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APPENDICES

Appendix 1: NIOSH frequency multiplier table

Frequency Multiplier Table (FM)

Source: [49]

```
==================================================================
                          Work Duration

            ---------------------------------------------------
Frequency       <= 1 Hour    >1 but <=2 Hours  >2 but <=8 Hours
Lifts/min   ------------- ----------------  ----------------
     (F):   V<30+  V>=30    V<30    V>=30      V<30    V>=30

---------   -----  -----    ----    -----      ----    -----
<=0.2   1.00    1.00      .95     .95        .85     .85
    0.5    .97     .97      .92     .92        .81     .81
      1    .94     .94      .88     .88        .75     .75
      2    .91     .91      .84     .84        .65     .65
      3    .88     .88      .79     .79        .55     .55
      4    .84     .84      .72     .72        .45     .45
      5    .80     .80      .60     .60        .35     .35
      6    .75     .75      .50     .50        .27     .27
      7    .70     .70      .42     .42        .22     .22
      8    .60     .60      .35     .35        .18     .18
      9    .52     .52      .30     .30        .00     .15
     10    .45     .45      .26     .26        .00     .13
     11    .41     .41      .00     .23        .00     .00
     12    .37     .37      .00     .21        .00     .00
     13    .00     .34      .00     .00        .00     .00
     14    .00     .31      .00     .00        .00     .00
     15    .00     .28      .00     .00        .00     .00
>15    .00     .00      .00     .00        .00     .00


+  Values of V are in inches

:  For lifting less frequently than once per 5 minutes, set

   F = 0.2 lifts/minute
```

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Appendix 2: Table to select the adequate ACGIH lifting TLV table

TABLE TO SELECT THE ADEQUATE ACGIH LIFTING TLV TABLE

Lifts per hour	Duration of Task per day	
	≤ 2h	>2h
≤ 60	Table 3	
≤ 12		Table 3
> 12 and ≤ 30		Table 4
> 60 and ≤ 360	Table 4	
> 30 and ≤ 360		Table 5

Source: [5]

Appendix 3: ACGIH Lifting table 1- TLVs for infrequent lifting

TLVs[®] for Infrequent Lifting:

≤ 2 Hours per Day with ≤ 60 Lifts per Hour OR

≥ 2 Hours per Day with ≤ 12 Lifts per Hour

	Horizontal Zone		
	Close: < 30 cm	Intermediate:3 0 to 60 cm	Extended: > 60 to 80 cm
Reach limit or 30 cm above shoulder to 8 cm below shoulder height	16 kg	7 kg	No known safe limit for repetitive lifting
Knuckle height to Below shoulder	32 kg	16 kg	9 kg
Middle shin to knuckle height	18 kg	14 kg	7 kg
Floor to middle shin height	14 kg	No known safe limit for repetitive lifting	No known safe limit for repetitive lifting

Source: [5]

Appendix 4: ACGIH Lifting table 2 - TLVs for moderately frequent lifting

> 2 Hours per Day with > 12 and ≤ 30 Lifts per Hour OR

≤ 2 Hours per Day with > 60 and ≤ 360 Lifts per Hour

Vertical Zone	Horizontal Zone		
	Close: < 30 cm	Intermediate: 30 to 60 cm	Extended: > 60 to 80 cm
Reach limit or 30 cm above shoulder to 8 cm below shoulder height	14 kg	5 kg	No known safe limit for repetitive lifting
Knuckle height to Below shoulder	27 kg	14 kg	7 kg
Middle shin to knuckle height	16 kg	11 kg	5 kg
Floor to middle shin height	9 kg	No known safe limit for repetitive lifting	No known safe limit for repetitive lifting

Source [5]

Appendix 5: ACGIH Lifting table 3 - TLVs for frequent, long duration lifting

TLVs for frequent, long duration lifting

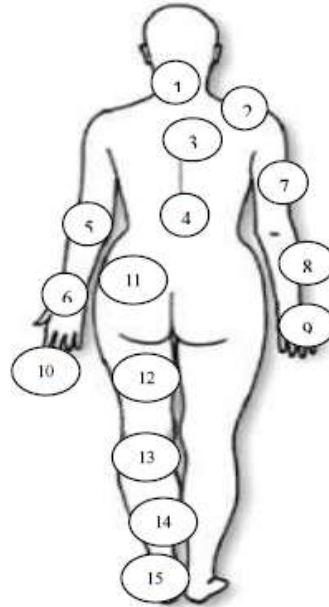> 2 Hours per Day with > 30 and ≤ 360 Lifts per Hour

	Horizontal Zone		
Vertical Zone	**Close:** **< 30 cm**	**Intermediate:3** **0 to 60 cm**	**Extended:** **> 60 to 80 cm**
Reach limit or 30 cm above shoulder to 8 cm below shoulder height	11 kg	**No known safe limit for repetitive lifting**	**No known safe limit for repetitive lifting**
Knuckle height to Below shoulder	14 kg	9 kg	5 kg
Middle shin to knuckle height	9 kg	7 kg	2 kg
Floor to middle shin height	**No known safe limit for repetitive lifting**	**No known safe limit for repetitive lifting**	**No known safe limit for repetitive lifting**

Source: [5]

Appendix 6: Ergonomic discomfort scale

Ergonomic discomfort scale

| Date : |
| Shift : |
| Emp No : |
| Job : |
| Job No |
| Start time: |
| End time: |

Body Part		No discomfort				Extreme discomfort	
1	Neck	0	1	2	3	4	5
2	Shoulder (R)	0	1	2	3	4	5
	Shoulder (L)	0	1	2	3	4	5
3	Upper back	0	1	2	3	4	5
4	Lower back	0	1	2	3	4	5
5	Elbow (R)	0	1	2	3	4	5
	Elbow (L)	0	1	2	3	4	5
6	Wrist (R)	0	1	2	3	4	5
	Wrist (L)	0	1	2	3	4	5
7	Upper arm (R)	0	1	2	3	4	5
	Upper arm (L)	0	1	2	3	4	5
8	Forearm (R)	0	1	2	3	4	5
	Forearm (L)	0	1	2	3	4	5
9	Hand (R)	0	1	2	3	4	5
	Hand (L)	0	1	2	3	4	5
10	Fingers(R)	0	1	2	3	4	5
	Fingers(L)	0	1	2	3	4	5
11	Hips Or Buttock	0	1	2	3	4	5
12	Upper Leg (R)	0	1	2	3	4	5
	Upper Leg (L)	0	1	2	3	4	5
13	Knee(R)	0	1	2	3	4	5
	Knee(L)	0	1	2	3	4	5
14	Lower Leg (R)	0	1	2	3	4	5
	Lower Leg (L)	0	1	2	3	4	5
15	Ankle/Foot(R)	0	1	2	3	4	5
	Ankle/Foot(L)	0	1	2	3	4	5

Appendix 7: NIOSH Lifting Equation calculator -Job Analysis Sheet for job 1

NIOSH Lifting Equation calculator -Job Analysis Sheet

Job No	1

NIOSH Lifting Variable	Value	Multiplier
Horizontal Location (H)	10in	1
Vertical Location (V)	15in	.89
Travel Distance (D)	9in	1
Angle of Assymetry (A)	0	1
Coupling (C)(1 -good, 2- fair, 3 - poor)	Fair	1
Frequency - (F)	12/hr	.85
Average load lifted (L) (lbs)		25kg
Max Load Lifted (L) (lbs)		25kg
Duration (D) (1-short, 2- Moderate, 8 - long)	8 hrs	1
RWL = 23 xHM x VM x DM x AM x FM x CM		17.4 kg
Lifting index		1.43
Status		Risky

Appendix 8: WISHA Lifting Calculator -Job Analysis Sheet for job1

WISHA Lifting Calculator -Job Analysis Sheet

Job No	1

Actual weight	25 kg
Unadjustted Weight Limit	50lb
Lifts per Minute	0.2
Hours per Day	8
Twisting	0

Unadjusted weight Limit x	50lb
Twisting Adjustment	1
Adjusted Weight Limit x	50lb
Limit Reduction Multiplier	.85
Weight Limit	42.5lb(19.3kg)

Weight Limit	19.3
Actual Weight	25
Lifting Index	1.29
Status	Risky

Determine Unadjusted Weight Limit:

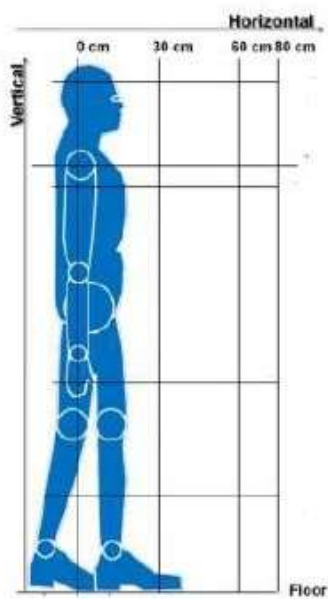|	lbs lbs	lbs
Above shoulder	65 40	30
Waist to shoulder	70 50	40
Knee to waist	90 55	40
Below Knee	70 50	35

0"   7"   12"
Near Mid Extended

Appendix 9: ACGIH Lifting TLV calculator -Job Analysis Sheet for job 1

ACGIH Lifting Threshold Limit Values calculator -Job Analysis Sheet
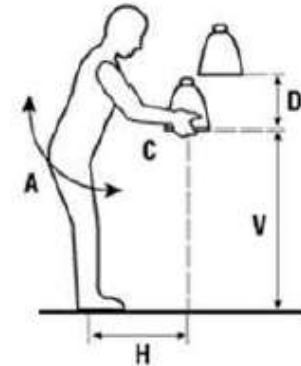
Job No   1

ACGIH Lifting Variable	Value
Weight	25kg
Lifting frequency	12 lift/hr
Vertical Zone	15 inches
Horizontal zone	10 inches
Lifting TLV	18 kg
Lifting index	1.39
Status	Risky

Appendix 10: NIOSH Lifting Equation calculator -Job Analysis Sheet for job 2

NIOSH Lifting Equation calculator -Job Analysis Sheet

Job No	2

NIOSH Lifting Variable	Value	Multiplier
Horizontal Location (H)	20in	.5
Vertical Location (V)	13in	.87
Travel Distance (D)	7in	1
Angle of Assymetry (A)	0	1
Coupling (C)(1 -good, 2- fair, 3 - poor)	Fair	1
Frequency - (F)	20/hr	.81
Average load lifted (L) (lbs)	12.5kg	
Max Load Lifted (L) (lbs)	12.5kg	
Duration (D) (1-short, 2- Moderate, 8 - long)	8 hrs	1
RWL = 23 xHM x VM x DM x AM x FM x CM		8.10 kg
Lifting index		1.48
Status		Risky

Appendix 11: WISHA Lifting Calculator -Job Analysis Sheet for job 2
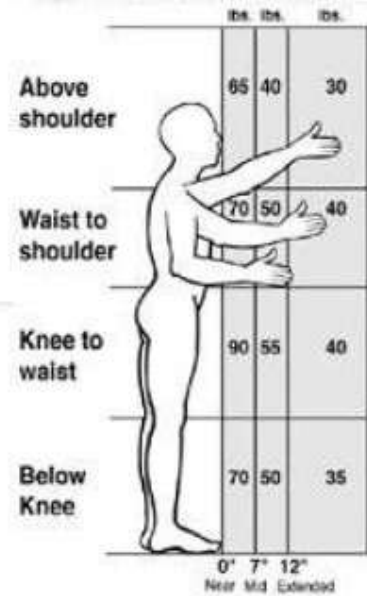
WISHA Lifting Calculator -Job Analysis Sheet

Job No   2

Actual weight	12.5 kg
Unadjusted Weight Limit	35 lb
Lifts per Minute	0.33
Hours per Day	8
Twisting	0

Unadjusted weight Limit x	35 lb
Twisting Adjustment	1
Adjusted Weight Limit x	35 lb
Limit Reduction Multiplier	.85
Weight Limit	29.75lb(13.5kg)

Weight Limit	13.5
Actual Weight	12.5
Lifting Index	0.925
Status	Not Risky

Determine Unadjusted Weight Limit:

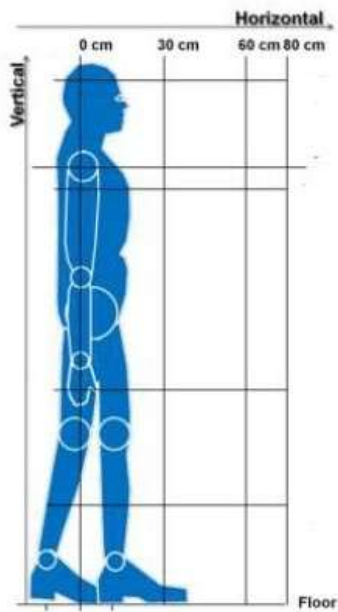|	lbs.	lbs.	lbs.
Above shoulder	65	40	30
Waist to shoulder	70	50	40
Knee to waist	90	55	40
Below Knee	70	50	35

0°   7°   12°
Near Mid Extended

Appendix 12: ACGIH Lifting TLV calculator -Job Analysis Sheet for job 2

ACGIH Lifting Threshold Limit Values calculator -Job Analysis Sheet

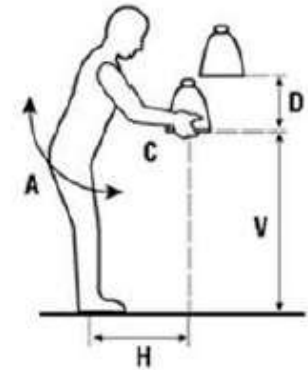Job No   2

ACGIH Lifting Variable	Value
Weight	12.5kg
Lifting frequency	20 lift/hr
Vertical Zone	13 inches
Horizontal zone	20 inches
Lifting TLV	14 kg
Lifting index	0.89
Status	Not Risky

Appendix 13: NIOSH Lifting Equation calculator -Job Analysis Sheet for job 3

NIOSH Lifting Equation calculator -Job Analysis Sheet

Job No	3

NIOSH Lifting Variable	Value	Multiplier
Horizontal Location (H)	10in	1
Vertical Location (V)	40in	.92
Travel Distance (D)	34in	.87
Angle of Assymetry (A)	0	1
Coupling (C)(1 -good, 2- fair, 3 - poor)	Fair	0.95
Frequency - (F)	10/hr	.85
Average load lifted (L) (lbs)	25kg	
Max Load Lifted (L) (lbs)	25kg	
Duration (D) (1-short, 2- Moderate, 8 - long)	8 hrs	1
RWL = 23 xHM x VM x DM x AM x FM x CM		14.9kg
Lifting index		1.74
Status		Risky

Appendix 14: WISHA Lifting Calculator -Job Analysis Sheet for job 3
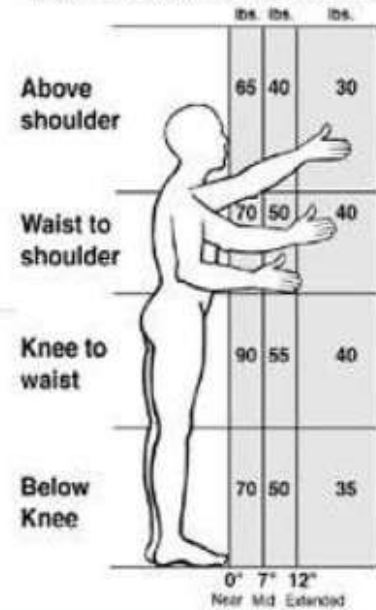
WISHA Lifting Calculator -Job Analysis Sheet

Job No	3

Actual weight	25 kg
unadjusted Weight Limit	55 lb
Lifts per Minute	.16
Hours per Day	8
Twisting	0

Unadjusted weight Limit x	55lb
Twisting Adjustment	1
Adjusted Weight Limit x	55lb
Limit Reduction Multiplier	.85
Weight Limit	46.75lb(21.22kg)

Weight Limit	21.22
Actual Weight	25
Lifting Index	1.17
Status	Risky

Determine Unadjusted Weight Limit:

	lbs.	lbs.	lbs.
Above shoulder	65	40	30
Waist to shoulder	70	50	40
Knee to waist	90	55	40
Below Knee	70	50	35

0°   7°   12°
Near   Mid   Extended
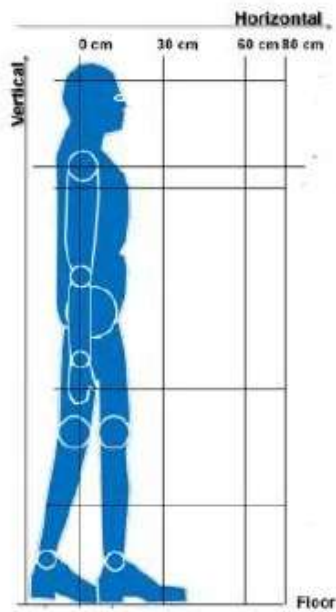
Appendix 15: ACGIH Lifting TLV calculator -Job Analysis Sheet for job 3

ACGIH Lifting Threshold Limit Values calculator -Job Analysis Sheet
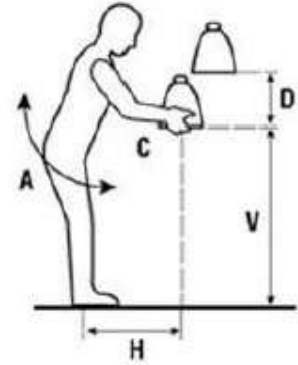
Job No   3

ACGIH Lifting Variable	Value
Weight	25kg
Lifting frequency	10 lift/hr
Vertical Zone	40 inches
Horizontal zone	10 inches
Lifting TLV	32kg
Lifting index	0.78
Status	safe

Appendix 16: NIOSH Lifting Equation calculator -Job Analysis Sheet for job 4

NIOSH Lifting Equation calculator -Job Analysis Sheet

Job No	4

NIOSH Lifting Variable	Value	Multiplier
Horizontal Location (H)	18in	.55
Vertical Location (V)	36in	.95
Travel Distance (D)	30in	.88
Angle of Assymetry (A)	0	1
Coupling (C)(1 -good, 2- fair, 3 - poor)	Fair	0.95
Frequency - (F)	10/hr	.85
Average load lifted (L) (lbs)	10kg	
Max Load Lifted (L) (lbs)	10kg	
Duration (D) (1-short, 2- Moderate, 8 - long)	8 hrs	1
RWL = 23 xHM x VM x DM x AM x FM x CM		8.53kg
Lifting index		1.17
Status		Risky

Appendix 17: WISHA Lifting Calculator -Job Analysis Sheet for job 4
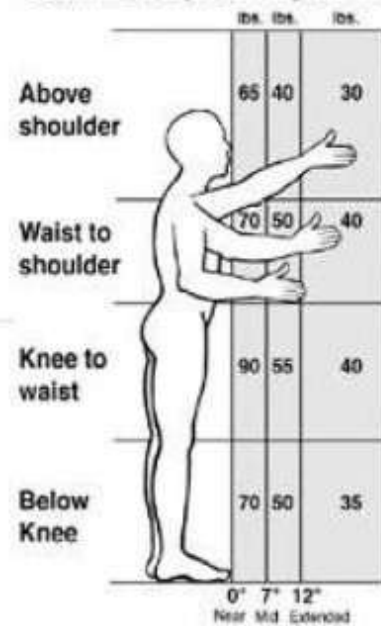
WISHA Lifting Calculator -Job Analysis Sheet

Job No	4

Actual weight	10 kg
Unadjusted Weight Limit	40lb
Lifts per Minute	.13
Hours per Day	8
Twisting	0

Unadjusted weight Limit x	40lb
Twisting Adjustment	1
Adjusted Weight Limit x	40lb
Limit Reduction Multiplier	.85
Weight Limit	34lb(15.43kg)

Weight Limit	16.43 kg
Actual Weight	10
Lifting Index	0.65
Status	Not Risky

Determine Unadjusted Weight Limit

	lbs.	lbs.	lbs.
Above shoulder	65	40	30
Waist to shoulder	70	50	40
Knee to waist	90	55	40
Below Knee	70	50	35

0° 7° 12°
Near Mid Extended
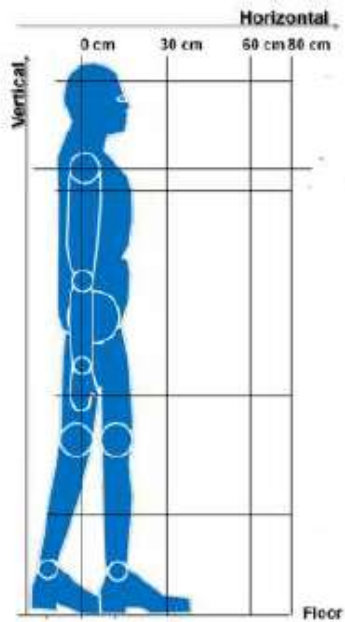
Appendix 18: ACGIH Lifting TLV calculator -Job Analysis Sheet for job 4

ACGIH Lifting Threshold Limit Values calculator -Job Analysis Sheet

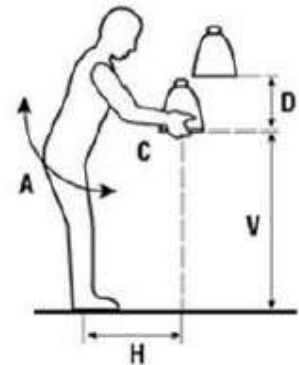Job No   4

ACGIH Lifting Variable	Value
Weight	10kg
Lifting frequency	8 lift/hr
Vertical Zone	36 inches
Horizontal zone	18 inches
Lifting TLV	14kg
Lifting index	0.71
Status	Not risky

Appendix 19: NIOSH Lifting Equation calculator -Job Analysis Sheet for job 5

NIOSH Lifting Equation calculator -Job Analysis Sheet

Job No	5

NIOSH Lifting Variable	Value	Multiplier
Horizontal Location (H)	10in	1
Vertical Location (V)	50in	.85
Travel Distance (D)	44in	.86
Angle of Assymetry (A)	0	1
Coupling (C)(1 -good, 2- fair, 3 - poor)	Fair	0.95
Frequency - (F)	10/hr	.85
Average load lifted (L) (lbs)	25kg	
Max Load Lifted (L) (lbs)	25kg	
Duration (D) (1-short, 2- Moderate, 8 - long)	8 hrs	
RWL = 23 xHM x VM x DM x AM x FM x CM		13.57kg
Lifting index		1.84
Status		Risky

Appendix 20: WISHA Lifting Calculator -Job Analysis Sheet for job 5

WISHA Lifting Calculator -Job Analysis Sheet

Job No | 5

Actual weight	25 kg
Unadjusted Weight Limit	50lb
Lifts per Minute	.16
Hours per Day	8
Twisting	0

Unadjusted weight Limit x	50lb
Twisting Adjustment	1
Adjusted Weight Limit x	50lb
Limit Reduction Multiplier	.85
Weight Limit	42.5lb(19.2)

Weight Limit	19.2 kg
Actual Weight	25
Lifting Index	1.30
Status	Risky

Determine Unadjusted Weight Limit:

	lbs. lbs.	lbs.
Above shoulder	65 40	30
Waist to shoulder	70 50	40
Knee to waist	90 55	40
Below Knee	70 50	35

0° 7° 12°
Near Mid Extended

Appendix 21: ACGIH Lifting TLV calculator -Job Analysis Sheet for job 5

ACGIH Lifting Threshold Limit Values calculator -Job Analysis Sheet

Job No | 5

ACGIH Lifting Variable	Value
Weight	25 kg
Lifting frequency	10 lift/hr
Vertical Zone	50 inches
Horizontal zone	10 inches
Lifting TLV	32 kg
Lifting index	0.78
Status	Not Risky

Appendix 22: NIOSH Lifting Equation calculator -Job Analysis Sheet for job 6

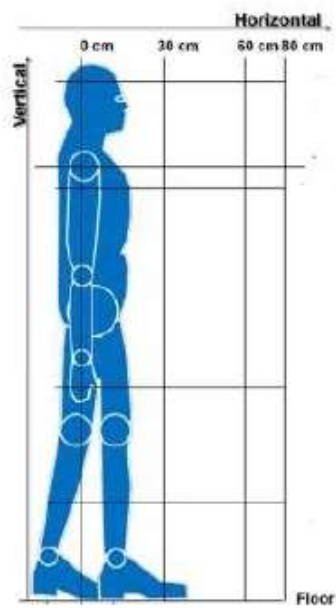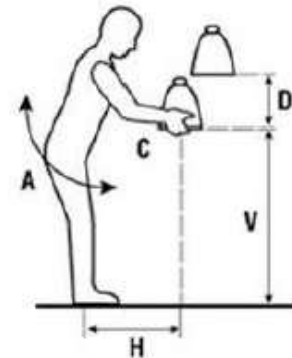## NIOSH Lifting Equation calculator -Job Analysis Sheet

Job No	6

NIOSH Lifting Variable	Value	Multiplier
Horizontal Location (H)	14in	0.71
Vertical Location (V)	45in	.89
Travel Distance (D)	39in	.87
Angle of Assymetry (A)	0	1
Coupling (C)(1 -good, 2- fair, 3 - poor)	Fair	0.95
Frequency - (F)	10/hr	.85
Average load lifted (L) (lbs)	20kg	
Max Load Lifted (L) (lbs)	20kg	
Duration (D) (1-short, 2- Moderate, 8 - long)	8 hrs	
RWL = 23 xHM x VM x DM x AM x FM x CM		14.38
Lifting index		1.39
Status		Risky

Appendix 23: WISHA Lifting Calculator -Job Analysis Sheet for job 6

WISHA Lifting Calculator -Job Analysis Sheet

Job No	6

Actual weight	20 kg
Unadjusted Weight Limit	40lb
Lifts per Minute	.16
Hours per Day	8
Twisting	0

Determine Unadjusted Weight Limit:

	lbs.	lbs.	lbs.
Above shoulder	65	40	30
Waist to shoulder	70	50	40
Knee to waist	90	55	40
Below Knee	70	50	35

0" 7" 12"
Near Mid Extended

Unadjusted weight Limit x	50lb
Twisting Adjustment	1
Adjusted Weight Limit x	50lb
Limit Reduction Multiplier	.85
Weight Limit	34lb(19.2)

Weight Limit	15.43 kg
Actual Weight	25
Lifting Index	1.30
Status	Risky

Appendix 24: ACGIH Lifting TLV calculator -Job Analysis Sheet for job 6

ACGIH Lifting Threshold Limit Values calculator -Job Analysis Sheet

Job No   6

ACGIH Lifting Variable	Value
Weight	20
Lifting frequency	10 lift/hr
Vertical Zone	45 inches
Horizontal zone	14 inches
Lifting TLV	16 kg
Lifting index	1.25
Status	Risky

Appendix 25: NIOSH Lifting Equation calculator -Job Analysis Sheet for job 7

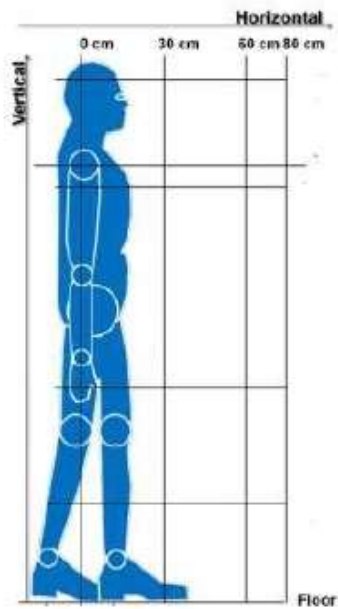<u>NIOSH Lifting Equation calculator -Job Analysis Sheet</u>

Job No	7

NIOSH Lifting Variable	Value	Multiplier
Horizontal Location (H)	10in	1
Vertical Location (V)	16in	.90
Travel Distance (D)	8in	1
Angle of Assymetry (A)	0	1
Coupling (C)(1 -good, 2- fair, 3 - poor)	Fair	1
Frequency - (F)	12/hr	.85
Average load lifted (L) (lbs)		15kg
Max Load Lifted (L) (lbs)		15kg
Duration (D) (1-short, 2- Moderate, 8 - long)	8 hrs	1
RWL = 23 xHM x VM x DM x AM x FM x CM		17.6 kg
Lifting index		0.85
Status		Not Risky

Appendix 26: WISHA Lifting Calculator -Job Analysis Sheet for job 7

WISHA Lifting Calculator -Job Analysis Sheet

Job No

7

Actual weight	15 kg
Unadjusted Weight Limit	50lb
Lifts per Minute	0.2
Hours per Day	8
Twisting	0

Unadjusted weight Limit x	50lb
Twisting Adjustment	1
Adjusted Weight Limit x	50lb
Limit Reduction Multiplier	.85
Weight Limit	42.5lb(19.3kg)

Weight Limit	19.3
Actual Weight	15
Lifting Index	0.78
Status	Not Risky

Determine Unadjusted Weight Limit

	lbs.	lbs.	lbs.
Above shoulder	65	40	30
Waist to shoulder	70	50	40
Knee to waist	90	55	40
Below Knee	70	50	35

0" 7" 12"
Near Mid Extended

Appendix 27: ACGIH Lifting TLV calculator -Job Analysis Sheet for job 7

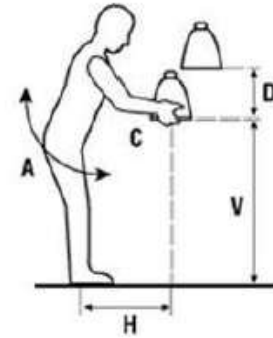**ACGIH Lifting Threshold Limit Values calculator -Job Analysis Sheet**

Job No   7

ACGIH Lifting Variable	Value
Weight	15kg
Lifting frequency	12 lift/hr
Vertical Zone	16 inches
Horizontal zone	10 inches
Lifting TLV	18 kg
Lifting index	0.83
Status	Not Risky

Appendix 28: NIOSH Lifting Equation calculator -Job Analysis Sheet for job 8

NIOSH Lifting Equation calculator -Job Analysis Sheet

Job No	8

NIOSH Lifting Variable	Value	Multiplier
Horizontal Location (H)	16in	0.62
Vertical Location (V)	30in	1
Travel Distance (D)	22in	.90
Angle of Assymetry (A)	0	1
Coupling (C)(1 -good, 2- fair, 3 - poor)	Fair	1
Frequency - (F)	12/hr	.85
Average load lifted (L) (lbs)		12.5kg
Max Load Lifted (L) (lbs)		12.5kg
Duration (D) (1-short, 2- Moderate, 8 - long)	8 hrs	1
RWL = 23 xHM x VM x DM x AM x FM x CM		10.9 kg
Lifting index		1.15
Status		Risky

Appendix 29: WISHA Lifting Calculator -Job Analysis Sheet for job 8

WISHA Lifting Calculator -Job Analysis Sheet

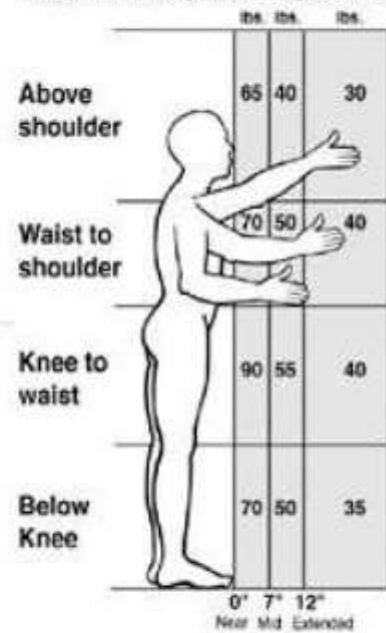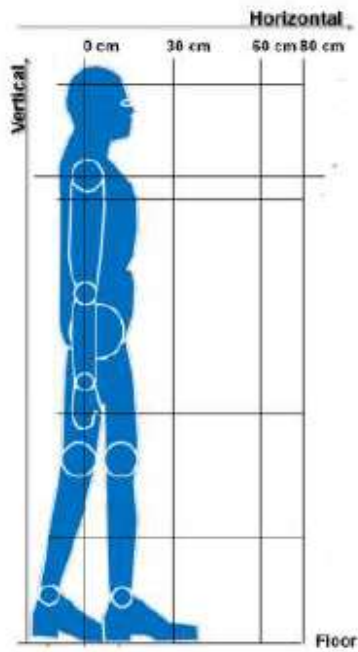| Job No	8

Actual weight	15 kg
Unadjusted Weight Limit	40lb
Lifts per Minute	0.2
Hours per Day	8
Twisting	0

Unadjusted weight Limit x	50lb
Twisting Adjustment	1
Adjusted Weight Limit x	50lb
Limit Reduction Multiplier	.85
Weight Limit	34(15.43kg)

Weight Limit	15.43
Actual Weight	12.5
Lifting Index	0.81
Status	Not Risky

Determine Unadjusted Weight Limit:

	lbs.	lbs.	lbs.
Above shoulder	65	40	30
Waist to shoulder	70	50	40
Knee to waist	90	55	40
Below Knee	70	50	35

0°   7°   12°
Near Mid Extended

Appendix 30: ACGIH Lifting TLV calculator -Job Analysis Sheet for job 8

ACGIH Lifting Threshold Limit Values calculator -Job Analysis Sheet
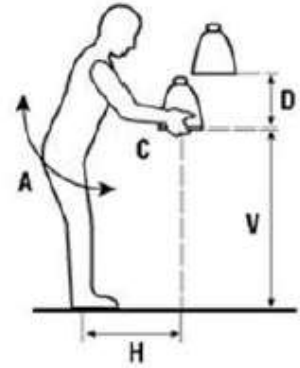
Job No   8

ACGIH Lifting Variable	Value
Weight	12.5kg
Lifting frequency	12 lift/hr
Vertical Zone	16 inches
Horizontal zone	10 inches
Lifting TLV	14 kg
Lifting index	0.89
Status	Not Risky

Appendix 31: NIOSH Lifting Equation calculator -Job Analysis Sheet for job 9

NIOSH Lifting Equation calculator -Job Analysis Sheet

Job No	9

NIOSH Lifting Variable	Value	Multiplier
Horizontal Location (H)	18in	0.56
Vertical Location (V)	15in	0.89
Travel Distance (D)	9in	1
Angle of Assymetry (A)	0	1
Coupling (C)(1 -good, 2- fair, 3 - poor)	2	1
Frequency - (F)	12/hr	0.85
Average load lifted (L) (lbs)	15kg	
Max Load Lifted (L) (lbs)	15 kg	
Duration (D) (1-short, 2- Moderate, 8 - long)	8 hrs	
RWL = 23 xHM x VM x DM x AM x FM x CM		10.14kg
Lifting index		1.48
Status		Risky

Appendix 32: WISHA Lifting Calculator -Job Analysis Sheet for job 9

WISHA Lifting Calculator -Job Analysis Sheet

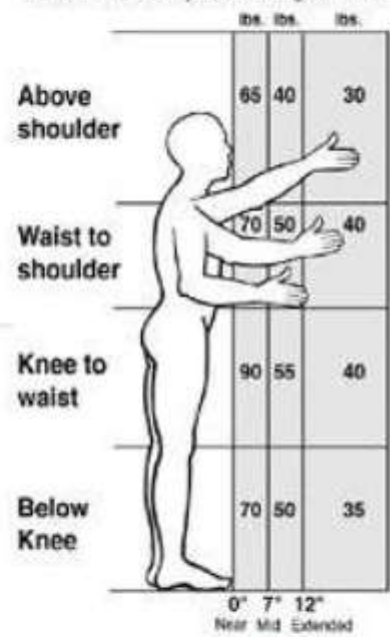Job No

9

Actual weight	15kg
Unadjusted Weight Limit	35 lb
Lifts per Minute	0.2
Hours per Day	8
Twisting	0

Unadjusted weight Limit x	35 lb
Twisting Adjustment	1
Adjusted Weight Limit x	35 lb
Limit Reduction Multiplier	0.85
Weight Limit	29.92lb(13.62kg)

Weight Limit	13.62 kg
Actual Weight	15kg
Lifting Index	1.10
Status	Risky

Determine Unadjusted Weight Limit:

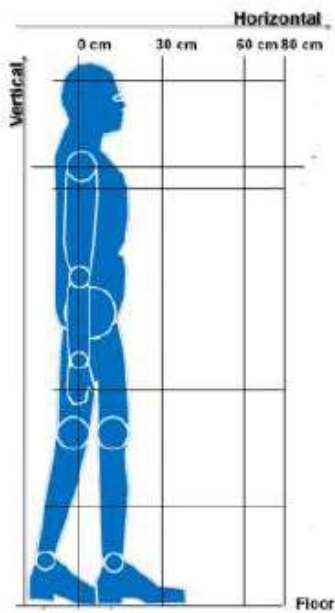|	lbs.	lbs.	lbs.
Above shoulder	65	40	30
Waist to shoulder	70	50	40
Knee to waist	90	55	40
Below Knee	70	50	35

0" 7" 12"
Near Mid Extended

Appendix 33: ACGIH Lifting TLV calculator -Job Analysis Sheet for job 9

ACGIH Lifting Threshold Limit Values calculator -Job Analysis Sheet
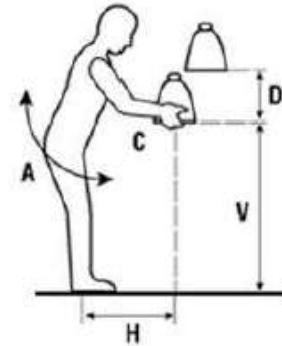
Job No   9

ACGIH Lifting Variable	Value
Weight	15
Lifting frequency	12
Vertical Zone	15
Horizontal zone	18
Lifting TLV	14
Lifting index	1.07
Status	Risky

Appendix 34: NIOSH Lifting Equation calculator -Job Analysis Sheet for job 10

NIOSH Lifting Equation calculator -Job Analysis Sheet

Job No	10

NIOSH Lifting Variable	Value	Multiplier
Horizontal Location (H)	8 in	1
Vertical Location (V)	48 in	0.87
Travel Distance (D)	42 in	0.86
Angle of Asymmetry (A)	0	1
Coupling (C)(1 -good, 2- fair, 3 - poor)	2	0.95
Frequency - (F)	11	0.85
Average load lifted (L) (lbs)	25kg	
Max Load Lifted (L) (lbs)	25kg	
Duration (D) (1-short, 2- Moderate, 8 - long)		
RWL = 23 xHM x VM x DM x AM x FM x CM		13.89
Lifting index		1.8
Status		Risky

Appendix 35: WISHA Lifting Calculator -Job Analysis Sheet for job 10
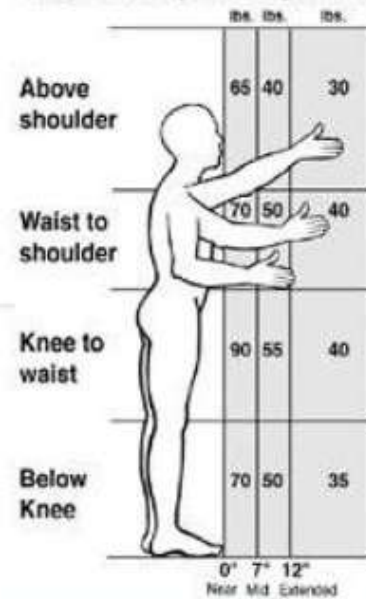
WISHA Lifting Calculator -Job Analysis Sheet

Job No	10

Actual weight	25 kg
Unadjusted Weight Limit	50 lb
Lifts per Minute	11/hr
Hours per Day	8
Twisting	0

Unadjusted weight Limit x	50lb
Twisting Adjustment	1
Adjusted Weight Limit x	50lb
Limit Reduction Multiplier	1
Weight Limit	50 lb(22.7kg)

Weight Limit	22.7kg
Actual Weight	25kg
Lifting Index	1.10
Status	Risky

Determine Unadjusted Weight Limit:

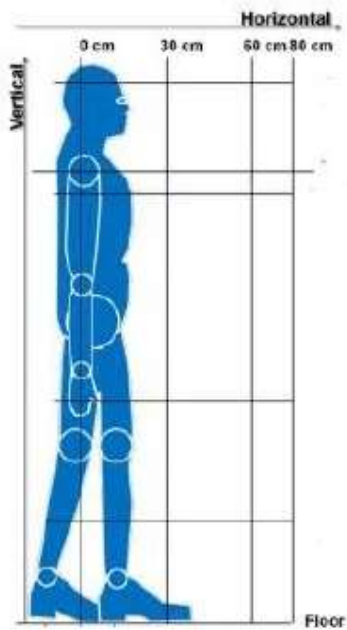|	lbs.	lbs.	lbs.
Above shoulder	65	40	30
Waist to shoulder	70	50	40
Knee to waist	90	55	40
Below Knee	70	50	35

0° 7° 12°
Near Mid Extended

Appendix 36: ACGIH Lifting TLV calculator -Job Analysis Sheet for job 10

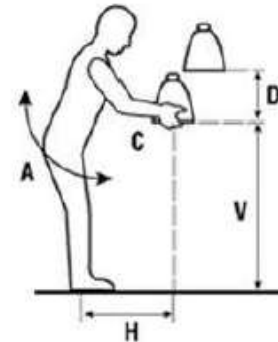**ACGIH Lifting Threshold Limit Values calculator -Job Analysis Sheet**

Job No   10

ACGIH Lifting Variable	Value
Weight	25kg
Lifting frequency	11/hr
Vertical Zone	48in
Horizontal zone	8 in
Lifting TLV	32kg
Lifting index	0.78
Status	Not risky

Appendix 37: NIOSH Lifting Equation calculator -Job Analysis Sheet for job 9

<u>**NIOSH Lifting Equation calculator -Job Analysis Sheet**</u>

Job No	11

NIOSH Lifting Variable	Value	Multiplier
Horizontal Location (**H**)	17in	0.59
Vertical Location (**V**)	48in	0.86
Travel Distance (**D**)	42in	0.86
Angle of Assymetry (**A**)	0	1
Coupling (**C**)(1 -good, 2- fair, 3 - poor)	2	0.95
Frequency - (**F**)	10/hr	0.85
Average load lifted (**L**) (lbs)		12.5kg
Max Load Lifted (**L**) (lbs)		12.5kg
Duration (**D**) (1-short, 2- Moderate, 8 - long)		
RWL = 23 xHM x VM x DM x AM x FM x CM		8.15
Lifting index		1.53
Status		Risky

Appendix 38: WISHA Lifting Calculator -Job Analysis Sheet for job 11
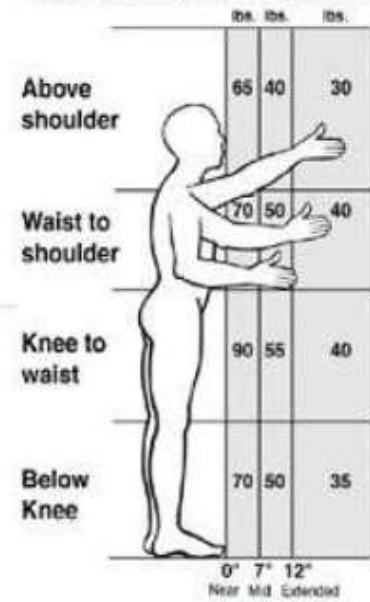
WISHA Lifting Calculator -Job Analysis Sheet

Job No	11

Actual weight	12.5
Unadjusted Weight Limit	40lb
Lifts per Minute	10/hr
Hours per Day	8
Twisting	0

Unadjusted weight Limit x	40lb
Twisting Adjustment	1
Adjusted Weight Limit x	40lb
Limit Reduction Multiplier	1
Weight Limit	40lb(18.16kg)

Weight Limit	18.16
Actual Weight	12.5
Lifting Index	0.69
Status	Not risky

Determine Unadjusted Weight Limit:

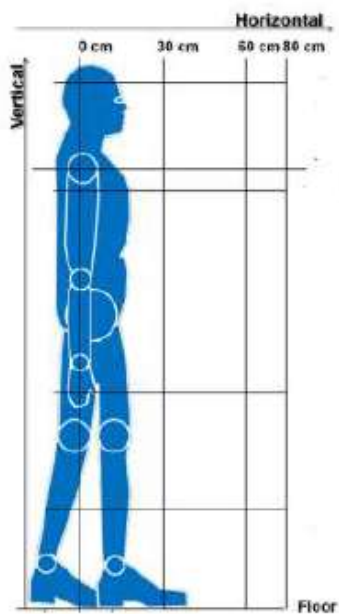|	lbs.	lbs.	lbs.
Above shoulder	65	40	30
Waist to shoulder	70	50	40
Knee to waist	90	55	40
Below Knee	70	50	35

0° 7° 12°
Near Mid Extended

Appendix 39: ACGIH Lifting TLV calculator -Job Analysis Sheet for job 11

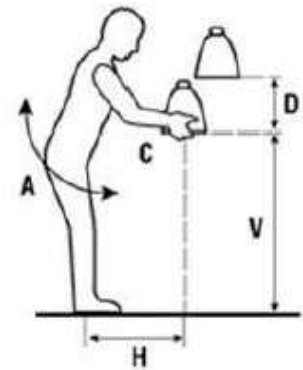**ACGIH Lifting Threshold Limit Values calculator -Job Analysis Sheet**

Job No   11

ACGIH Lifting Variable	Value
Weight	15kg
Lifting frequency	10/hr
Vertical Zone	48in
Horizontal zone	17in
Lifting TLV	16kg
Lifting index	0.78
Status	safe

Appendix 40: NIOSH Lifting Equation calculator -Job Analysis Sheet for job 12

NIOSH Lifting Equation calculator -Job Analysis Sheet

Job No	12

NIOSH Lifting Variable	Value	Multiplier
Horizontal Location (H)	16 in	0.62
Vertical Location (V)	46 in	0.88
Travel Distance (D)	40 in	0.86
Angle of Assymetry (A)	0	1
Coupling (C)(1 -good, 2- fair, 3 - poor)	2	0.95
Frequency - (F)	9/hr	0.85
Average load lifted (L) (lbs)	10kg	
Max Load Lifted (L) (lbs)	10kg	
Duration (D) (1-short, 2- Moderate, 8 - long)	8hrs	
RWL = 23 xHM x VM x DM x AM x FM x CM		8.84 kg
Lifting index		1.13
Status		risky

Appendix 41: WISHA Lifting Calculator -Job Analysis Sheet for job 12
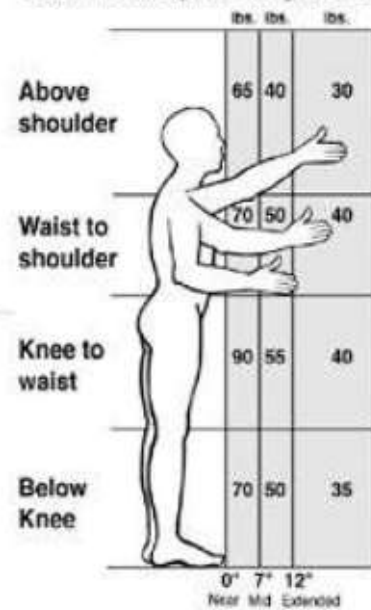
WISHA Lifting Calculator -Job Analysis Sheet

Job No	12

Actual weight	10kg
Unadjusted Weight Limit	40 lb
Lifts per Minute	9/hr
Hours per Day	8
Twisting	0

Unadjusted weight Limit x	40lb
Twisting Adjustment	1
Adjusted Weight Limit x	40lb
Limit Reduction Multiplier	1
Weight Limit	40lb(18.16kg)

Weight Limit	18.16kg
Actual Weight	10 kg
Lifting Index	0.55
Status	Not risky

Determine Unadjusted Weight Limit:

	lbs.	lbs.	lbs.
Above shoulder	65	40	30
Waist to shoulder	70	50	40
Knee to waist	90	55	40
Below Knee	70	50	35

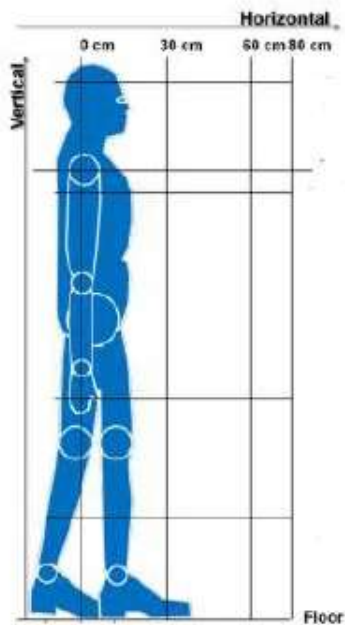0° 7° 12°
Near Mid Extended

Appendix 42: ACGIH Lifting TLV calculator -Job Analysis Sheet for job 12

ACGIH Lifting Threshold Limit Values calculator -Job Analysis Sheet
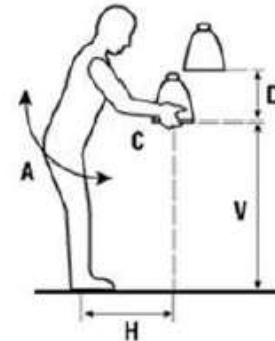
Job No   12

ACGIH Lifting Variable	Value
Weight	10kg
Lifting frequency	9/hr
Vertical Zone	46 in
Horizontal zone	16 in
Lifting TLV	16kg
Lifting index	0.625
Status	Not risky

Appendix 43: NIOSH Lifting Equation calculator -Job Analysis Sheet for job A

NIOSH Lifting Equation calculator -Job Analysis Sheet

Job No	Job A

NIOSH Lifting Variable	Value	Multiplier
Horizontal Location (**H**) cm	20	1
Vertical Location (**V**) cm	50	0.92
Travel Distance (**D**) cm	25	1
Angle of Asymmetry (**A**) Degrees	0	1
Coupling (**C**)(1 -good, 2- fair, 3 - poor)	1	1
Frequency - (**F**) Lifts/hour	12	0.85
Load lifted (**L**) kg	19.3	19.3 kg
Duration (**D**) (1-short, 2- Moderate, 8 - long)	8 hrs	
RWL = 23 xHM x VM x DM x AM x FM x CM		18.1 kg
Lifting index		1.07
Status		Risky

Appendix 44: WISHA Lifting Calculator -Job Analysis Sheet for job A
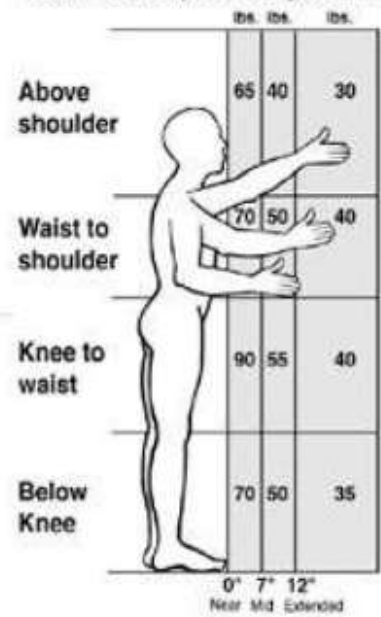
WISHA Lifting Calculator -Job Analysis Sheet

Job No	Job A

Actual weight (kg)	19.3 kg
Unadjusted Weight Limit (lb)	50
Unadjusted Weight Limit (kg)	22.7
Lifts per Minute	12/hr
Hours per Day	8 hr
Twisting	0
Horizontal distance (cm)	20
Vertical distance (cm)	50

Unadjusted weight Limit (kg) x	22.7
Twisting Adjustment	1
Adjusted Weight Limit (kg) x	22.7
Limit Reduction Multiplier	0.85
Weight Limit (kg)	19.3

Actual Weight(kg)/	19.3
Weight Limit(kg)	19.3
Lifting Index	1
Status	Not Risky

Determine Unadjusted Weight Limit:

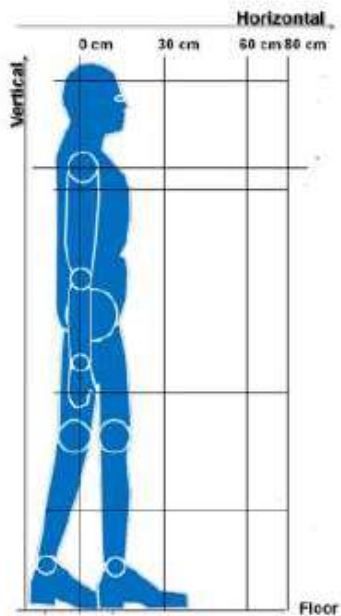|	lbs.	lbs.	lbs.
Above shoulder	65	40	30
Waist to shoulder	70	50	40
Knee to waist	90	55	40
Below Knee	70	50	35

0° 7° 12°
Near Mid Extended

Appendix 45: ACGIH Lifting TLV calculator -Job Analysis Sheet for job A

ACGIH Lifting Threshold Limit Values calculator -Job Analysis Sheet
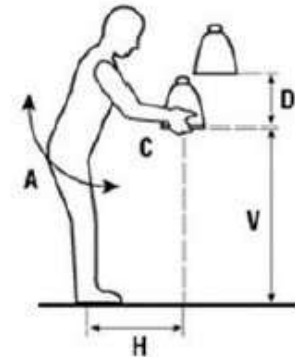
Job No   Job A

ACGIH Lifting Variable	Value
Weight (kg)	19.3
Lifting frequency (lifts per hour)	12
Vertical Zone (cm)	50
Horizontal zone (cm)	20
Lifting TLV (kg)	18
Lifting index	1.07
Status	Risky

Appendix 46: NIOSH Lifting Equation calculator -Job Analysis Sheet for job B

NIOSH Lifting Equation calculator -Job Analysis Sheet

Job No	Job B

NIOSH Lifting Variable	Value	Multiplier
Horizontal Location (**H**) cm	30	0.83
Vertical Location (**V**) cm	50	0.92
Travel Distance (**D**) cm	25	1
Angle of Asymmetry (**A**) Degrees	0	1
Coupling (**C**)(1 -good, 2- fair, 3 - poor)	1	1
Frequency - (**F**) Lifts/hour	12	0.85
Load lifted (**L**) kg	15.1	15.1 kg
Duration (**D**) (1-short, 2- Moderate, 8 - long)	8 hrs	
RWL = 23 xHM x VM x DM x AM x FM x CM		15.1 kg
Lifting index		1
Status		Not Risky

Appendix 47: NIOSH Lifting Equation calculator -Job Analysis Sheet for job C

NIOSH Lifting Equation calculator -Job Analysis Sheet

Job No	Job C

NIOSH Lifting Variable	Value	Multiplier
Horizontal Location (H) cm	20	1
Vertical Location (V) cm	100	0.92
Travel Distance (D) cm	50	0.91
Angle of Asymmetry (A) Degrees	0	1
Coupling (C)(1 -good, 2- fair, 3 - poor)	1	1
Frequency - (F) Lifts/hour	12	0.85
Load lifted (L) kg	21.2	21. 2 kg
Duration (D) (1-short, 2- Moderate, 8 - long)	8 hrs	
RWL = 23 xHM x VM x DM x AM x FM x CM		16.5 kg
Lifting index		1.3
Status		Risky

Appendix 48: WISHA Lifting Calculator -Job Analysis Sheet for job C

WISHA Lifting Calculator -Job Analysis Sheet

Job No	Job C

		Determine Unadjusted Weight Limit:
Actual weight (kg)	21.3 kg	
Unadjusted Weight Limit (lb)	55	
Unadjusted Weight Limit (kg)	24.97	Above shoulder
Lifts per Minute	12/hr	
Hours per Day	8 hr	Waist to shoulder
Twisting	0	
Horizontal distance (cm)	20	
Vertical distance (cm)	50	Knee to waist

Determine Unadjusted Weight Limit:

	lbs.	lbs.	lbs.
Above shoulder	65	40	30
Waist to shoulder	70	50	40
Knee to waist	90	55	40
Below Knee	70	50	35

0°   7°   12°
Near Mid Extended

Unadjusted weight Limit (kg) x	24.97
Twisting Adjustment	1
Adjusted Weight Limit (kg) x	24.97
Limit Reduction Multiplier	0.85
Weight Limit (9kg)	42.5lb

Actual Weight(kg)/	21.3
Weight Limit(kg)	21.3
Lifting Index	1
Status	Not Risky

115

Appendix 49: NIOSH Lifting Equation calculator -Job Analysis Sheet for job D

NIOSH Lifting Equation calculator -Job Analysis Sheet
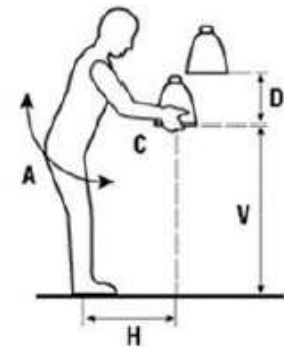
Job No	Job D

NIOSH Lifting Variable	Value	Multiplier
Horizontal Location (H) cm	30	0.83
Vertical Location (V) cm	100	0.92
Travel Distance (D) cm	50	0.91
Angle of Asymmetry (A) Degrees	0	1
Coupling (C)(1 -good, 2- fair, 3 - poor)	1	1
Frequency - (F) Lifts/hour	12	0.85
Load lifted (L) kg	13.7	13.7 kg
Duration (D) (1-short, 2- Moderate, 8 - long)	8 hrs	
RWL = 23 xHM x VM x DM x AM x FM x CM		13.7 kg
Lifting index		1
Status		Not Risky

Appendix 50: NIOSH Lifting Equation calculator -Job Analysis Sheet for job E

NIOSH Lifting Equation calculator -Job Analysis Sheet

Job No	Job E

NIOSH Lifting Variable	Value	Multiplier
Horizontal Location (**H**) cm	20	1
Vertical Location (**V**) cm	150	0.77
Travel Distance (**D**) cm	50	0.91
Angle of Asymmetry (**A**) Degrees	0	1
Coupling (**C**)(1 -good, 2- fair, 3 - poor)	1	1
Frequency - (**F**) Lifts/hour	12	0.85
Load lifted (**L**) kg	19.3	19.3 kg
Duration (**D**) (1-short, 2- Moderate, 8 - long)	8 hrs	
RWL = 23 xHM x VM x DM x AM x FM x CM		13.8 kg
Lifting index		1.37
Status		Risky

Appendix 51: WISHA Lifting Calculator -Job Analysis Sheet for job E
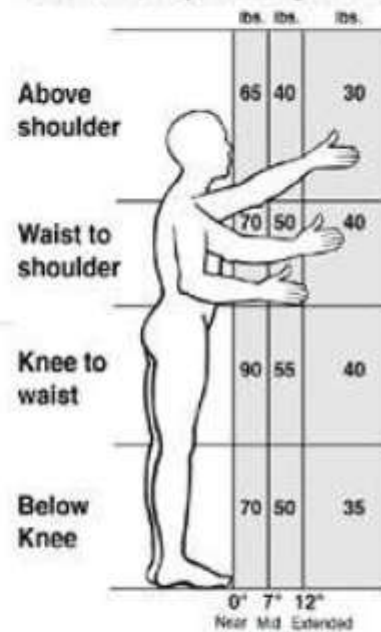
WISHA Lifting Calculator -Job Analysis Sheet

Job No	Job E

		Determine Unadjusted Weight Limit:
Actual weight (kg)	19.3 kg	
Unadjusted Weight Limit (lb)	50	
Unadjusted Weight Limit (kg)	22.7	Above shoulder — 65 40 30
Lifts per Minute	12/hr	
Hours per Day	8 hr	
Twisting	0	Waist to shoulder — 70 50 40
Horizontal distance (cm)	20	
Vertical distance (cm)	150	Knee to waist — 90 55 40

Unadjusted weight Limit (kg) x	22.7	Below Knee — 70 50 35
Twisting Adjustment	1	
Adjusted Weight Limit (kg) x	22.7	0° 7° 12°
Limit Reduction Multiplier	0.85	Near Md Extended
Weight Limit (kg)	19.3	

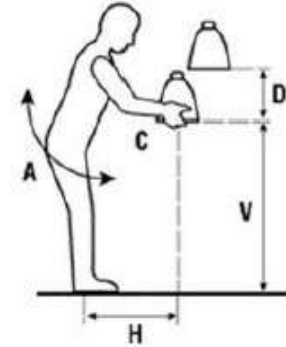|	
Actual Weight(kg)/	19.3
Weight Limit(kg)	19.3
Lifting Index	1
Status	Not Risky

Appendix 52: NIOSH Lifting Equation calculator -Job Analysis Sheet for job F

NIOSH Lifting Equation calculator -Job Analysis Sheet
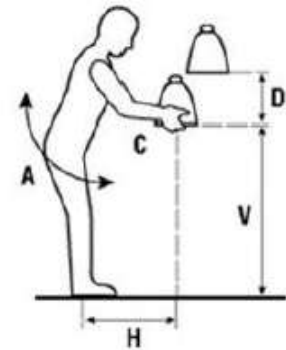

Job No	Job F

NIOSH Lifting Variable	Value	Multiplier
Horizontal Location (**H**) cm	30	0.83
Vertical Location (**V**) cm	150	0.77
Travel Distance (**D**) cm	50	0.91
Angle of Asymmetry (**A**) Degrees	0	1
Coupling (**C**)(1 -good, 2- fair, 3 - poor)	1	1
Frequency - (**F**) Lifts/hour	12	0.85
Load lifted (**L**) kg	11.5	11.5 kg
Duration (**D**) (1-short, 2- Moderate, 8 - long)	8 hrs	
RWL = 23 xHM x VM x DM x AM x FM x CM		11.5 kg
Lifting index		1
Status		Risky

Appendix 53: NIOSH Lifting Equation calculator -Job Analysis Sheet for job G

NIOSH Lifting Equation calculator -Job Analysis Sheet

Job No	Job G

NIOSH Lifting Variable	Value	Multiplier
Horizontal Location (H) cm	30	0.83
Vertical Location (V) cm	50	0.92
Travel Distance (D) cm	25	1
Angle of Asymmetry (A) Degrees	0	1
Coupling (C)(1 -good, 2- fair, 3 - poor)	1	1
Frequency - (F) Lifts/hour	12	0.85
Load lifted (L) kg	19.3	19.3 kg
Duration (D) (1-short, 2- Moderate, 8 - long)	8 hrs	
RWL = 23 xHM x VM x DM x AM x FM x CM		15.1 kg
Lifting index		1.28
Status		Risky

Appendix 54: WISHA Lifting Calculator -Job Analysis Sheet for job G
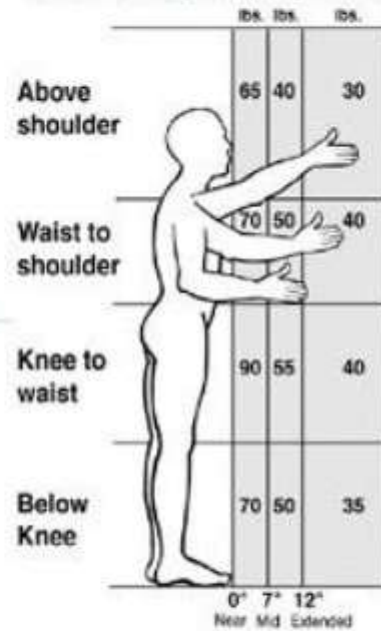
WISHA Lifting Calculator -Job Analysis Sheet

Job No	Job G

Actual weight (kg)	19.3 kg
Unadjusted Weight Limit (lb)	50
Unadjusted Weight Limit (kg)	22.7
Lifts per Minute	12/hr
Hours per Day	8 hr
Twisting	0
Horizontal distance (cm)	30
Vertical distance (cm)	50

Unadjusted weight Limit (kg) x	22.7
Twisting Adjustment	1
Adjusted Weight Limit (kg) x	22.7
Limit Reduction Multiplier	0.85
Weight Limit (kg)	19.3

Actual Weight(kg)/	19.3
Weight Limit(kg)	19.3
Lifting Index	1
Status	Not Risky

Determine Unadjusted Weight Limit

	lbs.	lbs.	lbs.
Above shoulder	65	40	30
Waist to shoulder	70	50	40
Knee to waist	90	55	40
Below Knee	70	50	35

0°   7°   12°
Near Mid Extended

Appendix 55: ACGIH Lifting TLV calculator -Job Analysis Sheet for job G

ACGIH Lifting Threshold Limit Values calculator -Job Analysis Sheet

Job No | Job G

ACGIH Lifting Variable	Value
Weight (kg)	19.3
Lifting frequency (lifts per hour)	12
Vertical Zone (cm)	50
Horizontal zone (cm)	30
Lifting TLV (kg)	18
Lifting index	1.07
Status	Risky

Appendix 56: NIOSH Lifting Equation calculator -Job Analysis Sheet for job H

NIOSH Lifting Equation calculator -Job Analysis Sheet
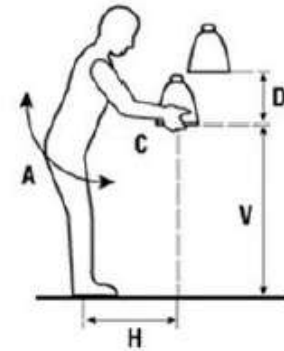
Job No	Job H

NIOSH Lifting Variable	Value	Multiplier
Horizontal Location (H) cm	50	0.5
Vertical Location (V) cm	50	0.92
Travel Distance (D) cm	25	1
Angle of Asymmetry (A) Degrees	0	1
Coupling (C)(1 -good, 2- fair, 3 - poor)	1	1
Frequency - (F) Lifts/hour	12	0.85
Load lifted (L) kg	9.0	9.0 kg
Duration (D) (1-short, 2- Moderate, 8 - long)	8 hrs	
RWL = 23 xHM x VM x DM x AM x FM x CM		9.0 kg
Lifting index		1
Status		Not Risky

Appendix 57: NIOSH Lifting Equation calculator -Job Analysis Sheet for job I

NIOSH Lifting Equation calculator -Job Analysis Sheet

Job No	Job I

NIOSH Lifting Variable	Value	Multiplier
Horizontal Location (H) cm	30	0.83
Vertical Location (V) cm	100	0.92
Travel Distance (D) cm	50	0.91
Angle of Asymmetry (A) Degrees	0	1
Coupling (C)(1 -good, 2- fair, 3 - poor)	1	1
Frequency - (F) Lifts/hour	12	0.85
Load lifted (L) kg	21.2	21. 2 kg
Duration (D) (1-short, 2- Moderate, 8 - long)	8 hrs	
RWL = 23 xHM x VM x DM x AM x FM x CM		13.7 kg
Lifting index		1.54
Status		Risky

Appendix 58: WISHA Lifting Calculator -Job Analysis Sheet for job I
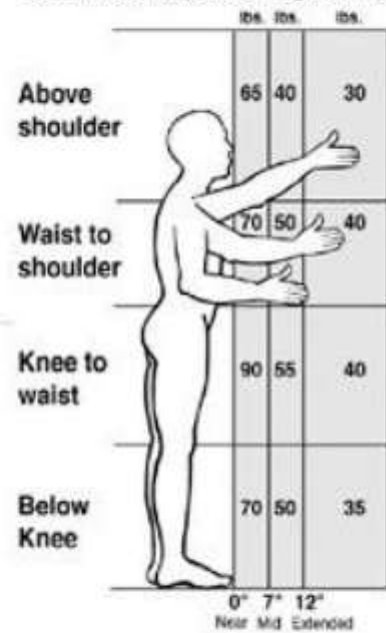
WISHA Lifting Calculator -Job Analysis Sheet

Job No | Job I

Actual weight (kg)	21.3 kg
Unadjusted Weight Limit (lb)	55
Unadjusted Weight Limit (kg)	24.97
Lifts per Minute	12/hr
Hours per Day	8 hr
Twisting	0
Horizontal distance (cm)	30
Vertical distance (cm)	50

Unadjusted weight Limit (kg) x	24.97
Twisting Adjustment	1
Adjusted Weight Limit (kg) x	24.97
Limit Reduction Multiplier	0.85
Weight Limit (kg)	21.2

Actual Weight(kg)/	21.2
Weight Limit(kg)	21.2
Lifting Index	1
Status	Not Risky

Determine Unadjusted Weight Limit:

	lbs.	lbs.	lbs.
Above shoulder	65	40	30
Waist to shoulder	70	50	40
Knee to waist	90	55	40
Below Knee	70	50	35

0°   7°   12°
Near Mid Extended

125

Appendix 59: NIOSH Lifting Equation calculator -Job Analysis Sheet for job J

NIOSH Lifting Equation calculator –Job Analysis Sheet
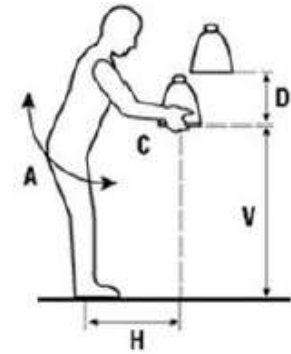
Job No	Job J

NIOSH Lifting Variable	Value	Multiplier
Horizontal Location (H) cm	50	0.5
Vertical Location (V) cm	100	0.92
Travel Distance (D) cm	50	0.91
Angle of Asymmetry (A) Degrees	0	1
Coupling (C)(1 -good, 2- fair, 3 - poor)	1	1
Frequency - (F) Lifts/hour	12	0.85
Load lifted (L) kg	8.2	8.2 kg
Duration (D) (1-short, 2- Moderate, 8 - long)	8 hrs	
RWL = 23 xHM x VM x DM x AM x FM x CM		8.2 kg
Lifting index		1
Status		Not Risky

Appendix 60: NIOSH Lifting Equation calculator -Job Analysis Sheet for job K

NIOSH Lifting Equation calculator -Job Analysis Sheet

Job No	Job K

NIOSH Lifting Variable	Value	Multiplier
Horizontal Location (H) cm	30	0.83
Vertical Location (V) cm	150	0.77
Travel Distance (D) cm	50	0.91
Angle of Asymmetry (A) Degrees	0	1
Coupling (C)(1 -good, 2- fair, 3 - poor)	1	1
Frequency - (F) Lifts/hour	12	0.85
Load lifted (L) kg	19.3	19.3 kg
Duration (D) (1-short, 2- Moderate, 8 - long)	8 hrs	
RWL = 23 xHM x VM x DM x AM x FM x CM		11.5 kg
Lifting index		1.68
Status		Risky

Appendix 61: WISHA Lifting Calculator -Job Analysis Sheet for job K
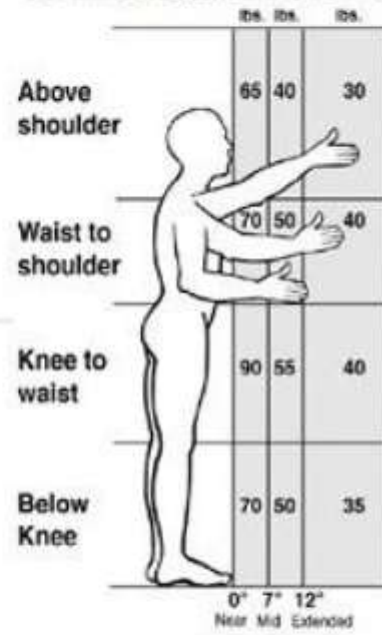
WISHA Lifting Calculator -Job Analysis Sheet

Job No	Job K

Actual weight (kg)	19.3 kg
Unadjusted Weight Limit (lb)	50
Unadjusted Weight Limit (kg)	22.7
Lifts per Minute	12/hr
Hours per Day	8 hr
Twisting	0
Horizontal distance (cm)	30
Vertical distance (cm)	50

Unadjusted weight Limit (kg) x	22.7
Twisting Adjustment	1
Adjusted Weight Limit (kg) x	22.7
Limit Reduction Multiplier	0.85
Weight Limit (kg)	19.3

Actual Weight(kg)/	19.3
Weight Limit(kg)	19.3
Lifting Index	1
Status	Not Risky

Determine Unadjusted Weight Limit:

	lbs.	lbs.	lbs.
Above shoulder	65	40	30
Waist to shoulder	70	50	40
Knee to waist	90	55	40
Below Knee	70	50	35

0"   7"   12"
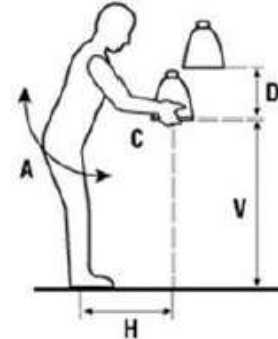Near   Mid   Extended

Appendix 62: NIOSH Lifting Equation calculator -Job Analysis Sheet for job L

NIOSH Lifting Equation calculator -Job Analysis Sheet
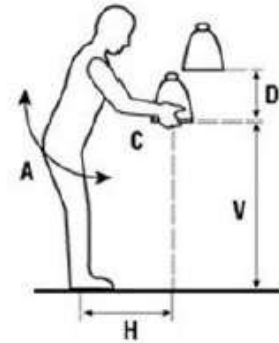
Job No	Job L

NIOSH Lifting Variable	Value	Multiplier
Horizontal Location (**H**) cm	50	0.5
Vertical Location (**V**) cm	150	0.77
Travel Distance (**D**) cm	50	0.91
Angle of Asymmetry (**A**) Degrees	0	1
Coupling (**C**)(1 -good, 2- fair, 3 - poor)	1	1
Frequency - (**F**) Lifts/hour	12	0.85
Load lifted (**L**) kg	6.9	6.9 kg
Duration (**D**) (1-short, 2- Moderate, 8 - long)	8 hrs	
RWL = 23 xHM x VM x DM x AM x FM x CM		6.9 kg
Lifting index		1
Status		Risky

Appendix 63: Details of the participants of the case study

Age (years)	Height (cm)	Weight (kg)
30	160	50
24	160	53
25	162	59
32	163	60
33	175	64
36	182	73
23	171	68
31	156	65
33	166	52
39	164	59
22	169	74
23	174	51
24	161	68
26	160	54
37	160	47
26	159	52
19	173	59
18	173	65
37	158	50
19	169	48
40	161	53
25	168	57
35	150	50
37	164	58
40	165	52
29	158	48
26	160	54
20	166	50
28	166	68
26	165	66
32	152	47
31	153	66
21	161	64
31	173	76
39	160	48
20	154	51
28	163	54
35	161	48
33	167	56
18	163	57
38	178	60
31	174	53
29	166	61
40	169	64
34	163	60
25	166	62
25	176	68
18	162	68
32	165	54
25	163	58
29	178	69

Age (years)	Height (cm)	Weight (kg)
22	168	60
24	167	66
30	164	53
39	156	56
25	161	53
35	160	56
33	163	57
28	160	59
26	168	64
49	167	68
38	165	57
25	171	57
30	151	47
26	164	68
26	168	70
33	155	56
19	163	48
31	160	50
22	169	73
23	159	52
22	150	51
37	165	81
42	183	80
40	172	61
32	177	66
26	159	60
26	169	51
27	168	50
18	158	51
40	151	50
27	178	68
25	171	70
26	172	80
30	167	69
39	166	65
21	160	48
29	159	53
34	178	62
33	157	61
20	165	71
23	155	56
38	169	68
20	160	50
22	164	55
24	163	59
38	171	58
21	164	58
23	160	47
43	157	52
24	170	57
27	164	78
35	157	51
40	170	52

Age (years)	Height (cm)	Weight (kg)
22	163	50
23	168	66
37	169	66
32	156	64
22	154	47
20	165	59
30	154	70
31	163	67
46	160	55
20	159	55
19	166	53
22	177	72
31	156	54
31	166	63
37	151	56
30	178	61
30	150	45
21	155	48
20	165	58
24	168	60
32	163	68
28	163	56
28	180	70
37	160	59
35	159	55
32	168	61
30	173	70
40	171	61
29	181	66
22	163	68
21	152	51
32	170	81
33	164	61
26	162	50
19	162	47
37	168	69
22	161	60
27	179	80
33	165	57
28	180	70
27	165	56
39	173	66
23	165	54
35	180	73
30	159	57
21	168	57
51	158	60
31	163	66
28	165	58
33	166	73
19	161	59
23	170	69
37	169	63

Age (years)	Height (cm)	Weight (kg)
34	148	49
30	158	54
26	160	55
29	177	82
39	168	68
21	166	66
36	161	54
24	168	58
23	159	54
22	163	62
29	172	66
27	158	58
40	158	55
29	168	53
26	163	55
29	166	59
20	160	51
34	150	53
40	157	64
22	160	59
32	166	58
25	166	55
36	148	52
20	166	59
26	149	55
40	159	53
21	158	50
25	168	48
21	160	50
34	166	66
24	163	65
22	176	53
21	164	65
20	160	53
22	162	57
19	160	46
31	181	71
26	167	61
21	160	74
21	160	70
24	163	56
18	167	62
30	172	65
28	154	52
25	182	64
24	176	52
20	172	67
30	172	84
21	161	62
25	168	55
20	160	54
41	164	51
23	165	57

Age (years)	Height (cm)	Weight (kg)
24	165	62
24	160	61
26	166	64
33	152	50
32	158	50
19	159	52
18	158	49
35	152	55
19	160	70
27	170	69
19	160	56
26	155	47
32	174	65
29	162	58
31	167	72
40	162	50
22	164	50
38	160	50
49	166	68
39	163	55
50	168	67
30	168	68
36	159	69
37	165	66
23	168	59
19	168	60
28	155	58
23	161	51
27	168	59
32	166	57
34	163	62
40	167	76
37	178	70
23	165	61
38	165	50
21	179	58
20	163	56
24	167	65
25	163	50
31	159	65
29	184	77

Appendix 64: Standing anthropometry data of Sri Lankan population [45]

Standing measurements

No.	Measurements	Mean (men)	Standard Deviation (men)	5th per centile (men)	95th per centile (men)
17	Stature	1639.01 / 1422.11	63.51 / 58.77	1536 / 1426	1746 / 1517
18	Masion height	1555.19 / 1439.50	62.07 / 59.56	1440 / 1343	1539 / 1534
19	Eye height	1535.31 / 1414.39	62.19 / 58.87	1429 / 1323	1634 / 1520
20	Submasale height	1503.25 / 1388.70	61.70 / 58.46	1403 / 1295	1601 / 1488
21	Menton height	1435.29 / 1327.45	59.32 / 56.72	1342 / 1232	1537 / 1474
22	Trylon height	1507.12 / 1396.68	60.40 / 57.69	1412 / 1304	1691 / 1490
24	Elbow height	1014.04 / 94145	70.04 / 62.11	929 / 873	1100 / 1015
31	Chest depth	170.60 / 161.53	19.87 / 19.40	146 / 136	204 / 193
38	Elbow wrist length	276.31 / 251.91	34.84 / 33.98	247 / 225	302 / 276
39	Forward reach	817.02 / 757.37	59.63 / 45.40	747 / 692	807 / 828
57	Knee fully Bent circulerence	391.68 / 355.77	25.57 / 24.86	350 / 320	430 / 395

Fig.2 (c)

Fig.2 (d)

No.	Measurements	Mean (men)	Standard Deviation (men)	5th per centile (men)	95th per centile (men)
23	Shoulder height	1377.09 / 1271.61	59.24 / 53.99	1280 / 1184	1472 / 1360
25	Waist height	1060.24 / 1012.79	64.35 / 57.05	976 / 931	1160 / 1040
27	Hip height	971.91 / 920.71	58.51 / 75.94	885 / 840	1062 / 980
28	Crotch height	775.32 / 776.24	483.91 / 60.90	707 / 690	841 / 846
29	Finger tip height	607.16 / 571.28	38.77 / 45.11	554 / 504	669 / 676
30	Span	1690.56 / 1544.66	88.64 / 98.93	1506 / 1407	1816 / 1670
32	Chest breadth	249.35 / 224.77	26.80 / 19.08	216 / 199	283 / 252
33	Ulacromial breadth	360.29 / 331.49	23.10 / 18.46	331 / 300	402 / 361
40	Upward reach	2083.74 / 1912.78	115.19 / 118.59	1947 / 1775	2236 / 2051
41	Ankle circumference	196.01 / 182.18	14.84 / 11.43	175 / 165	220 / 205
42	Calf	306.14 / 299.48	27.40 / 22.80	265 / 252	350 / 325
43	Thigh	459.24 / 456.97	49.54 / 46.98	395 / 390	545 / 540
48	Buttock	823.25 / 832.92	56.55 / 53.97	240 / 250	930 / 925
49	Waist	688.63 / 634.44	68.16 / 61.24	605 / 555	800 / 740
50	Abdomen	717.42 / 727.16	70.38 / 71.76	630 / 620	855 / 850

Appendix 65: Details of the participants of the validation case study

Age	Height	Weight
30	160	50
24	160	53
25	162	59
32	163	60
33	175	64
36	182	73
23	171	68
31	156	65
33	166	52
39	164	59
22	169	74
23	174	51
24	161	68
26	160	54
37	160	47
26	159	52
19	173	59
18	173	65
37	158	50
19	169	48
40	161	53
25	168	57
35	150	50
37	164	58
40	165	52
29	158	48
26	160	54
20	166	50
28	166	68
26	165	66
32	152	47
31	153	66
21	161	64
31	173	76
39	160	48
20	154	51
28	163	54
35	161	48
33	167	56
18	163	57
38	178	60
31	174	53
29	166	61
40	169	64
34	163	60
25	166	62
25	176	68
18	162	68
32	165	54
25	163	58

Cntd..

Age	Height	Weight
29	178	69
22	168	60
24	167	66
30	164	53
39	156	56
25	161	53
35	160	56
33	163	57
28	160	59
26	168	64
49	167	68
38	165	57
25	171	57
30	151	47
26	164	68
26	168	70
33	155	56
19	163	48
31	160	50
22	169	73
23	159	52
22	150	51
37	165	81
42	183	80
40	172	61
32	177	66
26	159	60
26	169	51
27	168	50
18	158	51
40	151	50
27	178	68
25	171	70
26	172	80
30	167	69
39	166	65
21	160	48
29	159	53
34	178	62
33	157	61
20	165	71
23	155	56
38	169	68
20	160	50
22	164	55
24	163	59
38	171	58
21	164	58
23	160	47
43	157	52
24	170	57
27	164	78
35	157	51

Age	Height	Weight
40	170	52
22	163	50
23	168	66
37	169	66
32	156	64
22	154	47
20	165	59
30	154	70
31	163	67
46	160	55
20	159	55
19	166	53
22	177	72
31	156	54
31	166	63