

R22-10 Distance and accuracy range testing performance results

United States Golf Association, R&A Rules, Ltd.

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1 Abstract

Elite amateur golfers participated in a driving range study that incentivized increasing distance but penalized inaccurate drives, with the goal of determining whether increasing that penalty led to shorter and more accurate driving distance. In the event, there was a statistically significant increase in the average accuracy by 8.6%, and a small but statistically significant increase in overall distance of 3 yards (despite no significant change in average clubhead speed).

2 Introduction

It has been hypothesized that increasing the penalty associated with inaccurate hitting from the tee may lead golfers to take more care in how they drive the ball, either by reducing their speed or changing their club selection. It was the aim of this testing to help determine how golfers will respond to significant and known changes in the penalty for inaccurate drives.

In this testing, participants were incentivized to achieve distance, but penalized for shots that did not finish within a marked 30-yard-wide rectangular landing area defining the fairway (see testing plan in Appendix, 6). Starting with a 'pot' of \$20, participants were given \$6, \$8, and \$10 for 'achievable', 'typical', and 'long' drives for each of 10 drives within the fairway. However, \$14, \$12, and -\$10 were deducted from their total for any hits at these respective distances if the ball landed outside the fairway. Participants were then given ten additional hits, but with an increased penalty by an additional \$5 at each distance (i.e., -\$19, -\$17, -\$15).

This testing included 77 elite amateur golfers in four U.S. markets, including New Jersey, Tennessee, Colorado, and Southern California. Participants were recruited in advance based on participation in U.S. Women's Open and U.S. Open qualifying events. Participants were interviewed before and after the event (SLRG, 2021).

The present report details the distance and accuracy measured during range testing, and the changes that were observed as a result to the increase in penalty for hits outside of the fairway.

3 Results

3.1 Participant descriptive statistics

In all, 68 male golfers and 9 female golfers participated. The following statistics are based on the first ten drives with the 'normal' or lower-penalty format. The average clubhead speed for all male participants was 110 MPH, with a maximum of 125 MPH. The average distance for all male participant as reported by TrackMan was 280 yards, and the maximum average distance was 330 yards (20% trimmed means were 281 and 332 yards, respectively). The average clubhead speed for all female participants was 87 MPH, with a maximum of 94 MPH. The

average distance for all female participant as reported by TrackMan was 222 yards, and the maximum average distance was 253 yards (trimmed means were identical).

Male golfers had an average accuracy (drives in the fairway) of 52%, while female golfers were significantly more accurate on average, 73%. In both cases, the maximum accuracy was 9 of 10 fairways (though accuracy was higher in the high-penalty format). As will be shown, below, there was a weak negative correlation between distance and accuracy.

3.2 Clubhead speed, distance, and accuracy results

Participants predominately chose to use driver regardless of the level of penalty for inaccurate drives (SLRG, 2021). Seventy-three of 77 participants used one club exclusively for the low-penalty round, and 70 of 77 used driver exclusively for the high-penalty round (in all cases but one, this was the driver). Non-driver clubs were used evenly between the two rounds (35 total hits of 770 for the first round, and 39 total hits of 770 for the second round), one participant opting not to use driver in either round. Further details are available in the Appendix.

The average changes to clubhead speed, distance, and accuracy are shown in Table 1. Most differences were not statistically significant: the exceptions are distance change (increased 2.2 yards), distance change for the second five of each ten drives (included as an example of participants having “warmed up”; increased 3.3 yards), and accuracy change (increased 8.6%).

Table 1: Summary results for distance and accuracy changes among 77 elite amateur golfers. Averages distances are reported: trimmed mean averages are 2 yards higher for both rounds.

	Average	Std. Dev.	P(t>T)
Speed change, MPH	0.2	3.0	51%
Distance change, yards	2.2	8.5	2.7%
Accuracy Change	8.6%	22%	0.11%
\$ Earned/hit	-\$0.28	\$5.0	63%

These results are also broken down by category (Table 2): given the small numbers of samples in each subgroup except for “male,” significance tests were not conducted, and it is not expected that these subgroup results are statistically significant.

Table 2: Segmented performance outcomes. No statistical significance is implied. “Longest” and “shortest” hitters determined by the 20% trimmed mean of the first ten drives. Distance changes are based on trimmed means.

	Distance Change	Accuracy Change
R1 10 longest hitters	-1.3	6%
R1 10 shortest hitters	2.1	7%
R1 10 most accurate	1.0	-6%
R1 10 least accurate	1.5	30%
R1 Accuracy at least 50%	0.5	1%
Male	2.4	9%
Female	0.1	5%

Distributions of the results of greatest interest, namely changes to clubhead speed, distance, and accuracy are shown in Figure 1 through Figure 3.

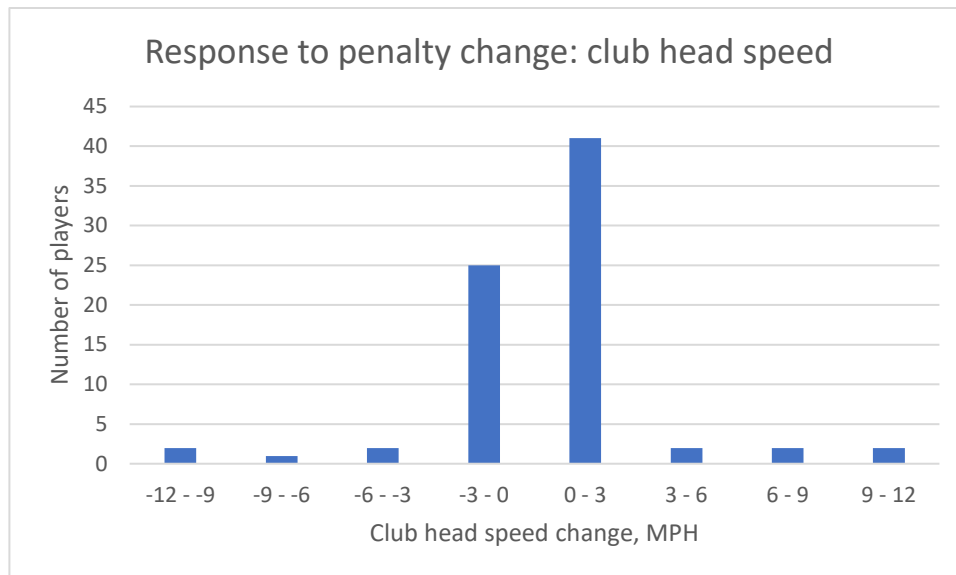


Figure 1: Distribution of clubhead speed changes (all clubs) for 77 elite amateurs in response to higher penalties for off-fairway drives. There was no statistically significant change to average club speed.

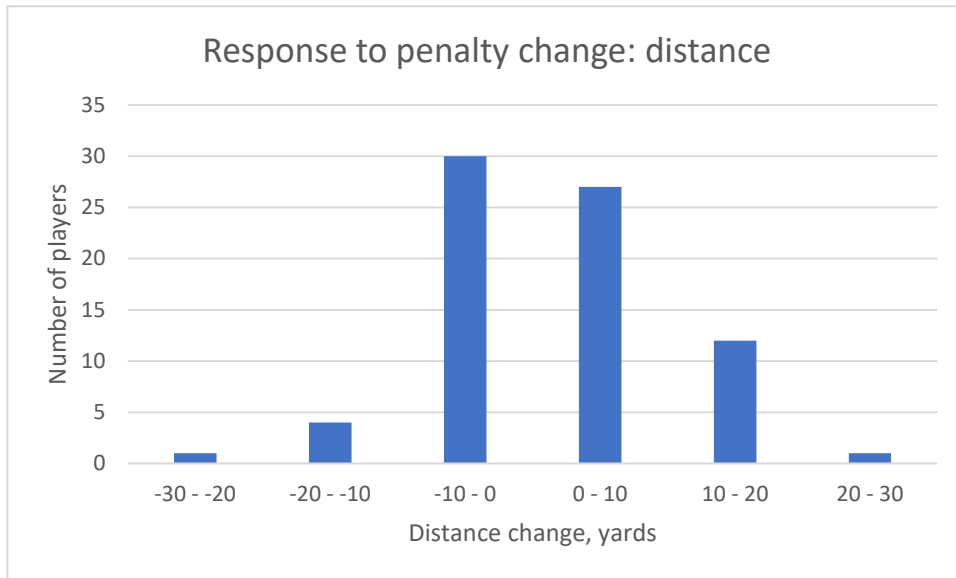


Figure 2: Distribution of distance changes for 77 elite amateurs in response to higher penalties for off-fairway drives. There was a statistically significant increase of 3 yards in average drive distance.

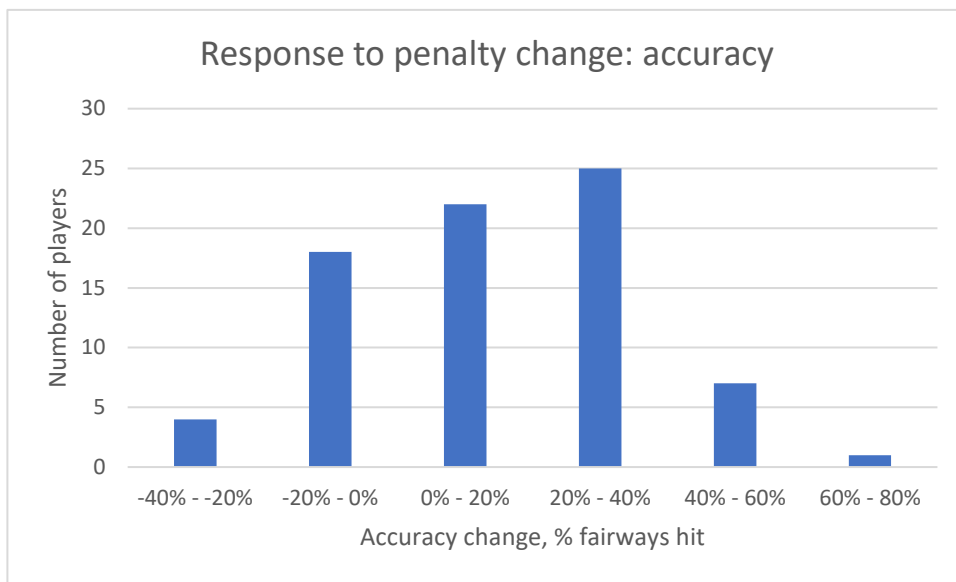


Figure 3: Distribution of accuracy changes for 77 elite amateur participants in response to higher penalties for off-fairway drives. There was a statistically significant increase of 8.6% in fairways hit.

However, more golfers increased rather than decreased the percentage of fairways hit.

The correlation between drive distance and accuracy was not strong with either penalty level Figure 4. There was a slightly greater correlation in drive distance as a function of clubhead speed at the higher level of penalty (Figure 5).

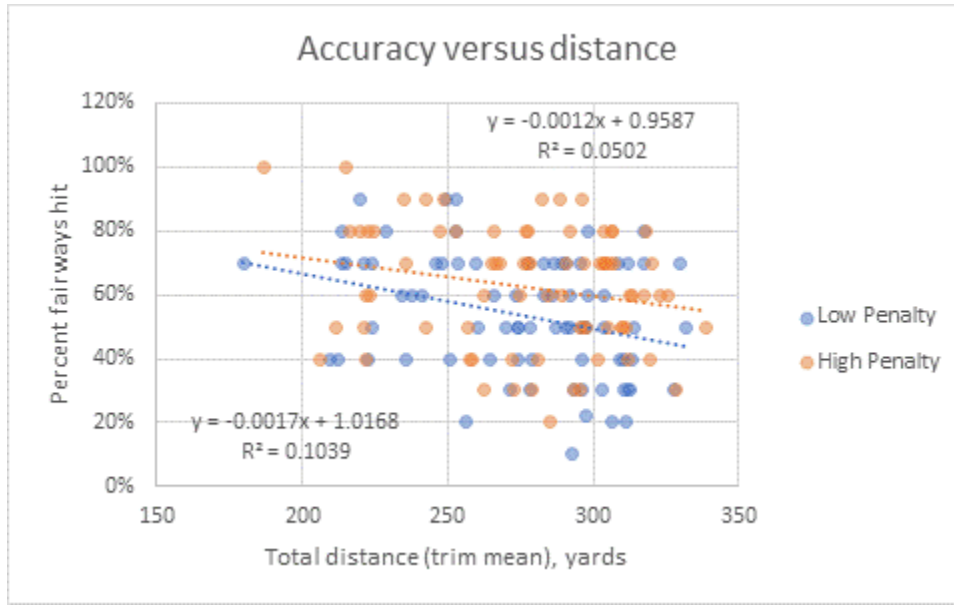


Figure 4: Accuracy versus distance for all participants using both penalty levels. There was a statically significant increase in the average accuracy with no decrease in the distance.

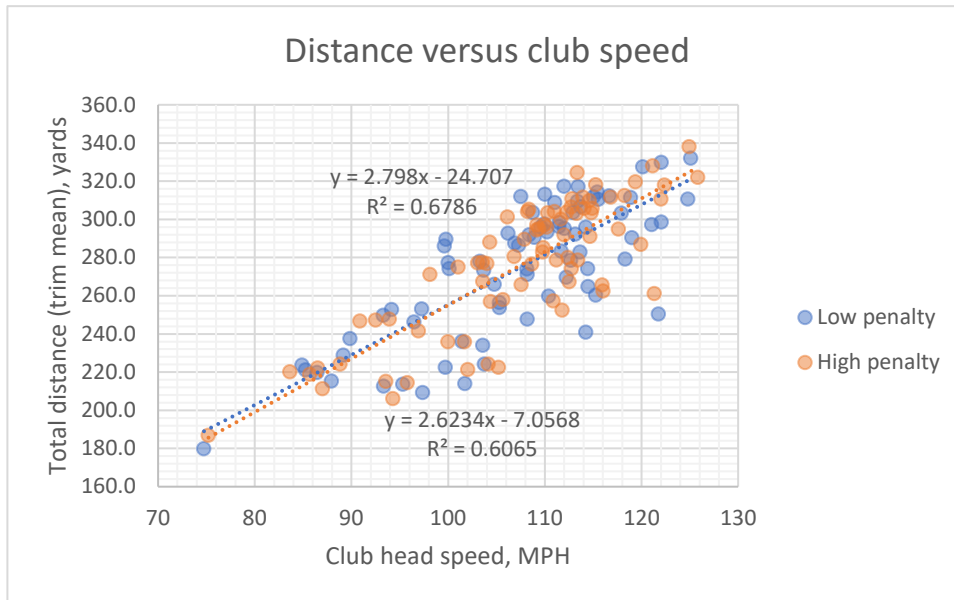


Figure 5: Total distance reported by TrackMan as a function of clubhead speed. Significant differences in the correlations are not observed.

As clubhead speed changes were not statistically significant, and few were outside of ± 3 MPH, a correlation between change in clubhead speed and change in accuracy was not identifiable (Figure 6).

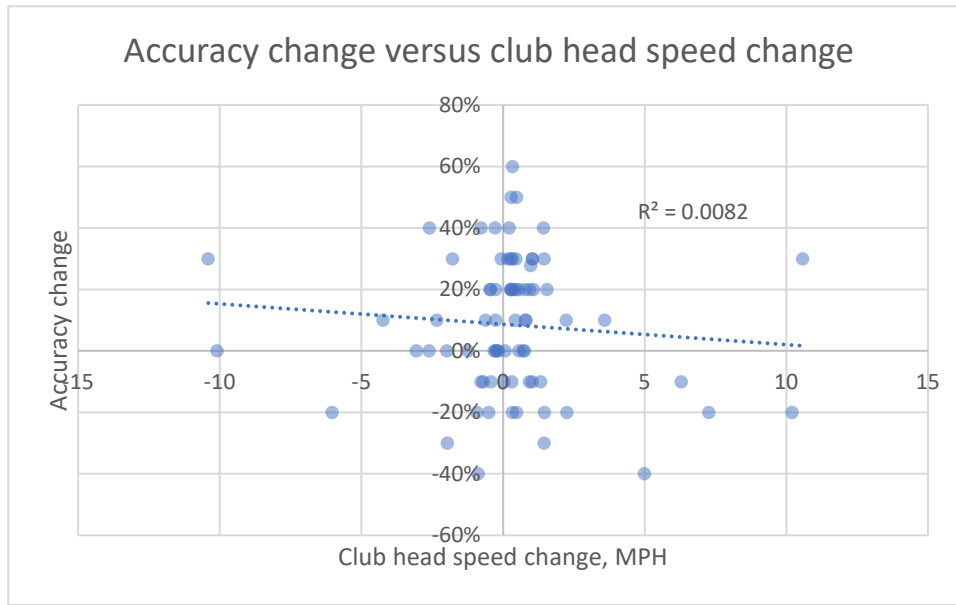


Figure 6: Accuracy change as a function of clubhead speed change.

4 Conclusions

When confronted by a substantial increase in the financial penalty for hitting golf balls outside of a defined 30-yard-wide fairway, golfers continued to predominately hit driver. There was a statistically significant increase in the average accuracy by 8.6%. This coincided with a small but statistically increase in overall distance of 2 yards, despite no significant change in average measured clubhead speed.

This study does not support the original hypothesis that increasing the penalty associated with inaccurate hitting from the tee would lead golfers to reduce their speed or change their club selection. However, it does appear to support the idea that golfers might take more care in driving the ball, though resulting distance was slightly increased rather than decreased.

5 References

SLRG. (2021). *Qualitative insights: TrackMan and Face tape-rough penalty elite player testing*. White Plains: Sports & Leisure Research Group.

6 Testing Plan

6.1 Goal

It has been hypothesized that increasing the risk associated with inaccurate hitting from the tee may lead golfers to take more care in how they drive the ball, either by reducing their speed or changing their club selection. It is the aim of this testing to help determine how golfers will respond to significant and known changes in the penalty for inaccurate drives.

6.1.1 Overview

Elite amateur golfers will hit golf balls onto a marked range, with swing speed, distance, accuracy, and club selection recorded. Each participant will be rewarded for increased distance but will be penalized for inaccurate hits. The level of penalty will then be changed significantly: the participant will be notified of the change, and be given further hits (swing speed, distance, accuracy, and club selection again recorded). Changes in the recorded values will be analyzed at the conclusion of this research.

6.1.2 Requirements

- a. Test the effects of a significant increase in the penalty for off-fairway hits.
- b. Incentivize distance in a consistent way through the test.
- c. Be simple for facilitators to explain and for participants to understand.
- d. Can be set up and conducted by two testers at a driving range.

6.1.3 Key outcomes

- a. Quantitative assessment of the effects of increasing the demand for accuracy on golfer behavior in terms of club choice, clubhead speed (where drivers are used) and distance.
 - i. To include, if possible: effect on accuracy.
- b. Attitudinal responses on the change in approach given increased accuracy demand (if any).
 - i. How do participants' expectations of their own distance and accuracy (i.e., % fairways hit) off the tee compare with experimental data?

6.2 Plan

6.2.1 Equipment

- a. 2x TrackMan RADAR launch monitors, with laptops as necessary.
- b. 6-9 Safety cones or similar for marking range.
- c. Tees.
- d. Range or practice balls, not to include restricted-flight golf balls.
 - a. Possible: USGA-supplied high-quality practice balls.
- e. Preferable: flagstick or similar for marking fairway centerline.

6.2.2 Site Preparation

- a. To the extent possible, select a part of the range that is relatively flat and level.
- b. Identify the centerline of a 30-yard wide 'fairway' hitting area (Figure 1).
- c. Set up teeing areas for two golfers, with sufficient space that both can warm-up and swing freely, centered on this centerline.
- d. Using a flag stick (if available) traffic/safety cone, or similar, mark a target (see site plan)
- e. Using traffic/safety cones or similar, mark the boundaries of the 'fairway' hitting area.

- f. Set up TrackMan RADAR behind each of the two tees (see instructions, separate, as available).

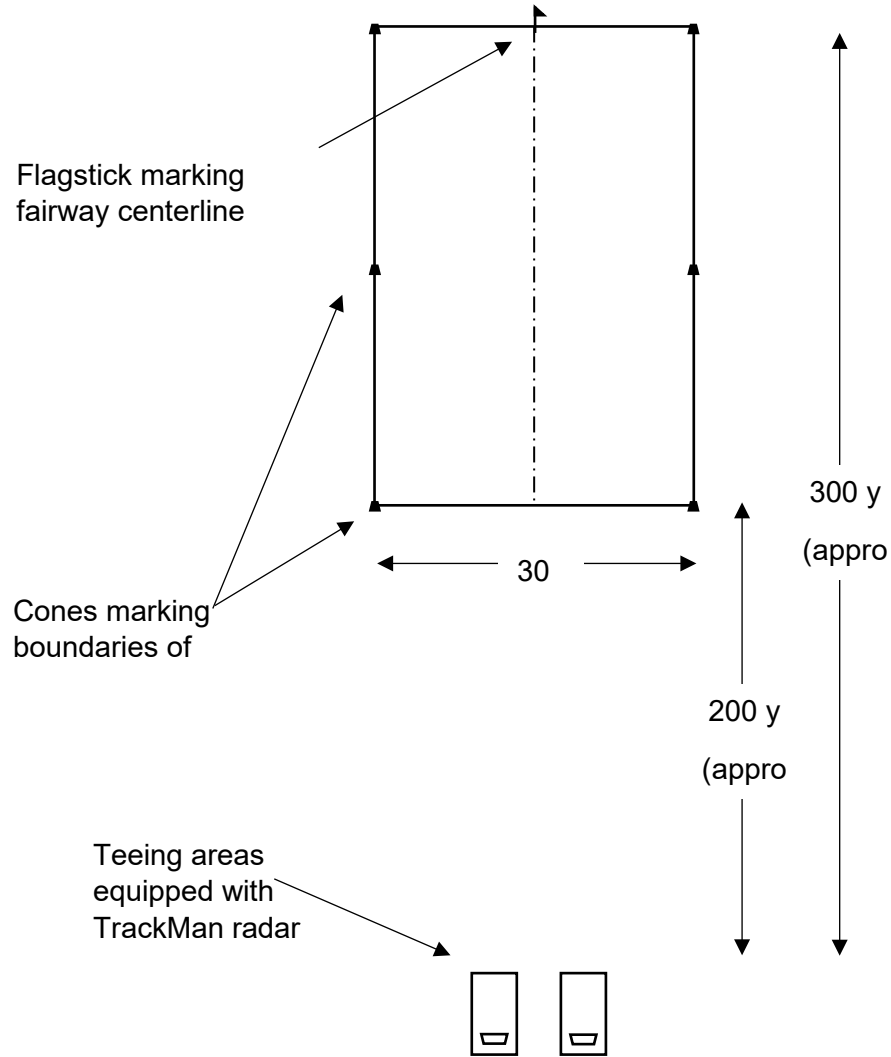


Figure 7: Site diagram.

6.2.3 Participant preparation

1. Allow participant time to warm up as necessary.
2. Perform the test:
 - a. Introduce the incentive format (described in the next section):
 - i. Participants will start with “seed” money (\$20).
 - ii. Participants will be given 10 hits and rewarded for hitting golf balls in the ‘fairway’ (between the cones) but penalized for shots outside of that area.
 1. In the fairway or out of the fairway includes bounce and roll distance as
 - iii. The level of penalty and reward changes with distance: distances will be recorded using TrackMan.

- b. Allow the participant to hit 10 drives
 - i. Any drives short of the shortest distance results in a “do-over”.
 - c. Track hits using RADAR. Participants may be given any information at their request at any time, including distance, reward or penalty, or current total.
 - d. Record:
 - i. Club used (if multiple clubs are used, how many hits with each)
 - ii. Average club speed over 10 hits
 - iii. Average distance over 10 hits
 - iv. Percent accuracy
3. Change the incentive format: if starting with the low penalty format, change to the high penalty format (or vice-versa). It is recommended that the choice of starting format be alternated or randomized to factor out participant fatigue.
 4. Repeat step 2 for the second incentive format.

6.2.4 Incentive formats

The following formats were developed based on distances for elite amateur male and female golfers, as identified in the Distance Insights Report (R&A Rules, Ltd., USGA, 2020), and an attempt to incentivize distance and penalize inaccuracy in a way that is consistent with strokes gained for distance and lie.

6.2.4.1 Low penalty format, all venues except Colorado:

Long	<p>Rough -\$10</p>	<p>Fairway (M 300+) (W 255+) +\$10</p>	<p>Rough -\$10</p>
Typical	<p>Rough -\$12</p>	<p>Fairway (M 275-299) (W 235-254) +\$8</p>	<p>Rough -\$12</p>
Achievable	<p>Rough -\$14</p>	<p>Fairway (M 255-274) (W 210-229) +\$6</p>	<p>Rough -\$14</p>

6.2.4.2 High penalty format, all venues except Colorado:

Long	<p>Rough -\$15</p>	<p>Fairway (M 300+) (W 255+) +\$10</p>	<p>Rough -\$15</p>
Typical	<p>Rough -\$17</p>	<p>Fairway (M 275-299) (W 230-254) +\$8</p>	<p>Rough -\$17</p>
Achievable	<p>Rough -\$19</p>	<p>Fairway (M 255-274) (W 210-229) +\$6</p>	<p>Rough -\$19</p>

6.2.4.3 Low penalty format, Colorado only:

Long	<p>Rough -\$10</p>	<p>Fairway (M 330+) (W 275+) +\$10</p>	<p>Rough -\$10</p>
Typical	<p>Rough -\$12</p>	<p>Fairway (M 300-329) (W 245-274) +\$5</p>	<p>Rough -\$12</p>
Achievable	<p>Rough -\$14</p>	<p>Fairway (M 275-299) (W 215-244) +\$2</p>	<p>Rough -\$14</p>

6.2.4.4 High penalty format, Colorado only:

Long	<p>Rough -\$15</p>	<p>Fairway (M 330+) (W 275+) +\$10</p>	<p>Rough -\$15</p>
Typical	<p>Rough -\$17</p>	<p>Fairway (M 300-329) (W 250-274) +\$8</p>	<p>Rough -\$17</p>
Achievable	<p>Rough -\$19</p>	<p>Fairway (M 275-299) (W 215-244) +\$6</p>	<p>Rough -\$19</p>