

23(1) Calculator Specifications and Calculations



To be used with the revised Permanent Disability Evaluation Schedule, policy and additional factors guide, which came into effect August 1, 2003. The 23(1) Calculator is a tool to assist Officers in Disability Awards in determining appropriate compensation under section 23 (1) of the *Workers Compensation Act*. This document outlines the calculations/ formulas used by the calculator to determine an impairment rating.

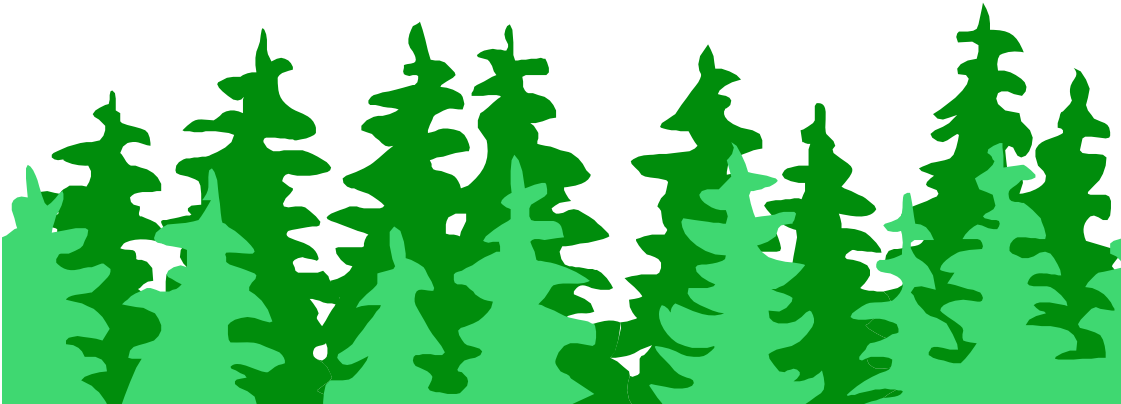


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Calculations

The overall impairment % allocated for each joint for restricted range of motion is based on the value of a fusion of the joint as outlined in our schedule.

Norms

Normally, when calculating impairment based on restricted range of movement, the injured side is compared with the uninjured side. If both sides are impaired then the injured sites are compared to established NORMs.^H

Tolerances

In general, loss of range of motion of 5 degrees or less does not constitute an impairment. Loss of range of motion of 5 degrees or less will calculate as zero.

The only exception is:

1. movements of the spine where loss of range of motion of 3 degrees or less shall be treated as zero.

Loss of hyperextension of the elbow, knee and fingers is not considered an impairment, hyperextension is taken as zero in the calculations.

Calculations:
G.S. = ROM on Good Side
I.S. = ROM on Injured Side
SA = Scheduled Amount
% Allotted = % allotted in the WCB schedule

1) Wrist

Amputations

Schedule item 5 provides for 54 percent of total impairment for an amputation at the wrist, middle of forearm to the wrist.

Restricted Range of Motion

↳ *The total impairment granted for the loss of wrist movement is 12.5% as outlined in schedule item 9. Each movement is allocated with a portion of this overall percentage.*

- | | |
|----------------------------|--------------|
| <i>a. Flexion</i> | <i>4.0%</i> |
| <i>b. Extension</i> | <i>4.0%</i> |
| <i>c. Radial Deviation</i> | <i>2.25%</i> |
| <i>d. Ulnar Deviation</i> | <i>2.25%</i> |

^H See attached list of NORMs at the end of this document. (these Norms also listed in revised Permanent Disability Evaluation Schedule)

Note: a totally fused wrist would be 12.5%.

$$\text{Flexion} = \frac{(\text{G.S.} - \text{I.S.})}{\text{G.S.}} \times \text{SA}$$

$$\text{Norm ROM} = 73$$

$$\% \text{ allotted} = 4$$

<u>EX. with injury on right side</u>	<u>R</u>	<u>L</u>
	50°	70°
$\frac{(70^\circ - 50^\circ)}{70^\circ} \times 4 = \frac{20}{70} \times 4 = \mathbf{1.14\%}$		

$$\text{Extension} = \frac{(\text{G.S.} - \text{I.S.})}{\text{G.S.}} \times \text{SA}$$

$$\text{Norm ROM} = 71$$

$$\% \text{ allotted} = 4$$

<u>EX. with injury on right side</u>	<u>R</u>	<u>L</u>
	45°	70°
$\frac{(70^\circ - 45^\circ)}{70^\circ} \times 4 = \frac{25}{70} \times 4 = \mathbf{1.43\%}$		

$$\text{Radial Deviation} = \frac{(\text{G.S.} - \text{I.S.})}{\text{G.S.}} \times \text{SA}$$

$$\text{Norm ROM} = 19$$

$$\% \text{ allotted} = 2.25$$

<u>EX. with injury on right side</u>	<u>R</u>	<u>L</u>
	12	18
$\frac{(18 - 12)}{18} \times 2.25 = \frac{6}{18} \times 2.25 = \mathbf{.75\%}$		

$$\text{Ulnar Deviation} = \frac{\text{G.S.} - \text{I.S.}}{\text{G.S.}} \times \text{SA}$$

$$\text{Norm ROM} = 33$$

$$\% \text{ allotted} = 2.25$$

<u>EX. with injury on right side</u>	<u>R</u>	<u>L</u>
	20	30
$\frac{(30 - 20)}{30} \times 2.25 = \frac{10}{30} \times 2.25 = \mathbf{.75\%}$		

TOTAL IMPAIRMENT OF WRIST = 4.07%

<u>EX. with injury on right side</u>	<u>R</u>	<u>L</u>
	<u>10°</u>	<u>0</u>
	120°	140°
$\frac{(140^\circ - (120^\circ - 10^\circ))}{140} \times 20 = \frac{(140^\circ - 110^\circ)}{140} \times 20 = \frac{30^\circ}{140} \times 20$		

ELBOW TOTAL = 4.29%

Note: if there is also extension loss on the good side, the extension loss must be deducted from the flexion figure.

Example, if there is extension loss of 5 degrees on the good side this must be subtracted from the flexion figure on the good side. In the example above the total Range of movement on the good side would now be 135° (140 – 5).

Loss of hyperextension is not considered an impairment, hyperextension is taken as zero.

Elbow Replacement

The impairment rating for this procedure has been set at 5.8 percent. Any loss of range of motion is awarded in addition to this item. Total impairment for a replacement and loss of range of motion can not exceed the amputation value.

Radial Head Excision with or without Prosthetic Replacement.


The impairment for this procedure is set at 3 percent. Any loss of range of motion is awarded in addition to this item. The total impairment cannot exceed the amputation value.

4) Shoulder

Amputations:

1. Schedule item 1 – Amputation: proximal, third of humerus or disarticulation at the Shoulder - 70 percent.

Range of Motion (a totally fused shoulder would be 35%)

 *The total impairment granted for the loss of shoulder movement is 35% as outlined in schedule item 6. Each movement is allocated with a portion of this overall percentage.*

$$\text{Flexion} = \frac{(\text{G.S.} - \text{I.S.})}{\text{G.S.}} \times \text{SA}$$

Norm ROM = 158
% allotted = 14

<u>EX. with injury on right side</u>	<u>R</u>	<u>L</u>
	140	155
$\frac{(155 - 140)}{155} \times 14 = \frac{15}{155} \times 14 = 1.35\%$		

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$$\text{Extension} = \frac{(\text{G.S.} - \text{I.S.})}{\text{G.S.}} \times \text{SA} \qquad \text{Norm ROM} = 53$$

% allotted = 3.5

<u>EX. with injury on right side</u>	<u>R</u>	<u>L</u>
	35	50
$\frac{(50 - 35)}{50} \times 3.5 = \frac{15}{50} \times 3.5 = \mathbf{1.05\%}$		

$$\text{Abduction} = \frac{(\text{G.S} - \text{I.S.})}{\text{G.S}} \times \text{SA} \qquad \text{Norm ROM} = 170$$

% allotted = 7

<u>EX. With injury on right side</u>	<u>R</u>	<u>L</u>
	110	169
$\frac{(169 - 110)}{169} \times 7 = \frac{59}{169} \times 7 = \mathbf{2.44\%}$		

$$\text{Adduction} = \frac{(\text{G.S.} - \text{I.S.})}{\text{G.S.}} \times \text{SA} \qquad \text{Norm ROM} = 50$$

% allotted = 3.50

<u>EX. with injury on right side</u>	<u>R</u>	<u>L</u>
	35	50
$\frac{(50 - 35)}{50} \times 3.5 = \frac{15}{50} \times 3.5 = \mathbf{1.05}$		

$$\text{Internal Rotation} = \frac{(\text{G.S.} - \text{I.S.})}{\text{G.S.}} \times \text{SA} \qquad \text{Norm ROM} = 70$$

% allotted = 3.5

(Arm in Abduction, 90°)

<u>EX. with injury on right side</u>	<u>R</u>	<u>L</u>
	20	65
$\frac{(65 - 20)}{65} \times 3.5 = \frac{45}{65} \times 3.5 = \mathbf{2.42\%}$		

$$\frac{\text{External Rotation}}{\text{(Arm in Abduction, 90°)}} = \frac{\text{(G.S. - I.S.)}}{\text{G.S.}} \times \text{SA} \quad \text{Norm ROM} = 90$$

$$\% \text{ allotted} = 3.5$$

EX. with injury on right side	<u>R</u>	<u>L</u>
	50	80
$\frac{(80 - 50)}{80} \times 3.5 = \frac{30}{80} \times 3.5 = 1.31\%$		

Total Shoulder = 9.62%

Shoulder Replacement

The impairment rating for this procedure has been set at 6.5 percent. Any loss of range of movement is considered in addition to this item. Total impairment may not exceed the amputation value.

Other Conditions and Surgical Procedures

- a. Biceps Tendon Rupture
 - (i) Proximal 1.5%
 - (ii) Distal 2.0%
- b. Acromioclavicular Joint Resection 3.0%

Any loss of range of movement is considered in addition to these items. Total impairment not to exceed the amputation value.

5) **Hip**

Amputations

Schedule item 15 – an amputation near the hip (hip disarticulation or short stump). The impairment rating is 65 percent.

Range of Motion (a totally fused hip would be 30%)

↳ *The total impairment granted for the loss of hip movement is 30% as outlined in schedule item 27. Each movement is allocated with a percentage of this overall impairment.*

$$\text{Flexion} = \frac{(\text{G.S.} - \text{I.S.})}{\text{G.S.}} \times \text{SA}$$

$$\text{Norm ROM} = 113$$

$$\% \text{ allotted} = 9$$

<u>EX. with injury on right side</u>	<u>R</u>	<u>L</u>
	80	110
$\frac{(110 - 80)}{110} \times 9 = \frac{30}{110} \times 9 = \mathbf{2.45\%}$		

$$\text{Extension} = \frac{(\text{G.S.} - \text{I.S.})}{\text{G.S.}} \times \text{SA}$$

$$\text{Norm ROM} = 28$$

$$\% \text{ allotted} = 2$$

<u>EX. with injury on right side</u>	<u>R</u>	<u>L</u>
	15	25
$\frac{(25 - 15)}{25} \times 2 = \frac{10}{25} \times 2 = \mathbf{0.80\%}$		

$$\text{Abduction} = \frac{(\text{G.S.} - \text{I.S.})}{\text{G.S.}} \times \text{SA}$$

$$\text{Norm ROM} = 48$$

$$\% \text{ allotted} = 7$$

<u>EX. with injury on right side</u>	<u>R</u>	<u>L</u>
	20	45
$\frac{(45 - 20)}{45} \times 7 = \frac{25}{45} \times 7 = \mathbf{3.89\%}$		

$$\text{Adduction} = \frac{(G.S. - I.S.)}{G.S.} \times SA \qquad \text{Norm ROM} = 31$$

% allotted = 3

<u>EX. with injury on right side</u>	<u>R</u>	<u>L</u>
	20	30
$\frac{(30 - 20)}{30} \times 3 = \frac{10}{30} \times 3 = \mathbf{1.00\%}$		

$$\text{Internal Rotation} = \frac{(G.S. - I.S.)}{G.S.} \times SA \qquad \text{Norm ROM} = 30$$

(In Flexion) % allotted = 3

<u>EX. with injury on right side</u>	<u>R</u>	<u>L</u>
	20	30
$\frac{(30 - 20)}{30} \times 3 = \frac{10}{30} \times 3 = \mathbf{1.00\%}$		

$$\text{External Rotation} = \frac{(G.S. - I.S.)}{G.S.} \times SA \qquad \text{Norm ROM} = 45$$

% allotted = 6

<u>EX. with injury on right side</u>	<u>R</u>	<u>L</u>
	15	40
$\frac{(40 - 15)}{40} \times 6 = \frac{25}{40} \times 6 = \mathbf{3.75\%}$		

Hip Replacement

The impairment rating for this procedure has been set at 6.0 percent Any loss of Range of motion over and above the 6.0 percent is awarded in addition to this item. Total impairment may not be more than the amputation value.

Femoral Head Replacement

The impairment rating for this procedure has been set at 3 percent. Any loss of Range of motion over and above the 3% is awarded in addition to this item. Total Impairment may not exceed the amputation value.

**6) Knee
Amputations**

- Schedule item 16 –Amputation of the thigh, sight of election or end bearing (requiring false knee joint) – 50 percent.

Range of Motion (a totally fused knee would be 25%)

Norm ROM = 134 Flexion
0 Extension
% allotted = 25

$$\frac{\text{G.S.} - \text{I.S.}}{\text{G.S.}} \times \text{SA}$$

EX. 1 Loss of Flexion only

$$\text{R: } \frac{0}{100} \quad \text{L: } \frac{0}{130}$$

$$\frac{(130 - 100)}{130} \times 25 = \frac{30}{130} \times 25 = 5.77\%$$

EX. 2 Loss of flexion plus extension deficit

$$\text{R: } \frac{15}{115} \quad \text{L: } \frac{0}{135}$$

$$\frac{(135 - (115 - 15))}{135} \times 25 = \frac{(135 - 100)}{135} \times 25 = \frac{35}{135} \times 25 = 6.48\%$$

Note: if there is also extension loss on the good side, the extension loss must be deducted from the flexion figure.

Example, if there is extension loss of 5 degrees on the good side this must be subtracted from the flexion figure on the good side. In the example above the total Range of movement on the good side would now be 130° (135 – 5).

Loss of hyperextension is not considered an impairment, hyperextension is taken as zero.

Knee Ligament Laxity

Laxity findings recorded based on the following rating scale:

- 0** = 0-4 mm opening
- 1** = 5-9 mm opening
- 2** = 10-14 mm opening
- 3** = more than 14 mm opening

Impairment for ligament laxity is rated as follows:

Anterior Cruciate (ACL) Maximum 5%:	where 1 = 1.67%
	2 = 3.34%
	3 = 5%
Posterior Cruciate Ligament (PCL) Maximum 6%:	where 1 = 1.67%
	2 = 3.34%
	3 = 5%
Medial Collateral (MCL) Maximum 2.5%:	where 1 = .83%
	2 = 1.66%
	3 = 2.5%
Lateral Collateral (LCL) Maximum 2.5%:	where 1 = .83%
	2 = 1.66%
	3 = 2.5%

Knee Replacement

The impairment rating for this procedure has been set at 9 percent. Any loss of range of movement or instability is awarded in addition to this item. Total impairment for knee replacement, loss of range of motion and instability shall not exceed the amputation value.

Patellectomy

This procedure is granted 3 percent for a partial patellectomy and 6 percent for a total patellectomy. Any loss of range of movement or instability is awarded in addition to this item. Total impairment shall not exceed the amputation value.

Deformity

The following deformities are granted 2 percent. Any loss of range of movement or instability would be awarded in addition to these items. Total impairment shall not exceed the amputation value.

- Recurvatum, greater than 10 degrees for each limb..... 2
- Valgus, greater than 10 degrees for each limb..... 2
- Varus, greater than 10 degrees for each limb..... 2
- Rotation, greater than 10 degrees for each limb..... 2



Triple Arthrodesis

Fusion of the subtalar (talocalcaneal) and Midtarsal equals 7 percent as per Schedule item 32 (b)

9) Midtarsal Amputation

1. Schedule item 23 – amputation through midtarsal (Chopart’s Amputation) is 20%.
2. Schedule item 24 – Tarsometatarsal (Lisfranc’s Amputation) is 15 percent.

Range of Motion

- Forefoot not measured in degrees. Movement reported as **full**, ¾, ½, ¼ or **none**.
- Total % of impairment is **2.75%** for complete immobility (fused).

The Medical Examiner indicates in the report how much movement there is in the forefoot. For example, ½ motion of the forefoot maybe recorded in the report. This is then selected in the software and the impairment rating given. ½ movement equals 1.375%.

9) Great Toe Amputation

There are two amputation selections for the great toe.

1. Schedule item 23 – Toes, great(at MP joint) – 2.5 percent. With the Head of the Metatarsal the rating is 5 percent.
2. Schedule item 24 – Toes, great at distal – 1.0 percent.

If all the toes are amputated at the MP joint the impairment will show as 5 percent, schedule item 22.

Range of Motion

$$\text{IP Joint} = \frac{(\text{G.S.FL.} - \text{G.S.Ex.}) - (\text{I.S.FL.} - \text{I.S.Ex.})}{(\text{G.S.FL.} - \text{G.S.Ex.})} \times 1.00 \times .50$$

Norm ROM = 60 Flexion, 0 Extension

<u>EX. with injury on right side</u>	<u>R</u>	<u>L</u>
	<u>0</u>	<u>0</u>
	40	60
$(60 - 0) - (40 - 0) \times 1.0 \times .50$		
$\frac{(60 - 0)}{60}$		
$= \frac{(60 - 40)}{60} \times .50 = .17$		

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MP Joint

Norm ROM = 37 Flexion
63 Extension

% allotted = 1.25

(When calculating the MP joint, any impairment value given for the IP joint must be subtracted)

$$\frac{\text{Total ROM G.S. (Ext. + Flex.)} - \text{Total ROM I.S. (Ext. + Flex.)}}{\text{Total ROM G.S.}} \times 2.50 \times .50$$

(example below only MP joint is injured)

<u>EX. with injury on right side</u>	<u>R</u>	<u>L</u>
Ext.	50	60
Flex.	<u>20</u>	<u>35</u>
Total ROM =	70	95
$\frac{(60 + 35) - (50 + 20)}{(60 + 35)} \times 2.5 \times .50$ $= \frac{(95 - 70)}{95} \times 1.25 = .33$		

Example 1: Complete Amputation of Great Toe
(injury on the right side)

IP Joint Amputated = 1.00%
MP Joint Amputated = 1.50%
Total Impairment = 2.50%

Example 2: Both joints having Restricted Movement

IP joint restricted on the right side.

<u>R</u>	<u>L</u>
<u>0</u>	<u>0</u>
40	60

$$\frac{(60 - 0) - (40 - 0)}{(60 - 0)} \times 1.0 \times .50$$

$$= \frac{(60 - 40)}{60} \times .50 = .17$$

MP Joint restricted.

	<u>R</u>	<u>L</u>
Flexion	20	35
Extension	<u>50</u>	<u>60</u>
Total	70	95

$$\frac{(60 + 35) - (50 + 20)}{(60 + 35)} \times (2.5 - .17) \times .50 \quad (.17 \text{ is } \% \text{ calculated for IP})$$
$$= \frac{(95 - 70)}{95} \times 1.17 = .31$$

TOTAL IMPAIRMENT = .48%

Toes, other than Great

Amputations

There are two schedule items dealing with the other toes.

1. Schedule item 25 – Toes, other than great, each - .5 percent.
With the head of the metatarsal, each additional - .5 percent.
2. Schedule item 26 – little with metatarsal – 2 percent.

Range of Motion

Although the toe motion of the other toes can be measured this is rarely done in the clinical setting. Measurement of the toes, other than the great, is difficult to perform. Therefore, any percentage given is a judgement award based on the Officer's review of the medical, often in consultation with a Disability Awards Medical Advisor . Any award given for a individual toe cannot exceed the amputation value.

Limb Shortening(leg length)

Shortening of the leg less than 1.5cm is normally not considered an impairment. The impairment shall conform to the following table (schedule item33).^φ

	<u>Percentage</u>
(a) 1.5 cm or less.....	0
(b) 1.6 cm to 2.5 cm.....	2
(c) 2.6 cm to 3.5 cm.....	3
(d) 3.6 cm to 4.5 cm.....	4
(e) 4.6 cm to 5.5 cm.....	6
(f) 5.6 cm to 6.5 cm.....	8
(g) 6.6 cm to 7.4 cm.....	10
(h) 7.5 cm or more.....	15

Osteoarthritis of a lower limb weight bearing joint will be classified as mild, moderate, or severe on the basis of imaging studies and/or operative report. It will be assessed as follows:

<u>Class of OA</u>	* Percent of Arthrodesis Value <u>From PDES</u>
Mild	0
Moderate	10
Moderately Severe	20
Severe	30

This OA assessment should be compared with the total ROM/Power/Sensory value, and the greater of the two given.

^φ Shortening of the leg as the result of an injury/surgery is evaluated making reference to Schedule item 33. Shortening of 1.6 cm or more would normally be considered an impairment.



Peripheral Nerve Impairment

⚡

THESE CONDITIONS ARE ASSESSED AS MILD, MODERATE, MARKED OR COMPLETE.

CRITERIA FOR ASSESSMENT OF NERVE FUNCTION.

I Sensory

- Normal - No loss of function
- Mild - Slight paresthesia/hypesthesia
- Moderate - Moderate paresthesia/hypesthesia
- Marked - As above (Moderate) + loss of stereognosis + ulcers/trophic changes or marked paresthesia/hypesthesia
- Complete - No sensation

II Motor

- Normal - No loss of function
- Mild - Active movement against strong resistance
- Moderate - Active movement against slight resistance
- Marked - Movement against gravity
- Complete - No power

III Complete Loss of Nerve Function

<u>Schedule item</u>	<u>Percentage</u>
Median at Elbow.....	40
at Wrist.....	20
Ulnar at Elbow.....	10
at Wrist.....	8
Radial Complete Loss.....	20
Axillary Complete Loss.....	6
Sciatic Complete Loss.....	30
Femoral Complete Loss.....	12.5
Peroneal Complete Loss.....	10

⚡ Injuries involving major nerves require a medical assessment by a physician. The impairment rating assigned is based on the percentage of loss of function of an area as the result of a nerve injury. The Medical Examiner would report the percentage loss of function for the applicable nerve based on the tables in this section.



Injury to other peripheral nerves are rarer and will be assessed by Disability Awards Medical Advisors on an individual case basis.

IV Relative Value Sensory vs. Motor Components of Peripheral Nerves

N.B. - Represents Percent of Total Nerve Function **NOT** Whole Person

R.V. = Relative Value

	R.V. Sensory	R.V. Motor
Median at Elbow	50	50
at Wrist	60	40
Ulnar at Elbow	30	70
at Wrist	30	70
Radial	10	90
Axillary	10	90
Sciatic	40	60
Femoral	25	75
Peroneal	20	80

TABLE OF AWARDS

PERIPHERAL NERVE CONDITIONS

(N.B. Percentages listed in this table are percent impairment of whole person.)

MEDIAN

AT ELBOW	<u>SENSORY</u>	<u>MOTOR</u>
Normal	0	0
Mild	5	5
Moderate	10	10
Marked	15	15
Complete	20	20
AT WRIST		
Normal	0	0
Mild	3	2
Moderate	6	4
Marked	9	6
Complete	12	8

ULNAR

SENSORY

MOTOR

AT ELBOW

Normal	0	0
Mild	0.75	1.75
Moderate	1.5	3.5
Marked	2.25	5.25
Complete	3	7

AT WRIST

Normal	0	0
Mild	0.6	1.4
Moderate	1.2	2.8
Marked	1.8	4.2
Complete	2.4	5.6

RADIAL

Normal	0	0
Mild	0.5	4.5
Moderate	1	9
Marked	1.5	13.5
Complete	2	18

AXILLARY

Normal	0	0
Mild	0.15	1.35
Moderate	0.3	2.7
Marked	0.45	4.05
Complete	0.6	5.4

SCIATIC

Normal	0	0
Mild	3	4.5
Moderate	6	9
Marked	9	13.5



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	Complete	12	18
FEMORAL			
	Normal	0	0
	Mild	0.625	2.5
	Moderate	1.25	5
	Marked	1.875	7.5
	Complete	2.5	10
PERONEAL			
	Normal	0	0
	Mild	0.5	2
	Moderate	1	4
	Marked	1.5	6
	Complete	2	8



Anatomic/Surgical Impairment of Spine

For the spine, the final impairment rating will be the greater of:

1. anatomic and/or surgical impairment or
2. loss or range of movement of the spine.

Anatomic and/or surgical impairment includes:

- compression fractures
- surgical loss of an intervertebral disc
- spine ankylosis (fusion)

Compression Fractures:

Cervical Spine

- up to 50% compression equals 0-2 percent
- greater than 50% compression equals 2-4 percent

Thoracic Spine

- up to 50% compression equals 0-1 percent
- over 50% compression equals 1-2 percent

Lumbar Spine

- up to 50% compression equals 0-2 percent
- over 50% compression equals 2-4 percent

Surgical loss of intervertebral disc

Cervical Spine – 2 percent per level (C1 to D1) to maximum of 21%

Thoracic Spine – 1 percent per level to a maximum of 6% (T1 to T12)

Lumbar Spine – 2 percent per level (T12 to S1) to maximum of 24%.

Ankylosis (fusion) including surgical of intervertebral disc

Cervical Spine – 3 percent per level (C1 to D1) to maximum of 21%

Dorsal (Thoracic) Spine – 1 percent per level to a maximum of 6 percent
(D1 to D12)

Lumbar Spine – 4 percent per level (D12 to S1) to maximum of 24%.

10) Cervical Spine (Range of Movement Calculations)

$$\frac{\text{Flexion} = (\text{Norm} - \text{I.S.})}{\text{Norm}} \times \text{SA}$$

Norm ROM = 40°
% allotted = 6

EX. ROM of injured back 25° Flexion

$$\frac{(40 - 25)}{40} \times 6 = \frac{15}{40} \times 6 = \mathbf{2.25\%}$$

$$\frac{\text{Extension} = \text{Norm} - \text{I.S.}}{\text{Norm}} \times \text{SA}$$

Norm ROM = 40°
% allotted = 3

EX. ROM of injured back 20° extension

$$\frac{(40 - 20)}{40} \times 3 = \frac{20}{40} \times 3 = \mathbf{1.5\%}$$

Lateral Flexion (Right & Left)

Norm ROM = 30°
% allotted = 2

$$\frac{(\text{Norm} - \text{I.S.})}{\text{Norm}} \times \text{SA}$$

EX. Measured Lateral Flexion on Right which is 20° on Left Lateral Flexion is Normal.

$$\text{Lat. Flexion Right} = \frac{(30^\circ - 20^\circ)}{30^\circ} \times 2 = \frac{10}{30} \times 2 = \mathbf{.67\%}$$

Rotation (Right & Left)

Norm ROM = 60°
% allotted = 4

$$\frac{(\text{Norm} - \text{I.S.})}{\text{Norm}} \times \text{SA}$$

EX. Measured Rotation on Right which is 40° on Left Rotation is Normal.

$$\text{Rotation, Right} = \frac{(60 - 40)}{60} \times 4 = \frac{20}{60} \times 4 = \mathbf{1.33}$$

11) Thoracic Spine (Range of Movement Calculations)

Rotation (*Right & Left*)

Norm ROM = 45°

% allotted = 3

$$\frac{(\text{Norm} - \text{I.S.})}{\text{Norm}} \times \text{SA}$$

EX. Measured Rotation on Right side is 30°, on Left, Rotation is Normal.

$$\frac{(45 - 30)}{45} \times 3 = \frac{15}{45} \times 3 = \mathbf{1.00\%}$$

12) Lumbar Spine (Range of Movement Calculations)

Flexion = $\frac{(\text{Norm} - \text{I.S.})}{\text{Norm}} \times \text{SA}$

Norm ROM = 60°

% allotted = 9

EX. ROM of injured back 45° Flexion

$$\frac{(60^\circ - 45^\circ)}{60^\circ} \times 9 = \frac{15}{60} \times 9 = \mathbf{2.25}$$

Extension = $\frac{(\text{Norm} - \text{I.S.})}{\text{Norm}} \times \text{SA}$

Norm ROM = 25°

% allotted = 5

EX. ROM of injured back 15° Extension

$$\frac{(25 - 15)}{25} \times 5 = \frac{10}{25} \times 5 = \mathbf{2.00\%}$$

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Lateral Flexion (*Right & Left*)

Norm ROM = 25°

% allotted = 5

(Norm – I.S.) X SA

Norm

EX. Measured Lateral Flexion on Right which is 15°, on Left, Lateral Flexion is Normal.

$$\text{Lat. Flexion Right} = \frac{(25 - 15)}{25} \times 5 = \frac{10}{25} \times 5 = \mathbf{2.00\%}$$

12) Hands

Hand impairment can vary from simple, single joint stiffness to a complex combination of amputation, stiffness and nerve injury.

Hand impairment is always calculated starting with distal impairment and proceeding proximally. The injured side is usually compared to the normal side. If both sides are injured then the injured joints are compared to the Board's established NORMs.*

The calculation process is as follows:

1. Determine the nature of the injuries to the affected hand or hands.
2. Select the hand chart which corresponds to the combination of hand impairments (amputations, loss of Range of Movement, sensory loss) for the complete hand. If thumb also involved, then calculations for thumb are done referencing hand chart #1.
3. For each finger affected at the most distal phalanx (ex. DIP joint) , calculate the impairment loss (for amputation, loss of range of movement, fusions, sensory loss) according to the selected chart.
4. Next, calculate the impairment for the next level (ex. PIP joint) , devaluing any impairment given on the previous level.
5. Proceed to the next phalanx (MP joint) and calculate impairment, devaluing for any impairment given on the previous level.
6. Loss of Hyperextension of a finger joint does not constitute an impairment, hyperextension is taken as zero.

Restricted Movement of a Single Finger (use hand chart #2)

Basic Formula

$$\frac{\text{Total ROM Normal Side} - \text{Total ROM Inj. side}}{\text{Total ROM Normal}} \times .75 \times \text{amputation value at joint concerned}$$



* When calculating hand impairment reference is made to Hand Charts (HC) #1 to 5. Hand Chart 1 is used for thumb and metacarpal impairments. Single and multiple finger impairments are assessed using Hand Charts 2 to 5. The multiple finger charts have built-in enhancement factors.

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A fused finger joint is equal to 3/4 of the value of an amputation at the same level.

EX. 1 Injury to DIP Joint of Right Index Finger

$$R = \frac{10}{60} \quad L = \frac{0}{80}$$

$$\frac{80 - (60 - 10)}{80} \times .75 \times 1.60 \text{ amp. Value}$$

$$= \frac{(80 - 50)}{80} \times .75 \times 1.60 = \frac{30}{80} \times .75 \times 1.60$$

$$= .45\%$$

EX. 2 Injury to all three joints of Right Index Finger

Use Hand Chart #2. The distal joint is calculated first. The next more proximal joint is then calculated based on the remaining value (after subtracting any impairment for the more distal impairment, either the DIP or the DIP/PIP combined).

	R	L
DIP	0/60	0/80
PIP	10/80	0/100
MP	20/60	0/90

$$\mathbf{DIP} = \frac{(80 - 60)}{80} \times .75 \times 1.60 = \frac{20}{80} \times .75 \times 1.6 = \mathbf{.30}$$

$$\mathbf{PIP} = \frac{100 - (80 - 10)}{100} \times .75 \times (3.2^{\text{=}} - .30^{\text{>}}) = \frac{30}{100} \times .75 \times 2.90 = \mathbf{.65}$$

$$\mathbf{MP} = \frac{90 - (60 - 20)}{90} \times .75 \times (4^{\text{=}} - .30 - .65) =$$

$$\frac{50}{90} \times .75 \times 3.05 = \mathbf{1.27}$$

$$\mathbf{TOTAL = 2.22}$$

Amputations (rules for thumb and fingers):

⁼ 1.6DIP + 1.6 PIP

[>] Impairment already given.

⁼ 1.6 DIP + 1.6 PIP + .8 MP

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- a. Complete amputation of the digital pulp is equivalent to one quarter of the distal phalanx.
- b. Amputations of a phalanx or a metacarpal will be assessed in fractions:
 - One quarter loss
 - One third loss
 - One half loss
 - Two thirds loss
 - Three quarters loss
 - Complete loss

EX. 3 Injury to Multiple Fingers at all three levels

If two or more fingers are involved the appropriate multiple finger chart is used to assess the impairment.

Index Finger

	R	L
DIP	0/60	0/80
PIP	10/80	0/100
MP	20/70	0/90

Middle Finger

	R	L
DIP	Amp	0/80
PIP	0/80	0/100
MP	Fused	0/90

In this example Hand Chart #3 is used for all the calculations as the injuries are to the index and long fingers (i.e. two fingers involved).

Index Finger:

$$\text{HC \#3 DIP } \frac{(80 - 60)}{80} \times .75 \times 2.8 = \frac{20}{80} \times .75 \times 2.8 = .53$$

$$\text{HC \#3 PIP } \frac{100 - (80 - 10)}{100} \times .75 \times (5.6 - .53) = \frac{30}{100} \times .75 \times 5.07 = 1.14$$

$$\text{HC \#3 MP } \frac{90 - (70 - 20)}{90} \times .75 \times (7.0 - .53 - 1.14) = \frac{40}{90} \times .75 \times 5.33 = 1.78$$

$$\text{TOTAL} = \underline{\underline{3.45\%}}$$

Middle Finger:

HC #3 DIP - Amputation at DIP Joint ∴ Impairment is 2.8% = **2.8%**

$$\text{HC \#3 PIP} - \frac{(100 - 80)}{100} \times .75 \times (5.6 - 2.8) = \frac{20}{100} \times .75 \times 2.8 = .42\%$$

$$\text{HC \#3 MP} - \text{Joint Fused} \therefore \text{Impairment is } (7 - 2.8 - .42) \times .75\% \\ = 3.78 \times .75\% = \mathbf{2.84\%}$$

TOTAL = 6.06

TOTAL BOTH = 9.51

EX. 4 Injury to Multiple Fingers at various levels

If two or more fingers are involved the appropriate multiple finger chart is used to assess the impairment. In this example, there is impairment to three fingers, therefore, Hand Chart 4 is used.

Index Finger

	R	L
DIP	AMP.	0/80
PIP	20/80	0/100
MP	0/70	0/90

Middle Finger

	R	L
DIP	0/60	0/80
PIP	0/70	0/100
MP	0/90	0/90

Ring Finger

	R	L
DIP	0/60	0/80
PIP	0/100	0/100

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MP	0/90	0/90
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Index Finger: Hand Chart #4

DIP – Amputation at DIP Joint of Right Index Finger ∴ impairment = **3.4%**

$$\text{PIP calculation} = \frac{100 - (80 - 20)}{100} \times .75 \times (6.8 - 3.4)$$

$$= \frac{40}{100} \times .75 \times 3.4 = \mathbf{1.02}$$

$$\text{MP calculation} = \frac{(90 - 70)}{90} \times .75 \times (8.5 - 3.4 - 1.02)$$

$$\frac{20}{90} \times .75 \times 4.08 = \mathbf{.68}$$

$$\text{TOTAL INDEX FINGER} = 3.4 + 1.02 + .68 = \mathbf{5.1}$$

Middle Finger: Hand Chart #4 (no impairment of MP)

$$\text{DIP Impairment} = \frac{(80 - 60)}{80} \times .75 \times 3.4$$

$$= \frac{20}{80} \times .75 \times 3.4 = \mathbf{.64}$$

$$\text{PIP calculation} = \frac{(100 - 70)}{100} \times .75 \times (6.8 - .64)$$

$$= \frac{30}{100} \times .75 \times 6.16 = \mathbf{1.39}$$

$$\text{TOTAL MIDDLE FINGER} = \mathbf{2.03}$$

Ring Finger: Hand Chart #4 (no impairment PIP and MP)

$$\text{DIP calculation} = \frac{(80 - 60)}{80} \times .75 \times 2.1$$

$$= \frac{20}{100} \times .75 \times 2.1 = \mathbf{.39}$$

80

TOTAL OF ALL THREE FINGERS 5.1 + 2.03 + .39 = 7.52**Restricted Movement of Thumb (use hand chart #1):**

Basic Formula = $\frac{\text{Restriction degrees}}{\text{Normal degrees}} \times .50 \times \text{amp. Value}$

This calculation is for IP + MP Joints, the CMC Joint calculation is different (see example below). Rules are similar to finger calculations. Amputation rules same as fingers.

EX. 5 Thumb

	R	L
IP	20/60	0/80
MP	0/40	0/50

$$\text{IP} = \frac{80 - (60 - 20)}{80} \times .50 \times 10$$

$$= \frac{40}{80} \times .50 \times 10 = \mathbf{2.5}$$

$$\text{MP} = \frac{(50 - 40)}{50} \times .50 \times (16 - 2.5)$$

$$= \frac{10}{50} \times .50 \times 13.50 = \mathbf{1.35}$$

TOTAL IMPAIRMENT = 3.85%

CMC Joint of Thumb

There are three separate movements measured for the CMC Joint. These are:

- Extension
- Flexion
- Palmar Abduction

Note: The total impairment value for the CMC joint is 20%. Each movement is assigned 1/3 of that ($20 \div 3 = 6.67\%$) If there is impairment of the IP or MP joints this impairment must be taken into account for devaluation purposes. Where devaluation applies the amounts granted for the IP & MP joints are first deducted from the 20%, and the remainder is then divided by 3 and 1/3 is assigned to each CMC joint movement.

In this example the right CMC joint is injured. The injured side is always compared with the good side which is consisted with our practice for calculating impairment ratings. The Norms are only used when both sides are impaired. In the following example **only** the CMC joint is injured and the measurements are:

	R (injured side)	L (good side)	Norms
Extension	8	50	50
Flexion	9	15	15
Palmar Abduction	40	50	50

Step 1: Calculation.

Good	Injured
------	---------

$(20 \div 3 = 6.67)$

Extension: $(50 - 8) \div 50 \times .50 \times 6.67$
 $= 42 \div 50 \times .50 \times 6.67 = \mathbf{2.80\%}$

Good	Injured
------	---------

Flexion: $(15 - 9) \div 15 \times .50 \times 6.67$
 $= 6 \div 15 \times .50 \times 6.67 = \mathbf{1.33\%}$

Good	Injured
------	---------

Palmar Abduction: $(50 - 40) \div 50 \times .50 \times 6.67$
 $= 10 \div 50 \times .50 \times 6.67 = \mathbf{0.67\%}$

TOTAL = 4.80

Sensory Loss

When calculating finger impairment, consideration is given first to any amputations, restricted movement, or fusions. An additional factor for sensory loss can be given up to 50% of the amputated value of a joint taking into consideration anything already calculated for reduced range of motion, fusions or amputations.

2 – point discrimination findings are measured on the radial and ulnar side of a phalanx. The ratings are recorded as follows:

- 3 = 6mm or less – 0%
- 2 = 7 – 15 mm – 12.5% value of the joint
- 1 = more than 15mm – 25% value of joint

The applicable Hand Chart would apply.

On the thumb, 2-point discrimination is normally only tested on the palmar surface of the IP joint. On the fingers, 2-point discrimination is normally only tested on the palmar surface of the DIP and PIP joints. The 2-point discrimination findings are only used in the calculation of the most distal prehensile surface. For example, if the IP joint of the thumb is completely amputated, there would normally be no impairment for 2-point discrimination loss on the MP joint palmar surface. If, the DIP joint of the index finger was amputated at the half way mark, any reduction in 2-point discrimination would be used in the impairment rating of the DIP joint, normally no consideration would be given for the PIP joint. Consideration of the PIP joint for 2-point discrimination normally would only be done if the DIP joint was completely amputated.

EX. 5 Injury to Multiple Fingers at various levels with sensory loss

If two or more fingers are involved the appropriate multiple finger chart is used to assess the impairment. In this example, there is impairment to three fingers, therefore, Hand Chart 4 is used. There is also sensory loss to each remaining distal surface.

Index Finger

	R	L
DIP	AMP.	0/80
PIP	20/80	0/100
MP	0/70	0/90

Middle Finger

	R	L
DIP	0/60	0/80
PIP	0/70	0/100
MP	0/90	0/90

Ring Finger

	R	L
DIP	0/60	0/80
PIP	0/100	0/100
MP	0/90	0/90

Sensory Testing

	Index		Long		Ring		Little	
	R	U	R	U	R	U	R	U
DIP	A	A	2	3	2	1		
PIP	3	1	2	3	2	1		

Index Finger:

DIP – Amputation at DIP Joint of Right Index Finger ∴ impairment = **3.4%**

$$\text{PIP calculation} = \frac{100 - (80 - 20)}{100} \times .75 \times (6.8 - 3.4)$$

$$= \frac{40}{100} \times .75 \times 3.4 = 1.02$$

PIP Sensory loss: No sensory loss on radial side. Ulnar side (1) more than 15 mm.

Remaining value of PIP joint is:

$$3.4\% - 1.02\% = 2.38$$

$$\text{Ulnar side sensory impairment would be } 2.38 \times 25\% = .60$$

$$\text{Total PIP impairment} = \mathbf{1.62\%}$$

$$\text{MP calculation} = \frac{(90 - 70)}{90} \times .75 \times (8.5 - 3.4 - 1.62)$$

$$\frac{20}{90} \times .75 \times 3.48 = \mathbf{.58}$$

$$\mathbf{\text{TOTAL INDEX FINGER} = 3.4 + 1.62 + .58 = \underline{5.6}}$$

Middle Finger: Hand Chart #4

$$\begin{aligned}\text{DIP Impairment} &= \frac{(80 - 60)}{80} \times .75 \times 3.4 \\ &= \frac{20}{80} \times .75 \times 3.4 = \mathbf{.64}\end{aligned}$$

DIP Sensory loss: Radial side (2) 7 to 15mm. Ulnar side (3) 6mm or less, no impairment.

Remaining value of DIP joint is:

$$3.4\% - .64\% = 2.76$$

$$\text{Radial side sensory impairment would be } 2.76 \times 12.5\% = .35$$

$$\text{Total DIP joint (ROM +Sensory)} = \mathbf{.99}$$

$$\begin{aligned}\text{PIP calculation} &= \frac{(100 - 70)}{100} \times .75 \times (6.8 - .99) \\ &= \frac{30}{100} \times .75 \times 5.81 = \mathbf{1.31}\end{aligned}$$

$$\text{TOTAL MIDDLE FINGER} = \mathbf{\underline{2.30}}$$

Ring Finger: Hand Chart #4

$$\begin{aligned}\text{DIP calculation} &= \frac{(80 - 60)}{80} \times .75 \times 2.1 \\ &= \frac{20}{80} \times .75 \times 2.1 = \mathbf{.39}\end{aligned}$$

DIP Sensory loss: Radial side (2) 7 to 15mm. Ulnar side (1) More than 15mm

Remaining value of DIP joint is:

$$2.1\% - .39\% = 1.71$$

$$\text{Radial side sensory impairment would be } 1.71 \times 12.5\% = .21$$

$$\text{Ulnar side sensory impairment would be } 1.71 \times 25\% = .43$$

$$\text{Total DIP joint (ROM +Sensory)} \mathbf{.39+.21+.43 = 1.03}$$

$$\text{TOTAL OF ALL THREE FINGERS } \mathbf{5.6 + 2.30 + 1.03 = \underline{8.93}}$$

Devaluation

When there is more than one injury within an extremity (arm or leg) then devaluation is applied. Where the sum of the scheduled percentages allocated to several disabilities exceeds their actual combined effect, a downward adjustment is required which is known as devaluation.*

Devaluation is always applied distal to proximal, with the distal impairment remaining the same. Devaluation is applied according to the following formula (RSCM # 39.13):

Devaluation Formula

- A) Value of whole _____ in schedule =
(extremity name)
- B) Value of assessed impairment – most distal =
- C) Remaining value of _____ (A – B) =
(extremity name)
- D) Value of assessed impairment (next level) _____ =
(2nd most distal)
- E) Percentage award for _____ (D X C) =
(2nd most distal) A
- F) Remaining value of _____ (C – E) =
(extremity name)
- G) Value of assessed impairment _____ (next level) =
(3rd most distal)
- H) Percentage award for _____ (G X F) =
(3rd most distal) A
- I) Total percentage of disability awarded (B + E + H) =

* Devaluation is discussed in policy 39.13.

A person can never receive more than 70% for a total arm or 65% for a total leg

Devaluation calculations:

EXAMPLE

Before devaluation arm impairment would be as follows:

Hand – 8.40%

Wrist – 5.74%

Elbow – 20.00%

Shoulder – 16.12%

Hand – Impairment remains the same (**8.40**)

Wrist – value of arm at shoulder is 70%.

Therefore remaining value of arm is $70 - 8.40 = 61.60$

$$\frac{5.74}{70} \times 61.60 = \mathbf{5.05}$$

Elbow – remaining value of arm is $61.60 - 5.05 = 56.55$

$$\frac{20}{70} \times 56.55 = \mathbf{16.16}$$

Shoulder – remaining value of arm is $56.55 - 16.16 = 40.39$

$$\frac{16.12}{70} \times 40.39 = \mathbf{9.30}$$

TOTAL DEVALUED IMPAIRMENT = 38.91

Enhancement (added in the form 24, not in calculator)

The application of an enhancement factor is a discretionary function carried out by the Officers based on the guidelines provided in policy 39.12. Normally, the enhancement factor is 50% of the lessor disability between two limbs. An

enhancement factor for the back maybe added if it is felt the back disability has been enhanced by another disability.

NORMs
(AVERAGE RANGES OF JOINT MOTION TABLE as listed in PDES)

Site/Measurement	Norm
ELBOW	
FLEXION	146
HYPEREXTENSION	0
FOREARM	
PRONATION	71
SUPINATION	84
WRIST	
EXTENSION	71
FLEXION	73
ULNAR DEVIATION	33
RADIAL DEVIATION	19
THUMB	
<i>IP JOINT</i>	
FLEXION	81
EXTENSION	0*
<i>MP JOINT</i>	
FLEXION	53
EXTENSION	0*
<i>CMC JOINT</i>	
EXTENSION	50 *
FLEXION	15 *
PALMAR ABDUCTION	50 *

* The Boards practice is to use zero as the norm for extension of the fingers, thumb, elbows and knees.

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Site/Measurement	Norm
FINGERS	
DIP JOINT	
FLEXION	80
EXTENSION	0
PIP JOINT	
FLEXION	100
EXTENSION	0
MP JOINT	
FLEXION	90
EXTENSION	0*
SHOULDER	
FLEXION	158
EXTENSION	53
ABDUCTION	170
ADDUCTION	50
INTERNAL ROTATION (ARM IN ABDUCTION 90 DEGREES)	70
EXTERNAL ROTATION (ARM IN ABDUCTION 90 DEGREES)	90
HIP	
FLEXION	113
EXTENSION	28
ABDUCTION	48
ADDUCTION	31
INTERNAL ROTATION (IN FLEXION)	30
EXTERNAL ROTATION (IN FLEXION)	45
KNEE	
FLEXION	134
EXTENSION	0*
ANKLE	
PLANTAR FLEXION	40
DORSIFLEXION	18
SUBTALAR	
MEASURED IN TERMS OF QUARTER MOVEMENTS.	
FOREFOOT	
MEASURED IN TERMS OF QUARTER MOVEMENTS.	

* The Boards practice is to use zero as the norm for extension of the fingers, thumb, elbows and knees. As noted in “The Clinical Measurement of Joint Motion”, hyperextension of these joints is not common in adults. Loss of hyperextension does not constitute a disability.

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Site/Measurement	Norm
GREAT TOE	
<i>IP JOINT</i>	
FLEXION	60
EXTENSION	0
<i>MP JOINT</i>	
FLEXION (PLANTAR FLEXION)	37
EXTENSION (DORSIFLEXION)	63
OTHER TOES	
Measurement of range of motion of the 2 nd to 5 th toes is difficult. Therefore the impairment rating is reached using adjudicative judgement based on the medical information and the impairment limits for these toes as provided by the schedule.	
SPINE	
<i>CERVICAL</i>	
FLEXION	40
EXTENSION	40
LATERAL FLEXION	30
ROTATION	60
<i>Thoracic</i>	
Rotation	45
<i>LUMBAR</i>	
FLEXION (12 DEG. EQUALS 1 CM FOR MODIFIED SCHOBER CONVERSION)	60
EXTENSION	25
LATERAL FLEXION	25