
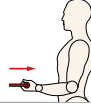
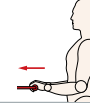
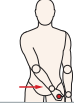







3. Select force categories present. Record critical force measurements.

Force Name (Full Body) Example: Pushing cart	Left/ Right/ Both	Value (Measured or Borg – 0-10) & Units (lb or kg)					
		Lift/Lower 	Pull In 	Push Out 	Pull Across 	Pull Down 	Press Down 

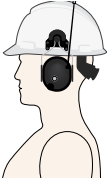
Force Name (Hands) Example: Cutting excess wire	Left/Right/Both	Value (Measured or Borg – 0-10) & Units (lb or kg)		
		Pinch Grip 	Finger Press 	Power Grip 

Borg Scale Operator Strength Capability: Below Average Average Above Average

Vibration: Yes No

Personal Protective Equipment (PPE)

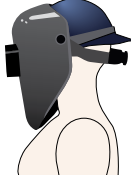
- Safety glasses - 0.1 lb
- Goggles - 0.25 lb
- Bump cap - 0.5 lb
- Face shield - 0.5 lb
- Hard hat - 1 lb
- Hearing protection - 1 lb



Other: _____

Welding Helmet

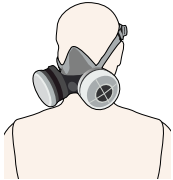
- Light weight - 1.5 lb
- Heavier - 4 lb
- PAPR welding - 4 lb
- Older, very heavy - 5 lb



Other: _____

Respiratory Protection

- Particulate mask - 0.1 lb
- PAPR - 0.5 lb
- Half-mask - 0.75 lb
- Full-mask - 1.25 lb
- SCBA - 1.5 lb
- Supplied-air - 1.5 lb

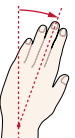


Other: _____

4. Record hand information.


Radial Deviation

- Left ≥ 20°
- Right ≥ 20°
- Both ≥ 20°
- Duration ≥ 10 sec
- Frequency ≥ 30/min



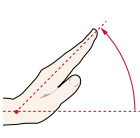
Ulnar Deviation

- Left ≥ 20°
- Right ≥ 20°
- Both ≥ 20°
- Duration ≥ 10 sec
- Frequency ≥ 30/min



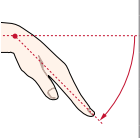
Extended

- Left ≥ 45°
- Right ≥ 45°
- Both ≥ 45°
- Duration ≥ 10 sec
- Frequency ≥ 30/min



Flexed

- Left ≥ 45°
- Right ≥ 45°
- Both ≥ 45°
- Duration ≥ 10 sec
- Frequency ≥ 30/min



Estimated Forces Borg CR-10 Scale – Operator Instructions

Borg CR-10 Scale Instructions:

Using the rating scale at right, report the number that best represents the level of physical effort exerted in either the hands or arms and in the back when performing the task.

Rating Considerations:

- If your effort level is “Very light,” choose “1.”
- If your effort level is “Moderate,” choose “3.” Note that this level is considered lower than the verbal expressions “medium,” “mean,” or “middle.”
- If your effort level is “Hard,” choose “5.” This level should represent about half of your maximum ability for that body segment.
- If your effort level is “Very hard,” choose a rating from “7” to “9.”

Report what you actually feel, not what you think you should report.

All ratings of perceived exertion should come from a single operator. Rate the individual’s strength or ask them to rate their own strength.

Borg CR-10 Scale Rating of Perceived Exertion	
Rating	Description
0	Nothing at all
0.5	Very, very light
1	Very light
2	Light
3	Moderate
4	Somewhat hard
5	Hard
6	
7	Very hard
8	
9	
10	Very, very hard
•	Maximal

Measured Forces – Force Gauges

Step 1:

Select the mode and units. Use peak or max mode to measure initial force and tracking, or normal mode to measure sustained force.



Step 2:

Attach the appropriate end piece. Use a large end piece for forces applied by the whole hand, and a small end piece for forces applied by a finger.

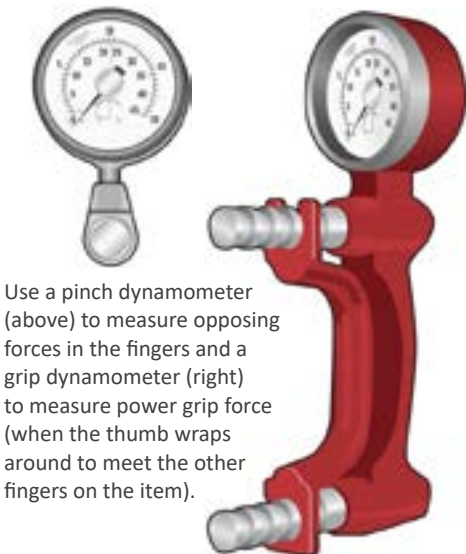


Step 3:

Apply the force directly on the item with a steady movement, and in the same direction and orientation as it is performed during the task.



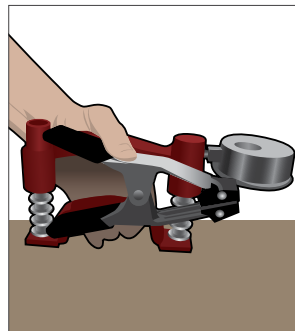
Measured Forces – Dynamometers



Use a pinch dynamometer (above) to measure opposing forces in the fingers and a grip dynamometer (right) to measure power grip force (when the thumb wraps around to meet the other fingers on the item).

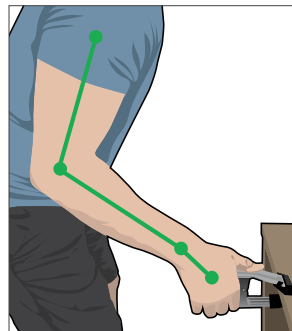
Step 1:

Adjust the dynamometer grip to match tool grip span.



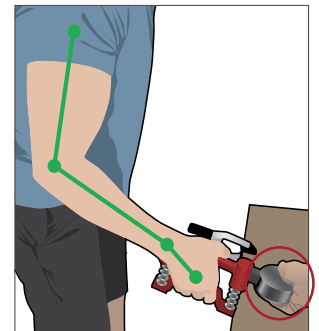
Step 2:

Perform task with tool.



Step 3:

Immediately replicate force with dynamometer.

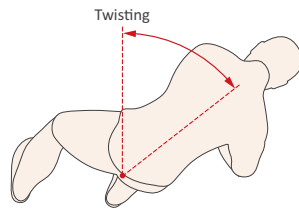
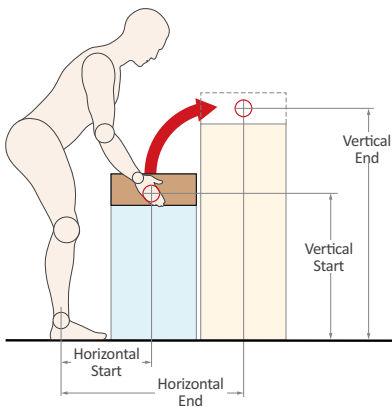


Manual Material Handling Analysis

Push/Pull Tasks	Task Name			Task Name			Task Name		
	Initial Force (lb or kg)			Initial Force (lb or kg)			Initial Force (lb or kg)		
	Sustained Force (lb or kg)			Sustained Force (lb or kg)			Sustained Force (lb or kg)		
	Hand Height (circle)			Hand Height (circle)			Hand Height (circle)		
	Chest 53" (135 cm)	Forearm 35" (89 cm)	Thigh 22" (57 cm)	Chest 53" (135 cm)	Forearm 35" (89 cm)	Thigh 22" (57 cm)	Chest 53" (135 cm)	Forearm 35" (89 cm)	Thigh 22" (57 cm)
	Distance (circle)			Distance (circle)			Distance (circle)		
	Feet: 7 25 50 100 150 200 (Meters: 2.1 7.6 15.2 30.5 45.7 61.0)			Feet: 7 25 50 100 150 200 (Meters: 2.1 7.6 15.2 30.5 45.7 61.0)			Feet: 7 25 50 100 150 200 (Meters: 2.1 7.6 15.2 30.5 45.7 61.0)		
	Task Frequency			Task Frequency			Task Frequency		
Every _____ seconds, or Every _____ minute(s)			Every _____ seconds, or Every _____ minute(s)			Every _____ seconds, or Every _____ minute(s)			

Carry Tasks	Task Name		Task Name		Task Name	
	Weight (lb or kg)		Weight (lb or kg)		Weight (lb or kg)	
	Hand Height (circle)		Hand Height (circle)		Hand Height (circle)	
	Elbow 41" (105 cm)	Hand 28" (72 cm)	Elbow 41" (105 cm)	Hand 28" (72 cm)	Elbow 41" (105 cm)	Hand 28" (72 cm)
	Distance (circle)		Distance (circle)		Distance (circle)	
	Feet: 7 14 28 (Meters: 2.1 4.3 8.5)		Feet: 7 14 28 (Meters: 2.1 4.3 8.5)		Feet: 7 14 28 (Meters: 2.1 4.3 8.5)	
	Task Frequency		Task Frequency		Task Frequency	
	Every _____ seconds, or Every _____ minute(s)		Every _____ seconds, or Every _____ minute(s)		Every _____ seconds, or Every _____ minute(s)	

Lift/Lower Tasks	Task Name			Task Name			Task Name		
	Weight (lb or kg)			Weight (lb or kg)			Weight (lb or kg)		
	Horizontal Distance (in)	Vertical Distance (in)	Twist (degrees)	Horizontal Distance (in)	Vertical Distance (in)	Twist (degrees)	Horizontal Distance (in)	Vertical Distance (in)	Twist (degrees)
	Start	Start	Start	Start	Start	Start	Start	Start	Start
	End	End	End	End	End	End	End	End	End
	Grip	Duration (hours)	Frequency (lifts/minute)	Grip	Duration (hours)	Frequency (lifts/minute)	Grip	Duration (hours)	Frequency (lifts/minute)
	<input type="checkbox"/> Good <input type="checkbox"/> Fair <input type="checkbox"/> Poor			<input type="checkbox"/> Good <input type="checkbox"/> Fair <input type="checkbox"/> Poor			<input type="checkbox"/> Good <input type="checkbox"/> Fair <input type="checkbox"/> Poor		



Make two measurements, one at the start of the lift and one at the end.		
Horizontal: from ankle to knuckle on middle finger	Vertical: from standing surface to knuckle on middle finger	Twisting: degrees traveled from neutral (0 degrees) in either direction

Workstation Layout

