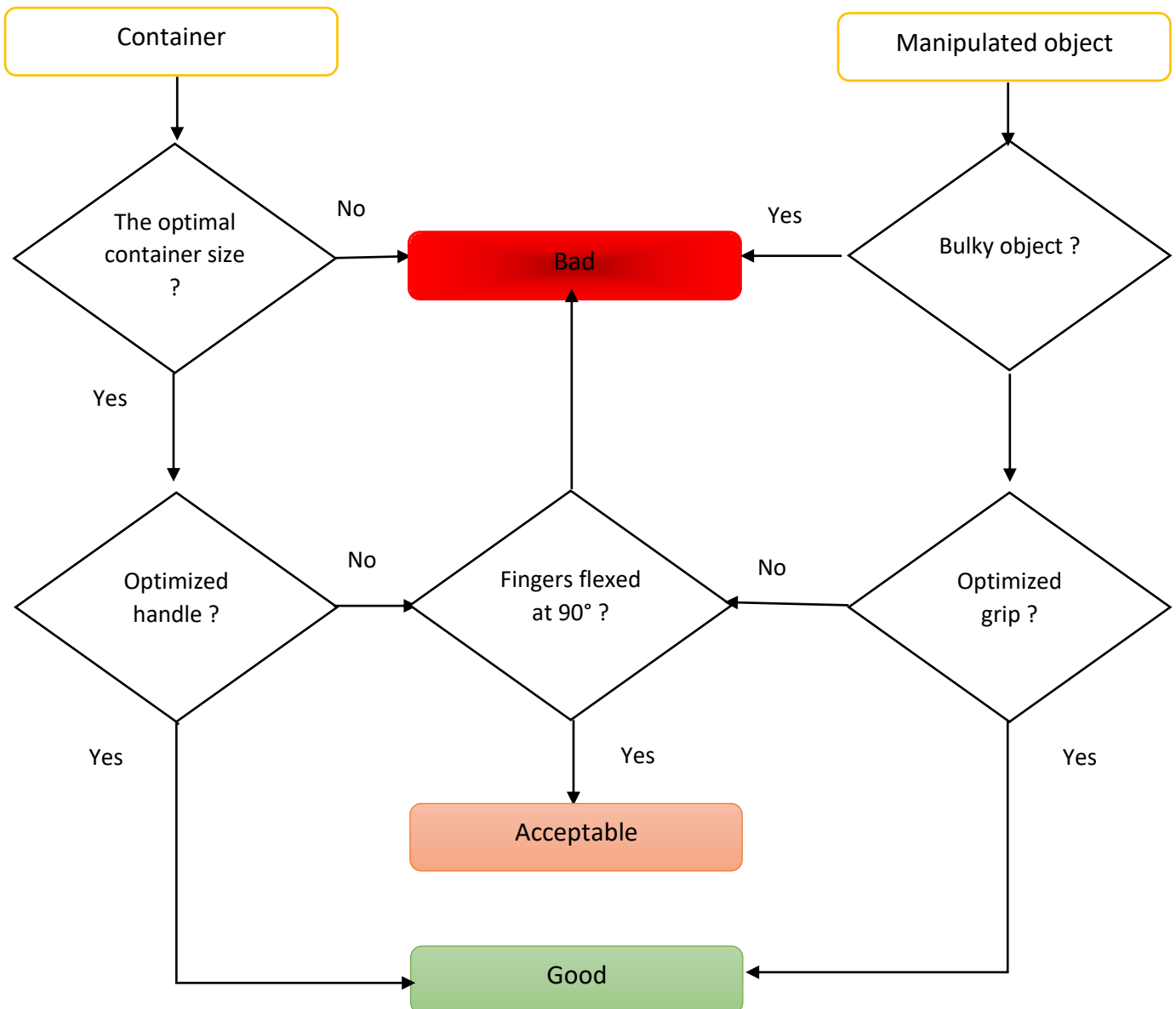
VII. Coupling Factor Multiplier

Depending on the coupling and the vertical placement of the object, the CM multiplication factor is determined based on the type of gripping and according to the following table:

Coupling Type	Coupling Multiplier	
	V<75 cm	V>=75 cm
Good	1.00	1.00
Acceptable	0.95	1.00
Bad	0.90	0.90

How to choose the type of grip?

The "Coupling" parameter describes the way the operator handles or grabs the object to be handled or the load.



Section II: Exportable report from NawoLive

In the report exported from NawoLive, an analysis of the Niosh equation is presented

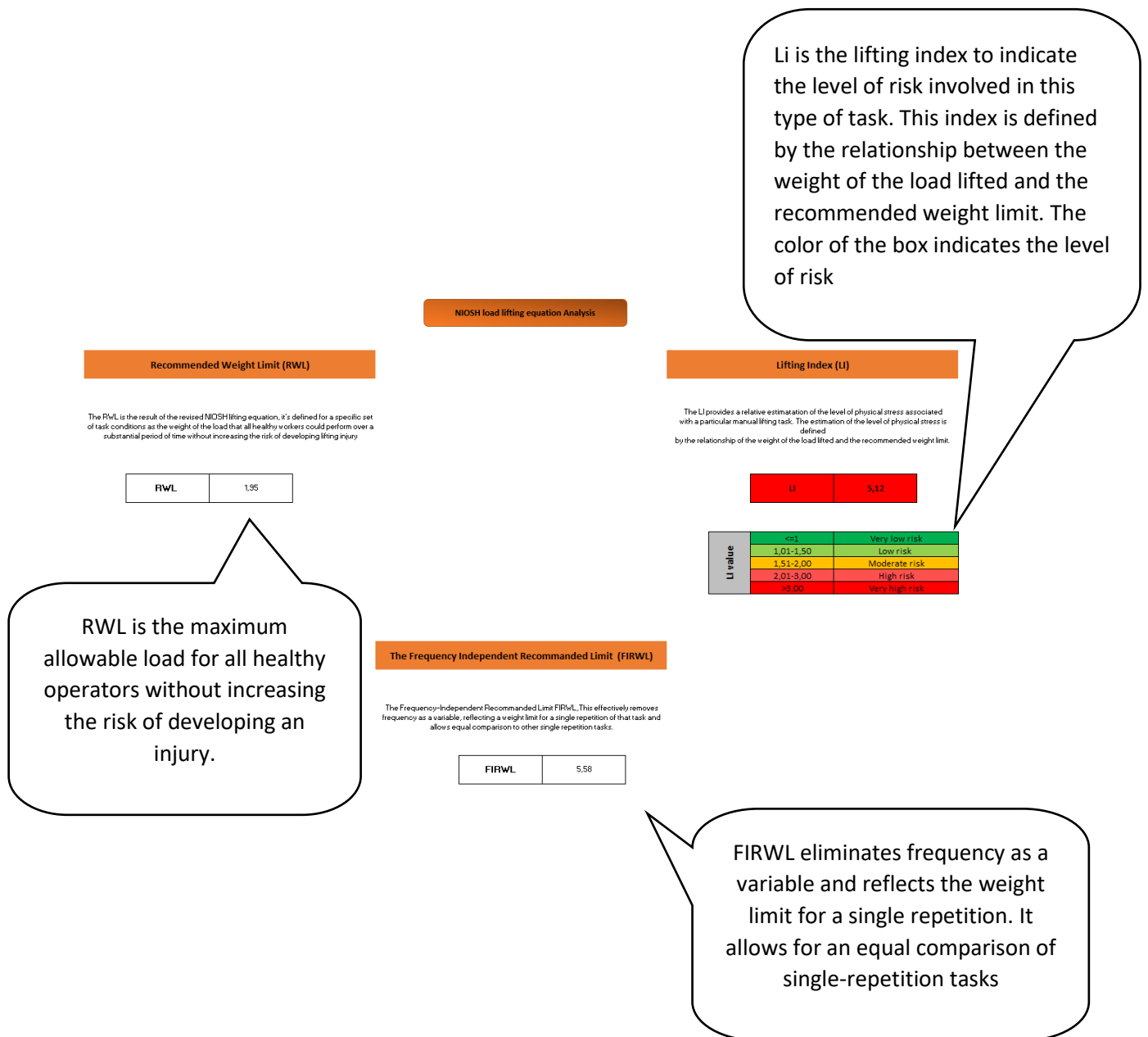
Each task is analyzed in a separate way allowing a complete analysis for each parameter **Part**

I: Analysis of each « Task »

Global Analysis	Task 1	Task 2	Task 3	Task 4	RawData	Reference Values
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Considering the example of the first task named « Task 1 »

An overall analysis of the task is represented by analyzing the maximum allowable load "RWL", the lifting index "LI" and the recommended independent limit frequency "FIRWL".



Risk factors analyzed

Each risk factor is obtained based on calculations obtained from the NawaLive software

Assessment of the six factors when analyzing the handling task

Horizontal Multiplier Factor (HF)

Based on H which is the horizontal distance in cm between the middle of the ankles and the projection of the hands on the ground after gripping the object

Horizontal Multiplier Factor



Horizontal Multiplier Factor:
Based on the data from the analysis, it is possible to use the table in Section I Part II to reduce this risk

Vertical Multiplier Factor (VF)

Based on V which is the distance in cm that separates the ground from the hands at the beginning of the handling task

Vertical Multiplier Factor



Horizontal Multiplier Factor:
Based on the data from the analysis, it is possible to use the table in Section I Part III to reduce this risk

Displacement Multiplier Factor (DF)

Based on D which Represents the vertical displacement in cm of the object during the handling task

Displacement Multiplier Factor



Displacement Multiplier Factor: Based on the displacement distance, it is possible to adjust in case of risk in the orange or red zone based on the table in section I Part IV.

Asymmetry Multiplier Factor (AF)

Based on A which is the angle formed by the load to be lifted and the body, in °, during the lifting task

Asymmetry Multiplier Factor

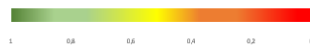


Asymmetry Multiplier Factor indicating the angle between the load and the operator and can be used as an indicator for workstation design based on the table in Section I Part V

Frequency Multiplier Factor (FF)

F is the number of lifts per unit time and the continuous handling time, minute or second, during a task

Frequency Multiplier Factor



Frequency Multiplier Factor indicating the risk related to repetition by calculating the number of lifts/min, based on the table in Section I Part VI

Part II: Global Analysis

In this section, we summarize the key indicators obtained during the evaluation, starting with the workstation and then the global parameters

Evaluation Information

Date

Evaluator

Evaluation reference

WorkStation

NIOSH load lifting equation Global Analysis

Largest Single Task Lifting Index (LSTLI)

The Largest Single Task Lifting Index represents the division of the average load weight and the single task recommended weight limit

LSTLI	5,12
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The larger task single lift index "LSTLI" represents the division of the average load weight and the recommended weight limit for the single task.

Composite Lifting Index (CLI)

The CLI (Composite Lifting Index) determines the additive affect of several tasks and is obtained by renumbering the tasks in decreasing order of physical difficulty of each task.

CLI	33,23
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Composite Lifting Index "CLI" determines the additive effect of several tasks and is obtained by renumbering the tasks in descending order of physical difficulty of each task.

$\Sigma \Delta$ lifting Index ($\Sigma \Delta$ LI)

The Δ LI value is calculated using the Frequency Independent Lifting Index value and the change in Frequency of lift multiplier caused by adding the additional task

$\Sigma \Delta$ LI	2,68
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The Δ LI value is calculated using the frequency-independent lift index value and the change in the lift frequency multiplier caused by the addition of the extra task.

Subsequently, we propose to note the level of criticality observed in relation to all the tasks studied, to determine the most critical tasks among all the parameters analyzed.

NIOSH load lifting equation Analysis

In this section, the representation of the riskier multipliers for all tasks analysed with corresponding task. Coloured indicators allow you to estimate the level of risk related to the Factor

Highest Risk related to Horizontal Factor Multiplier		
Task	2	0,33

Highest Risk related to Vertical Factor Multiplier		
Task	4	0,85

Highest Risk related to Displacement Factor Multiplier		
Task	2	0,85

Highest Risk related to Asymmetric Factor Multiplier		
Task	2	0,79

Highest Risk related to Frequency Factor Multiplier		
Task	5	0,21