



**CRICKET AUSTRALIA**

**DOUBTFUL BOWLING ACTIONS PROCEDURES**

**Effective 1st October 2016**

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**TABLE OF CONTENTS**

1	Introduction .....	3
2	Umpires .....	4
3	Reporting Procedure .....	5
4	Analysis .....	6
5	Bowling Review Group Hearing.....	8
6	Re-assessment of player's action.....	10
7	Second and further reports .....	11
8	Costs .....	11
9	Under-Age Championships .....	12
10	Cricket Australia Standard Analysis Protocols.....	14

**CRICKET AUSTRALIA DOUBTFUL BOWLING ACTIONS PROCEDURES**  
**Effective 1st October 2016**

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## **1 Introduction**

- 1.1 The aim of these procedures is to ensure that all bowlers playing interstate cricket have actions that comply with Law 24.2 and the ICC Illegal Bowling Action Procedures.
- 1.2 These procedures:
  - 1.2.1 Detail the process for dealing with players bowling with a doubtful action in the following competitions:
    - a. Sheffield Shield
    - b. Matador BBQs One-Day Cup
    - c. KFC Twenty20 Big Bash League
    - d. WNCL
    - e. WBBL
    - f. Toyota Futures League
  - 1.2.2 Provide for an additional mechanism for the reporting of players suspected of bowling with illegal bowling actions at the Cricket Australia Under-Age Championships.
- 1.3 Nothing contained herein shall override an umpire's responsibility and discretion to apply Law 24.

**CRICKET AUSTRALIA DOUBTFUL BOWLING ACTIONS PROCEDURES**  
**Effective 1st October 2016**

---

## **2 Umpires**

- 2.1 Cricket Australia umpires have a duty to ensure the game is played within both the Laws and the Spirit of the game. Umpires must police Law 24.2 “Fair Delivery – The Arm”, read in conjunction with Law 24.3 “Definition of fair delivery – the arm”, by notifying Cricket Australia if they observe any bowler in a match situation who, in their opinion, possesses an action that may contravene these Laws.
- 2.2 Cricket Australia has instructed umpires as follows:
- 2.2.1 There are three categories of delivery:
- a. Fair Delivery;
  - b. Illegal Delivery (Blatant Throw); and
  - c. Doubtful Delivery

**Illegal Delivery:** *If an umpire believes a bowler has bowled a delivery that is clearly illegal (i.e. deliberately and blatantly thrown), the umpire shall call “no-ball” and Report the bowler on the Doubtful Bowling Action Report Form. To be considered an illegal delivery, the ball must be delivered with a markedly different action to his normal deliveries.*

**Doubtful Delivery:** *If an umpire believes a bowler has bowled with an action that may be illegal, the umpire should not “call” the bowler, but record the bowler’s name on the Doubtful Bowling Action Report Form. The Doubtful Bowling Action Report Form will offer the umpire two options;*

*Report;* If an umpire believes that a bowler has bowled a ball with an action that ***is illegal***, the umpire should **Report** that bowler on the Doubtful Bowling Action Report Form.

*Mention;* If an umpire is suspicious that a bowler has bowled a ball with an action that ***may be illegal***, the umpire should **Mention** that bowler on the Doubtful Bowling Action Report Form.

**Note:** *Umpires, in deciding whether to call or report a player under these regulations, should use the naked eye viewing the action live and/or on television at normal speed. Slow motion television replays should only be used to confirm initial suspicions.*

- 2.3 If, in any of the competitions detailed in 1.2.1, a player is called by an umpire for throwing in accordance with Law 24.2 or is suspected by the umpire(s) and/or the match referee for bowling with an action which contravenes Law 24.2 as read with Law 24.3 (a “Doubtful Bowling Action”), the following procedure shall apply.

**CRICKET AUSTRALIA DOUBTFUL BOWLING ACTIONS PROCEDURES**  
**Effective 1st October 2016**

---

### **3 Reporting Procedure**

- 3.1 At the conclusion of the match the umpires shall write a report (the Doubtful Bowling Action Report) detailing their concerns about the bowling action of the Player, including whether those concerns relate to the Player's bowling action generally or whether they relate to one or more specific types of delivery.
- 3.2 The umpires will notify the player, the Player's coach, and Cricket Australia of the report within 24 hours of the end of the days play on which the report is made or the Player is called.
- 3.3 Cricket Australia will then write to the CEO of the Player's State Association or BBL/ WBBL Team and to the Australian Cricketers Association (ACA) to advise that the Player has been Mentioned or Reported, to include a copy of the Doubtful Bowling Action Report, and to describe the implications of this Mention or Report for the Player with respect to the Cricket Australia Doubtful Bowling Action Procedures.
- 3.4 If a player is called for throwing, Reported, or Mentioned by the umpires officiating in that match the following procedure will apply:
  - 3.4.1 Cricket Australia will supply the player, the ACA and the State Association/BBL/WBBL Team CEO a copy of the Doubtful Bowling Action Report.
  - 3.4.2 Cricket Australia shall arrange for three copies of any available video footage of the bowling spells of the Player in the match in question to be produced as soon as possible. Two copies of this footage will be sent to the Player's State Association/BBL/WBBL Team. The State Association/BBL/WBBL Team will be responsible for providing a copy of the footage to the Player. The third copy shall be retained by Cricket Australia for the Analysis and any BRG hearing. If no video footage is available, Cricket Australia shall write to the Player's State Association/BBL/WBBL Team advising that there is no match footage available.
  - 3.4.3 The Player must submit to an Analysis as detailed below.
  - 3.4.4 Once the Analysis has been completed with the findings submitted in a Report to CA, The State Association/BBL/WBBL Team CEO and the player, CA shall make a media statement providing relevant information about the Player being reported, the Doubtful Bowling Action Analysis process and the results of that Analysis.

**CRICKET AUSTRALIA DOUBTFUL BOWLING ACTIONS PROCEDURES**  
**Effective 1st October 2016**

---

## **4 Analysis**

- 4.1 If a Player is *reported* in accordance with paragraph 3.4 above, they shall be required to submit to an Analysis of their bowling action carried out as follows:
- 4.2 The Analysis shall be carried out by the Cricket Australia Biomechanist (or their representative) in accordance with Cricket Australia Standard Analysis Protocols (Annexure 1) and shall take into account the Doubtful Bowling Action Report.
- 4.3 The Analysis shall be carried out as soon as possible but, in any event, within 14 days of receipt by the Player's State Association/BBL/WBBL Team of the notice advising that the Player has been *reported*.
- 4.4 The Analysis shall be conducted at the National Cricket Centre in Brisbane and Cricket Australia shall ensure that the Player, through the Player's State Association/BBL/WBBL Team, is given reasonable notice of the testing arrangements.
- 4.5 If the Player fails to submit to the Analysis as required above, such failure will be regarded as an admission that he/she bowls with an Illegal Bowling Action and he/she shall be immediately suspended from bowling in interstate/BBL/WBBL cricket until such time as he/she so submits.
- 4.6 If the Player expresses any concern or complaint regarding the circumstances or conduct of the Analysis, he/she should make these known to the Cricket Australia Sports Science Manager (or their representative) before the conclusion of the Analysis. The Cricket Australia Biomechanist (or their representative) responsible for conducting the Analysis should make a written note of the relevant concern or complaint which should be agreed with the Player.
- 4.7 Within 14 days of the date of the Analysis, the Cricket Australia Biomechanist (or their representative) shall provide Cricket Australia with a written report (the Assessment) in the form as set out in Cricket Australia Standard Analysis Protocols. Where the Assessment concludes that the Player employed an Illegal Bowling Action during the Analysis, it should indicate whether the Player employed an Illegal Bowling Action generally or in respect of specific type(s) of delivery only and whether, in the Cricket Australia Biomechanist (or their representative)'s opinion, such conclusion is not inconsistent with the relevant video evidence.
- 4.8 Where the Assessment concludes that the Player did not employ an Illegal Bowling Action during the Analysis, it should, where relevant, indicate whether, in the opinion of the Cricket Australia Biomechanist (or their representative), the Player's bowling action during the Analysis was materially different to his/her action in the match in respect of which he/she was reported (whether generally or in respect of the specific type(s) of delivery (if any) identified in the Doubtful Bowling Action Report). The Assessment should also include any notes of concerns or complaints of the Player made under paragraph 4.6 above.
- 4.9 Immediately upon receipt of the Assessment, Cricket Australia shall provide the Player's State Association/BBL/WBBL Team with a copy thereof.
- 4.10 Subject to paragraph 4.11 below, in the event that the Assessment concludes either that (i) the Player employed an Illegal Bowling Action during the Independent Analysis and that such conclusion is not inconsistent with the relevant video footage or that (ii) the Player's bowling action during the

## CRICKET AUSTRALIA DOUBTFUL BOWLING ACTIONS PROCEDURES

### Effective 1st October 2016

---

Analysis was materially different to their action in the match in respect of which he/she was reported, the Player shall immediately be suspended from bowling in interstate and BBL/WBBL cricket until such time as he/she has submitted to a fresh Analysis in accordance with the provisions set out in paragraph 1 below, and it is concluded that he/she has remedied his/her action. The suspension shall commence on the date of receipt by the Player's State Association of a copy of the Assessment, and the Player is not able to request a fresh Analysis of his action until at least 90 days after the commencement of the suspension.

**Note:** *Cricket Australia Doubtful Bowling Action Analysis Protocols contains reference to a level of acceptable elbow extension. Should the Assessment conclude that the Player's action exhibits a degree of elbow extension higher than the acceptable level; the action of the Player shall be deemed to be an Illegal Bowling Action. It should be noted that in order for the action to be classified as a legal action, the degree of elbow extension recorded for each and every delivery shall be within the level of acceptable elbow extension.*

- 4.11 In circumstances where the Assessment concludes that the Player employed an Illegal Bowling Action during the Analysis in respect of a specific type of delivery only, the Player will be allowed to continue bowling in interstate/BBL/WBBL cricket but subject to the warning (Warning) that should he/she continue to bowl any of the specific type(s) of delivery for which he/she has been found to have an Illegal Bowling Action, he/she will run the risk of being reported a second time. In these circumstances a further report resulting in an Analysis concluding that the Player has employed an Illegal Bowling Action will result in the immediate suspension of the Player from bowling in interstate and BBL/WBBL cricket and such suspension shall be considered a second suspension under the provisions of paragraph 7 below.

**Note:** *This is intended to cover the circumstances where a bowler employs a different technique to deliver a specific type of delivery e.g. propelling the ball out of the back of the hand to produce a "googly" or "doosra". It is not intended to cover the situation where the same basic technique is used to produce a different type of delivery e.g. more effort to produce a bouncer or a 'yorker'.*

- 4.12 Subject to the provisions of paragraph 4.5 above, throughout the period up to the date of receipt by the Player's State Association or BBL/WBBL Team of the Assessment, the Player shall be permitted to continue bowling in interstate/BBL/WBBL cricket. At any time throughout this period the Player is subject to being called on the field by the umpire(s) in accordance with Law 24.2 and the consequences of such Law must apply. During this period a further Doubtful Bowling Action Report will however have no consequence.
- 4.13 In the event that the Player does not accept the conclusions of the Assessment he/she shall be entitled to a hearing of the Bowling Review Group (BRG) as set out below.

**CRICKET AUSTRALIA DOUBTFUL BOWLING ACTIONS PROCEDURES**  
**Effective 1st October 2016**

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## **5 Bowling Review Group Hearing**

- 5.1 Upon receipt of an application for a BRG hearing, Cricket Australia shall appoint a BRG as follows:
  - 5.1.1 The Bowling Review Group shall comprise three (3) people:
    - a. Human movement specialist (CA Biomechanist or his representative);
    - b. Ex-Player; and
    - c. Legal Practitioner.
  - 5.1.2 The Head of Cricket Operations (or their representative) will be responsible for appointing the members of the BRG who will review the reported player. The Head of Cricket Operations (or their representative) shall also be responsible for chairing the Bowling Review Group.
  - 5.1.3 No member of the BRG shall be from the State or BBL/WBBL Team of the player who is the subject of the BRG hearing, unless permission is sought by Cricket Australia and granted by the Player and/or their State Association/BBL/WBBL Team.
- 5.2 The Player seeking a BRG hearing shall lodge with Cricket Australia (Head of Cricket Operations) written notice thereof within 14 days of the date of receipt by the Player's State Association/BBL/WBBL Team of the Assessment. The BRG hearing will be held as soon as reasonably possible but at least within 14 days of receipt by Cricket Australia of the Player's written notice.
- 5.3 Cricket Australia shall be responsible for arranging the appointment of the BRG in accordance with paragraph 5.1 above and for determining the time and place for the hearing. Cricket Australia shall ensure that the Player, through the Player's State Association/BBL/WBBL Team, is given reasonable notice thereof.
- 5.4 The Player shall attend the hearing. However, if the Player has received notice of the hearing and fails to attend, the hearing may proceed in the absence of the Player.
- 5.5 The Player shall be entitled to a representative who may attend the hearing.
- 5.6 The BRG hearing shall be conducted in accordance with the usual principles of natural justice.
- 5.7 The BRG will consider the following:
  - a. The video evidence referred to in paragraph 3.4.2 above.
  - b. The Doubtful Bowling Action Report.
  - c. The Assessment together with any image based evidence accompanying such assessment.
  - d. Any further evidence that the Player and/or their representative wishes to present in the Player's defence. This may include a written report, a verbal submission, any expert evidence and image based evidence.



**CRICKET AUSTRALIA DOUBTFUL BOWLING ACTIONS PROCEDURES**  
**Effective 1st October 2016**

---

- e. Any written or video evidence that the Player's State Association/BBL/WBBL Team wishes to be considered on behalf of the Player.
  
- 5.8 The Player and/or their representative shall be entitled to question any person called to give evidence in the course of the hearing on any issue relevant to the hearing. The members of the BRG shall be entitled to question the Player and/or any person called to give evidence on the Player's behalf.
- 5.9 After all the evidence and argument has been presented, the BRG shall adjourn the hearing to deliberate on its decision.
- 5.10 The BRG shall reach a decision by a simple majority vote. The Chairman of the BRG has the casting vote.
- 5.11 The BRG shall decide whether or not the Player has an Illegal Bowling Action and that (i) the suspension of, or the Warning to, the Player be maintained, or (ii) the suspension of, or the Warning to, the Player be lifted. The BRG must, in each case, set out the reasons why the decision has been reached, including a summary of the evidence on which the decision was based.
- 5.12 Cricket Australia will communicate the decision of the BRG in writing to the Player, through his State Association/BBL/WBBL Team, within 48 hours of the hearing being adjourned in accordance with paragraph 5.9 above.
- 5.13 Subject to the right of the Player to re-assessment, the decision of the BRG shall be final and binding.

**CRICKET AUSTRALIA DOUBTFUL BOWLING ACTIONS PROCEDURES**  
**Effective 1st October 2016**

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## **6 Re-assessment of player's action**

- 6.1 A Player who has been suspended from bowling in interstate and BBL/WBBL cricket under these regulations shall be permitted, under the supervision and with the consent of his State Association/BBL/WBBL Team, to continue to play club cricket.
- 6.2 Subject to the provisions of paragraph 7 below, a Player who has been suspended from bowling in interstate and BBL/WBBL cricket under these regulations, may apply to Cricket Australia for a re-assessment of their bowling action, provided that this application is not made earlier than 90 days after the date that the suspension commenced.
- 6.3 Such re-assessment shall be carried out in the same manner as the Analysis detailed earlier, save that the purpose of the comparison between the re-assessed action and the action of the Player as employed in the match in which he/she was reported shall be to determine the extent of the improvement to their action.
- 6.4 In the event of such re-assessment concluding that the player has remedied their action and that their action is no longer an Illegal Bowling Action, the Player's suspension shall be lifted and he/she shall be permitted to resume bowling in interstate or BBL/WBBL cricket.
- 6.5 In the event of such re-assessment concluding that the player has not remedied their action the CA Biomechanist, in their professional discretion, will outline the severity of the illegality of the bowler's action to determine the appropriate period of time before an additional re-assessment can occur. For the avoidance of doubt, the CA Biomechanist will prescribe a period of time between 30 days minimum and up to 90 days maximum after the date of the first re-assessment before the Player can to apply to Cricket Australia for a second re-assessment of their bowling action.
- 6.6 The Assessment resulting from the re-assessment will stand in the place of the original Assessment.

**CRICKET AUSTRALIA DOUBTFUL BOWLING ACTIONS PROCEDURES**  
**Effective 1st October 2016**

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## **7 Second and further reports**

- 7.1 In the event of a Player being suspended from bowling in interstate and BBL/WBBL cricket under these regulations for a second time within a period of 2 years from the date of the commencement of the first period of suspension, the Player shall be suspended from bowling in interstate cricket for a minimum period of 6 months. Only after the expiry of this 6 month period will the Player be able to approach Cricket Australia for a re-assessment of their action in accordance with paragraph 1 above. (See also paragraph 4.11 above)

## **8 Costs**

- 8.1 The Player's State Association or BBL/WBBL Team will be responsible for all costs incurred as a consequence of the Player being Mentioned or Reported under these procedures:
- 8.1.1 Analysis and Assessment (A\$2,000)
  - 8.1.2 Travel and accommodation
  - 8.1.3 BRG hearing (if applicable)
  - 8.1.4 Representation (if applicable)
  - 8.1.5 Re-assessment (if applicable)

**CRICKET AUSTRALIA DOUBTFUL BOWLING ACTIONS PROCEDURES**  
**Effective 1st October 2016**

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## **9 Under-Age Championships**

- 9.1 If in any Cricket Australia under-age championship (boys or girls, including the Cricket Australia Women's Cup), a player is called by an umpire for throwing in accordance with Law 24.2 or is suspected by the umpire(s) for bowling with an action which contravenes Law 24.2 as read with Law 24.3 (a "Doubtful Bowling Action"), the following procedure shall apply.

**Note:** *Umpires, in deciding whether to call, Mention or Report a player under these regulations, should use the naked eye viewing the action live. Slow motion television replays should only be used to confirm initial suspicions.*

9.2 Reporting procedure:

- 9.2.1 At the conclusion of the match the umpires shall complete a Doubtful Bowling Action Report, detailing their concerns about the bowling action of the Player, including, whether those concerns relate to the Player's bowling action generally or whether they relate to one or more specific types of delivery.
- 9.2.2 Within 48 hours of the conclusion of the match in which the Player is reported, the tournament director shall provide the Player's coach and Cricket Australia with a copy of the Doubtful Bowling Action Report.
- 9.2.3 Cricket Australia shall then write to the Player's State Association confirming that the Player has been Mentioned or Reported, to include a copy of the Doubtful Bowling Action Report, and to describe the implications of this Mention or Report for the Player with respect to the Cricket Australia Doubtful Bowling Action Procedures.
- 9.2.4 Such written confirmation shall require the Player to submit to and the Player's State Association to carry out an analysis of their bowling action (State Association Analysis) as provided for below.

9.3 State Association Analysis

- 9.3.1 If a Player is Mentioned or Reported, they shall be required to submit to an analysis of his/her bowling action carried out as follows:
- 9.3.2 The State Association Analysis shall be conducted by a bowling advisor appointed by the Player's State Association.
- 9.3.3 The State Association Analysis need not involve the detailed laboratory analysis as prescribed in the Cricket Australia Standard Analysis Protocols but should involve a genuine effort to assess the legality of the action, taking into account the provisions of Law 24.3, by using available video footage, and the experience and technical bowling expertise of the appointed bowling advisor.
- 9.3.4 The State Association Analysis shall be carried out as soon as possible and the Player's State Association shall provide Cricket Australia with a written report (State Association Assessment) of the outcome of such analysis within 21 days of the receipt of the confirmation of the report.

**CRICKET AUSTRALIA DOUBTFUL BOWLING ACTIONS PROCEDURES**  
**Effective 1st October 2016**

---

- 9.3.5 The findings of a State Association Assessment must have the endorsement of the Cricket Australia Biomechanist (or his representative) before being submitted to Cricket Australia.
  - 9.3.6 Where the State Association fails to provide a State Association Assessment within 21 days, the Player shall automatically be suspended from bowling in interstate competitions and the BBL/WBBL from the date of expiry of such notice period until such time as a State Association Assessment has been properly provided.
  - 9.3.7 Where the State Association Assessment concludes that the Player employs a legal bowling action, the player shall be permitted to continue bowling in interstate competitions.
  - 9.3.8 Where the State Association Assessment concludes that the Player employs an Illegal Bowling Action, the Player shall be immediately suspended from bowling in any interstate competitions until such time as a further State Association Assessment concludes that he/she has remedied his action.
  - 9.3.9 Subject to the provisions of paragraph 9.3.6 above, throughout the period up to the date of receipt of the State Association Assessment, the Player shall be permitted to continue bowling in interstate competitions. At any time throughout this period the Player is subject to being called on the field by the umpire(s) in accordance with Law 24.2 and the consequences of such Law must apply. During this period a further Doubtful Bowling Action Report will however have no consequence.
- 9.4 Costs - the Player's State Association shall be responsible for any costs associated with the State Association Analysis.

# CRICKET AUSTRALIA DOUBTFUL BOWLING ACTIONS PROCEDURES

## Effective 1st October 2016

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### ANNEXURE 1

## 10 Cricket Australia Doubtful Bowling Action Analysis Protocols

### Biomechanical Analysis of a Bowling Action

#### 1. INTRODUCTION

Cricket Australia has introduced a revised process for the review of bowlers with doubtful bowling actions (Bowling Review Process). This process is in accordance with the ICC doubtful bowling action analysis protocols

In order for the Bowling Review Process to be conducted in a fair and consistent manner the following standard protocols for the collection of data and the assessment and analysis of bowling actions have been introduced.

The overall purpose of the report is to confirm the legality / or not, of the action of the player as used in the match situation. Thus the protocols are provided not only for how the action should be analysed in the laboratory setting, but also highlight the need for a detailed comparison between the action performed during the match in which the player was reported and the bowling action analysed in the laboratory.

Cricket Australia has determined that it is the degree of elbow extension, as opposed to hyperextension or abduction / adduction that is prohibited. Elbow hyperextension and elbow abduction / adduction are involuntary movements that cannot be controlled by the individual during the bowling action. (See Paragraph 5.3 & Appendix A)

The conclusion of the report should be that having analysed the action in the laboratory and having compared it to the action as used in the supplied match footage, in the opinion of the expert, the bowler has faithfully reproduced his match technique in the laboratory. A statement concerning the legality of the action with respect of the amount of elbow extension measured and the 15 degree elbow extension tolerance threshold should then follow.

#### 2. VIDEO FOOTAGE FROM MATCH IN WHICH PLAYER REPORTED

The television video footage of the entire bowling spell(s) of the player in the match where the report was made shall be presented on a master tape. (CA to supply match footage. If possible, rear, frontal and lateral views of the action shall be provided.)

The master tape shall be converted to 50Hz / 60Hz (standard television footage is recorded at 25Hz) to enable more accurate evaluation of the player's bowling action on the day the bowler was actually reported.

Descriptive analysis during the match footage should compare the actions of the bowler e.g. positioning of feet, angle of run up, position of the torso, velocity of arm, velocity of delivery (95% of match speed etc.). These comparisons should be clearly presented in the report.

#### 3. ANTHROPOMETRIC ASSESSMENT (Both the bowling & non-bowling arms) See Appendix A

**Physical Measurements:** Height, weight and assessment of general mobility of the shoulder, elbow and wrist joints. Any specific anatomical variances (e.g. carry angle, elbow hyperextension)

**History of Previous or Current Injuries:** A brief history of previous injuries should be determined as an aid in the biomechanical assessment - particular focus should be brought to the elbow and shoulder joints.

#### 4. BOWLING ANALYSIS (Indoors – Laboratory conditions)

All biomechanical assessment shall be carried out with the player bowling off his normal full run-up, on a correct length cricket pitch.

## CRICKET AUSTRALIA DOUBTFUL BOWLING ACTIONS PROCEDURES

### Effective 1st October 2016

A three-dimensional motion capture system with a minimum of 12 synchronised cameras (using opto-reflective markers) operating at a minimum of 200 frames per second and a maximum of 250 frames per second (preferable) should be used to collect the data. The cameras and computer to be operated and positioned in appropriate positions to facilitate a subsequent three-dimensional analysis of the shoulder, elbow, wrist and ball.

Video data (minimum 120fps) should also be collected in order to allow comparison with match footage. These cameras should be aligned from the side and posterior to the bowlers arm. An additional mobile high-speed camera should be aligned at angles similar to those in the match footage. A minimum shutter speed of 1000Hz is required to prevent blurred images.

Calibration and accuracy procedures must be undertaken in alignment with the ICC standard protocols (see Appendix A) prior to data collection.

Optimal "levels of filter" must be used in the laboratory process. Ideally a laboratory environment using opto-reflective marker system will produce the environment with the least amount of error (Noise) and therefore less filtering can be used. Filtering will applied in line with the ICC guidelines. This includes a Low-pass Butterworth filter of 10Hz for calibration trials and 40Hz for bowling trials.

Warm up (player's own) – but must include the bowling of a number of deliveries at match pace prior to data collection. The player to have no clothing on the torso, in order to enable the correct marker set to be placed on the bowling arm. (In line with ICC standard protocols) Automatic digitisation of the marker set will enable joint centres to be determined during each delivery.

In respect of a fast bowler, six 'normal' – good length deliveries, six 'yorkers' and six 'bouncers' must be recorded. Six deliveries of each spin variation for the leg or off spin bowler must be recorded. Standard video cameras should be used to assess the position the ball lands, along with the amount of bounce and turn created with each delivery. This video should also be presented in the report.

Three-dimensional analysis of the bowling arm to begin from back foot contact, to include 'arm horizontal' maximum flexion, ball release and a minimum of 10 frames after ball release for each successful delivery.

Upper arm horizontal is calculated within the ICC illegal action software GUI and defined as occurring when the shoulder joint centre and elbow joint centre have the same z-axis co-ordinates. Figure 1A depicts upper arm horizontal i.e. The upper arm being level with shoulder and parallel to the ground.

Hand-Ball distance is calculated during the bowler calibration trial. The biomechanist will touch the ball (with reflected tape attached to either side) against the tip of the bowlers fully extended fingers. The distance between the Origin of the wrist marker cluster co-ordinate system and the ball is calculated from this trial. The moment of ball release is defined as occurring when the Hand-Ball distance exceeds that calculated in the calibration trial.

Figure 1a: Arm Horizontal – NO



Figure 1b: Arm Horizontal – YES

# CRICKET AUSTRALIA DOUBTFUL BOWLING ACTIONS PROCEDURES

## Effective 1st October 2016



Every effort must be made to ensure that the player is bowling as close to match pace as possible. This can be measured after each delivery by comparing ball speeds and video footage during the assessment with those from match play. If deliveries are not at a suitable speed (so as to represent match conditions) or the comparison of video footage deemed dissimilar, the bowler will be required to continue bowling until the Biomechanist is satisfied that the match action is being replicated. In the event that the bowler is unable to and unwilling to replicate his match action the test will be deemed invalid and the bowler will be considered to have failed the assessment.

### 5. PRESENTATION OF RESULTS

A summary of the results of each delivery to be presented – graphical or table format.

The presentation of still sequences taken from high-speed video footage from each of the delivery type assessed (i.e. stock delivery and any variation) as well as any particular delivery of interest will be presented from side-on and posterior views. In the event that match footage is available, still sequences from this footage will be presented alongside the comparable view from the assessment.

The 'flexion-extension' curves should be presented either as a group average  $\pm$  standard deviation for each delivery type, or as individual deliveries. This data should be presented in graphical form, with specific data values for flexion-extension angle at arm horizontal, maximum flexion, maximum extension and flexion-extension angle at ball release. Hyperextension values will be represented by negative values, with any values below zero being considered as 0 degrees for all calculations of elbow extension (i.e. hyperextension is not included in the calculation of elbow extension)

Ball release speeds to be presented for each delivery.

Stick figure representation, to include pictures of the various key positions to aid in the presentation of the results. (Alternatively, an avi file may be provided.)

### 6. ACCEPTABLE LEVEL OF ELBOW EXTENSION

This should be set at a maximum of 15 degrees 'Elbow extension' for all bowlers and types of deliveries. This specifically refers to extension of the forearm relative to the upper arm to the straight position. Elbow hyperextension or adduction is not included in the 15-degree tolerance threshold. It should be noted that in order for the action to be classified as a legal action, the degree of 'elbow extension' recorded for each delivery should be within the 15 degree limit.



## CRICKET AUSTRALIA DOUBTFUL BOWLING ACTIONS PROCEDURES

### Effective 1st October 2016

---

#### APPENDIX A: MOVEMENTS.

**Flexion** - This movement takes place about a transverse axis and is a description of the movement that occurs when you move your arm forward. It is described as the approximation (moving closer together) of two ventral surfaces of the body e.g. flexing the elbow joint. There are a number of situations where this rule doesn't seem to apply e.g. at the ankle where the terms dorsi and plantar flexion are used to avoid confusion.

**Extension** - This movement is the opposite of flexion; it also takes place about a transverse axis and occurs when you approximate two dorsal surfaces e.g. straightening the elbow.

**Hyperextension** - An abnormal movement beyond the normal limit of extension, such as more than the 180 degrees of extension of the knee or elbow joints.

**Abduction and Adduction** - These movements take place about an antero-posterior axis and occur when the arm is taken sideways away from the body (abduction) and returned from such a position to the side of the body (adduction).