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The Equipment and Facilities Specifications Newsletter

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WELCOME TO NEW SUBSCRIBERS

This Newsletter is a semi-annual educational tool for Implement Inspectors, Technical Managers, interested Throws Officials, and certification chairs. Input and suggestions are always welcome. This copy is being sent to about **850** officials around the world. Welcome to our new subscribers this year:

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CHAIRMAN'S CORNER

Getting a Handle on Handles

Last year several implement inspectors sent me reports on some of their meets. From those reports there emerged a problem with hammer handles. The failure rate on hammers was 18.5%. Taking out the number of hammers that failed for handle problems reduced that rate to 4.4%. The problem with the handles is that they are too long and they stretch.

The rules have been changed over the last several years, but are now quite clear. The handle, when measured from the inside of the bottom loop to the inside of the grip, must 110 mm or less. This rule is the same for USATF and NCAA.

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The length of the handle can be checked in several ways. The most logical choice would be to use a set of digital calipers measuring the inside length. An easier method might be to have a bar 110 mm long (or a longer one with two marks 110 mm apart). That can quickly and easily be put behind the handle and a quick observation will give the answer.

While new handles should be fine, it is not always the case. Between last summer's Masters Outdoor Championships and the JO Outdoor Championships, 13 meet-supplied handles (new, out of the box) were found to be over the 110 mm length limit. Additionally, post-competition inspection of the meet-supplied Masters hammers showed that six handles had stretched beyond the 110 mm limit, including the handle on a 2 kg hammer. Clearly, some handles are stretching measurably during use.

The above experience means we should be checking all handles, new or previously used, during weigh-ins. Also, the handle needs to be rechecked when recertifying a hammer for a record.

When checking a hammer and you find the hammer is too long, the next thing to do would be to check the handle. Both the wire and the handle may well need to be changed to make the handle legal. Before replacing the handle, check it first.

To be consistent from one meet to the next, we all need to check the hammer handles to be sure they meet the rule. It does not help an athlete to allow a hammer into one meet, if that same setup would not be accepted at the next level. The rule is now clear and needs to be enforced by all implement inspectors.

Anyone receiving this newsletter is welcome to help put it out by submitting articles. These articles need to relate to the subject of the committee. Any problems that come up may be sent to us as well. Keep us informed as to what is happening out there.

E&FSS ANNUAL CONVENTION MEETING

The subcommittee annual meeting was held on Thursday, December 2 in Virginia Beach, VA. The meeting minutes can be found at: http://www.usatf.org/groups/officials/info/meeting-minutes-and-reports.asp

RULE CHANGES AFFECTING EQUIPMENT OR FACILITIES

The 2011 **NFHS** high school rules changes do not contain any equipment or facilities revisions. However, Point of Emphasis #2 stipulates that schools should have upgraded their discus facilities to meet or exceed the minimum requirements within the rule and meet or exceed the guidelines in Appendix A of the rule book.

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During last December's **USATF** annual meeting the following rules changes were approved for 2011 which pertain to equipment and facilities:

Item 65, Rule 193.10: Redefines the 500 g mini-javelin, and creates a 600 g mini-javelin.

Item 67, Rule 195.5: Modifies the throwing weight handle specification, and brings it into WMA conformity.

Item 68, Rule 195.6: Modifies the throwing weight connection specification.

Item 69, Rule 195.9: This rule is deleted; and Rule 196 is created to codify the ultraweight pentathlon implement and throwing area rules.

Item 72, Rule 203: Codifies the ultraweight pentathlon rules of competition.

Item 73, Rule 203 chart: Adjusts the ultraweight pentathlon table to reflect new implements for W75+ age group.

Item 74, Rule 221.5: Clarifies the indoor shot specs for Masters men and Youth boys.

Item 91, Rule 301: Adds the 300 g mini-javelin to the Sub-Bantam classification.

Item 94, Rule 302.4(a): Adds hurdle specifications for the Midget indoor classification.

Item 95, Rule 302.5(n): Changes the responsibility for performing Youth PV pole inspection.

Item 109, Rule 332.2(j): Codifies the Masters shuttle hurdle rules.

Item 112, Rule 332.3(g): Modifies the Masters women's superweight implements.

Item 115, Figures 14 & 15: Adds several hammer and throwing weight handle examples.

Item 116, #7, Rule 188.4: Corrects a note under the shot specification table.

Item 116, #10, Rule 203.3 table: Corrects the women's Open-49 implement requirements.

Item 116, #15, Rule book front cover: Corrects the hammer handle sketch.
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EQUIPMENT CORNER

If you have any information on equipment that you have purchased or built to help with your weight and measures or technical managers' activities, please pass along the information. One of our goals is to disseminate this type of information.

More Mini-Javelin Balance Problems

Newsletter 19-2 featured a letter from Bruce Long, describing several mini-javs with out-of-spec balance points. These had been supplied for the 2009 Youth National and JO National Championships. Whereas the specification requires the balance point to be 365 to 380 mm, they measured 385 to 390 mm.

Subsequent to that occurrence, the same problem was encountered during last year's Region 13 JO Championships. Two mini-javs were found to be similarly out-of-balance. These javs are still out there.

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Javelin Measurement Gauges

Several javelin measurement boards and fixtures, both commercially-available and privately-built, are shown in the Implement Inspector's Handbook. Adding to that, two articles follow here, describing the UCS javelin gauge and a privately-designed and built board.

1. UCS Javelin Gauge

Bob Springer

I had the opportunity to use the new UCS javelin gauges at the NCAA D-1 Outdoor meet. Between Carl Ostling and myself, we examined over 200 javelins for the meet. While we seemed to always be behind on the javelins, we really weren't. These gauges were a large part of keeping up with the demands of the javelin.

I have seen a number of home built gauges that help reduce the workload on the javelin. This commercial setup gets it mostly right and is a big help. To give the reader an overview, let me walk through the steps I followed in examining a javelin.

The first step was weighing the javelin and nothing has changed there. Next thing was to balance the jav. Once the javelin was balanced, a clamp was tightened as shown in Figure 1.

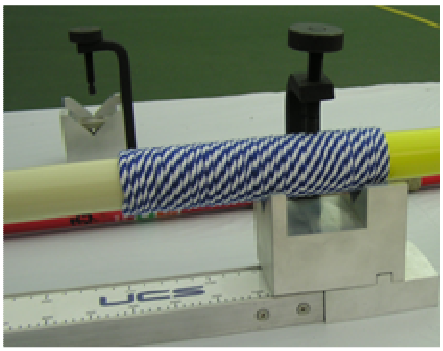

Figure 1

Note the other clamp in the background and the indexing slot at the right edge of the bottom of the clamp. In order to show the javelin in the gauge, the javelin is set here with the tail to the left and over the scales. The index slot retains the center of gravity so that the javelin can be placed in either orientation with the CG at the zero point of the scales.

With the tip over the scale a quick check of the limits as marked shows the balance of the javelin. There is also a double scale. The main scale shows the distance from the CG while the other scale is half-length. With the length noted a marker is placed at the center point quickly as the numbers will match. Figure 2 shows that marker and the two scales.

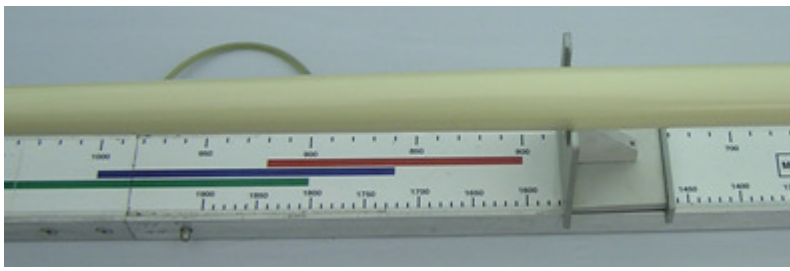

Figure 2

The green, blue and red lines are the limits for the 800, 700 and 600 gram javelins respectively. This particular scale is the one for the tip while the javelin here is shown with the tail to the left.

I usually used a digital caliper to check the 90% limit at the midpoint because it was quicker and easier than using the supplied gauge shown in Figure 3.

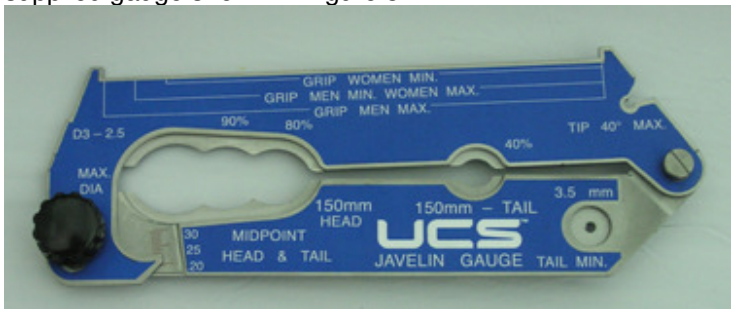

Figure 3
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As can be seen, it is similar to the diameter gauge we have used from TrackMaster for some time, but has some new features. At the top is a grip gauge with the grip thickness indicated by the ends touching the javelin. At the top right is a tip gauge and the small circle at the bottom right is the 3.5 mm minimum tail diameter.

I did use that gauge for the rest of the diameter checks. Figure 3 shows the tip of the javelin with the end gauge. With that gauge in this position the 150 mm distance is noted. That gauge is 150 mm from each edge to the corresponding edge at the other end.

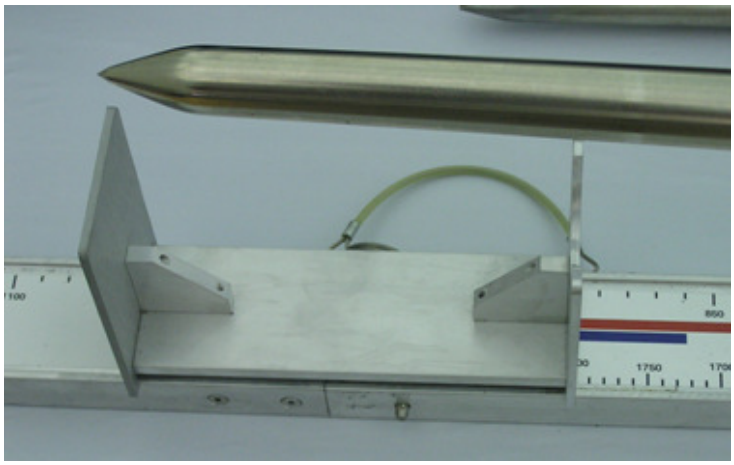

Figure 4

I would first use the gauge the other end to the tip so I could check the limit lines shown and then turn it around to get the 150 mm mark. Figure 5 shows the tail length being checked by the gauge.

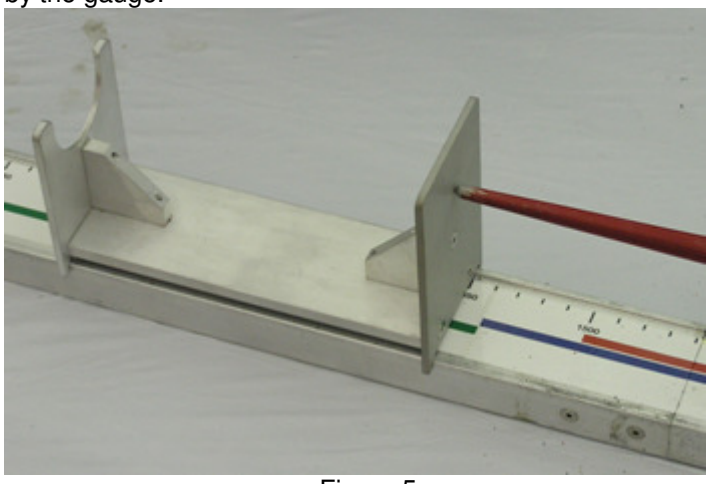

Figure 5

As you can see, the tail is within the green limit.

Do note that I have not placed one single mark on the javelin in order to do any of these checks. The only marks we placed were our numerical marks for inventory control.

After checking the tip, the javelin is turned over and placed back on the gauge for checking the tail in the same manner (Figure 6).

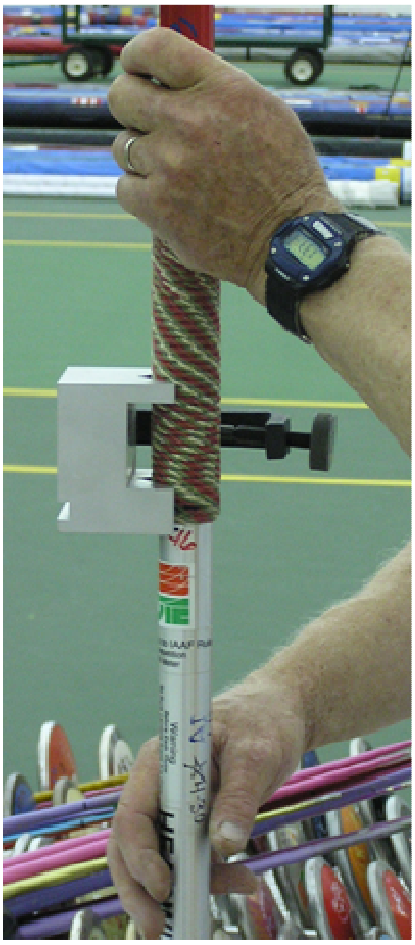

Figure 6

This gauge does not check the total length, but since it does check the maximum and minimum distances to both ends from the center of gravity, I don't see that as a problem. There is nothing stopping us from putting up our tape marks on the wall to check that in any event. I did disqualify two javelins for not meeting the minimum distance from CG to tail. I later checked both javs for total length. One was exactly at the minimum length and the other was short. It also does not give the limits for the 400 and 500 gram javelins, but that is not going to be a problem to add to the gauge as needed.

I congratulate UCS for putting out a gauge that should save us some time and makes the job of checking the javelins much easier.

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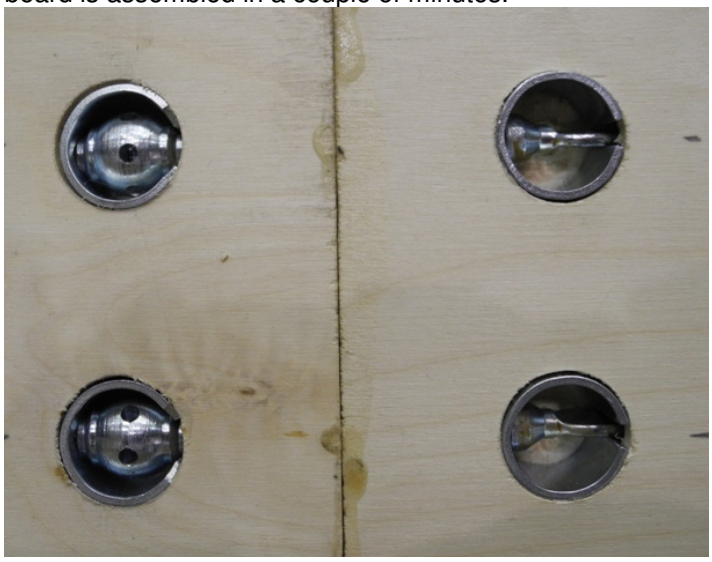
2. Custom-Built Javelin Board

This board is the result of the following requirements:

- must perform length measurement
- must perform CG measurement
- must enable marking the front & tail mid-points
- must perform the above functions without having to turn over the javelin
- must measure all five javelins
- must be easy to take apart for transportation

Birch plywood was chosen as the base material because a literature search indicated it has reasonable dimensional stability under changing temperature and humidity conditions.

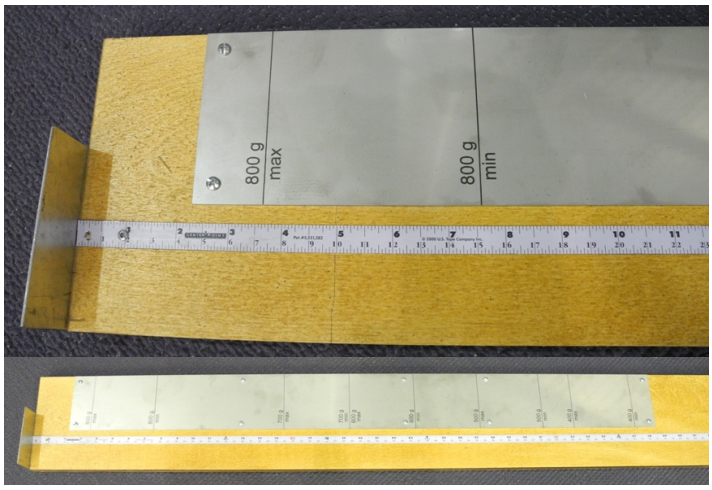
Since this board has to handle a full-length 800 gram javelin, it was built in two pieces for ease of transportation and storage. The pieces are joined by "Tite Joint Fasteners" made by Rockler. This company also supplies drill bits and a drill guide to make the top and side holes on the back of the board. The lock nuts are tightened or loosened by inserting a 1/8" drill bit and rotating them 45° at a time. Even so, the board is assembled in a couple of minutes.



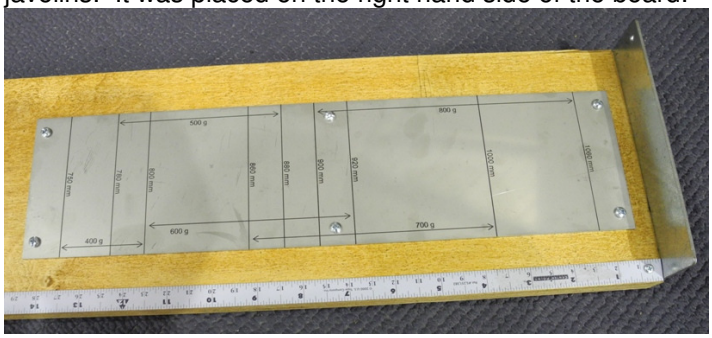
A stop plate was installed on each end of the board. These are necessary for positioning the scales and javelins.

The length and CG scales were permanently laser-etched on stainless steel sheets. Since this was a custom job, the scales were annotated for ease of measuring all five javelin types. The cutting and etching of the scales was performed by a specialty company using a computer-controlled 2-axis laser machine.

The length scale is 3 feet long, to cover the shortest 400 g jav to the longest 800 g jav. It was placed on the left hand side of the board:

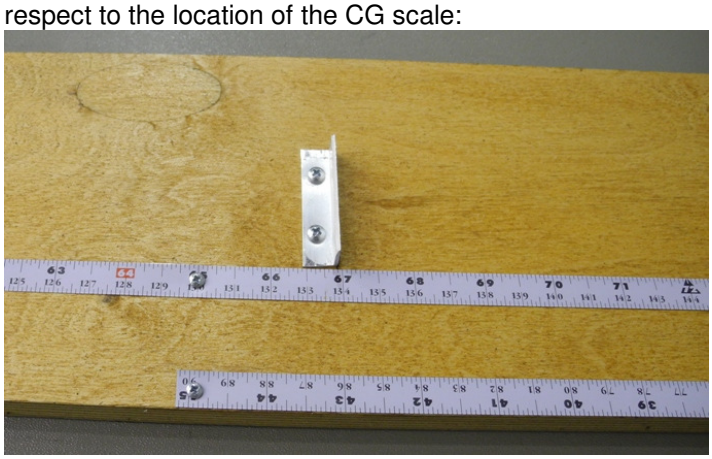


The CG scale is slightly over one foot in length. It is annotated with arrows to show the balance limits of all five javelins. It was placed on the right hand side of the board:



Each scale was carefully positioned on the board, clamped, match-drilled and screwed in place.

The knife edge for the CG check is a small aluminum angle, which is beveled. Its position was carefully adjusted with respect to the location of the CG scale:



Two center point bench tapes were then installed. They are made by US Tape and have adhesive backing. Even so, they were also affixed with small wood screws for good measure. One tape is indexed to the right hand side of the board, the other to the left hand side.

The tapes were installed with the board halves fully joined. One tape was then cut at the board joint to ensure accuracy.

In practice, the javelin is first placed on the far side of the board, with its tip against the right hand stop plate. The length is checked with the scale on the left.

Then the javelin is moved to the middle of the board and balanced on the knife edge. The balance point is marked on the grip cord and the forward CG length is checked with the scale on the right.

The javelin is then moved to the near side of the board, with the tip against the right hand stop plate. Using the CG marking on the grip and the lower center point tape, the forward midpoint on the jav is quickly found and marked.

The javelin is then slid to the left, placing the tail against the left hand stop plate. Using the CG marking on the grip and the upper center point tape, the forward midpoint on the jav is found and marked.

This board is missing reference marks for the 125 mm and 150 mm profile points. These marks still need to be added to the board.

This entire process is accomplished within a minute, and the javelin is ready for the profile measurements.

THE TRAINING CENTER

This is a regular feature of this newsletter, where we discuss the method of measuring an implement, venue or a track facility. Your comments or areas of interest are welcome. It is through this kind of dialogue that we learn from each other and improve our skills. Send the editor your stories and questions.

SCALE CALIBRATION, Part 2

An article on scale calibration and error was published in Newsletter 20-2. The following article is a continuation of the previous work. If you haven't already done so, please read the preceding article first.

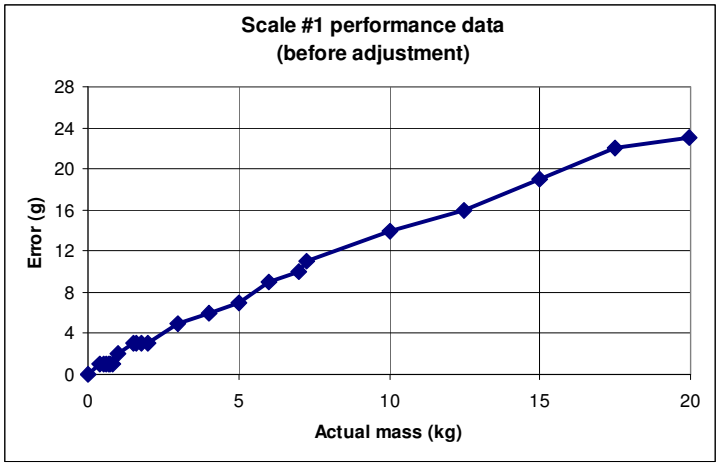
This article focuses on two points:
- more examples of scale error from the field, including the results of scale adjustment and drift
- picking out a scale for your application

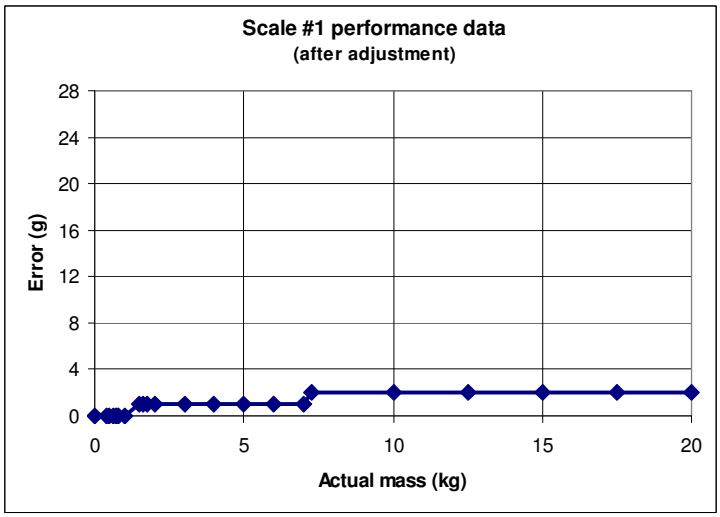
More examples of scale error from the field

The previous article presented scale error data from ten scales that are used predominantly for T&F. This section presents a follow-up for two of those scales, and data on one more scale.

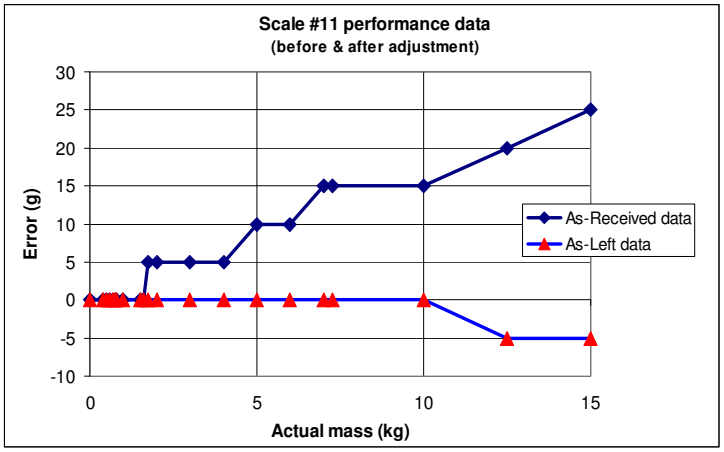
Scale #1 was brand new and never previously used. Its original calibration showed a fairly linear error curve, with a maximum error of 23 grams at full range (20 kg). The factory maintenance instructions for this scale were obtained and the scale was electronically adjusted using NIST Class F mass standards.

The subsequent calibration data show significantly improved performance data. Both of the following graphs use the same range on the error axis, so the plots can be directly compared. Clearly, the after-adjustment data show a maximum of 2 grams error, which is significantly better than before.





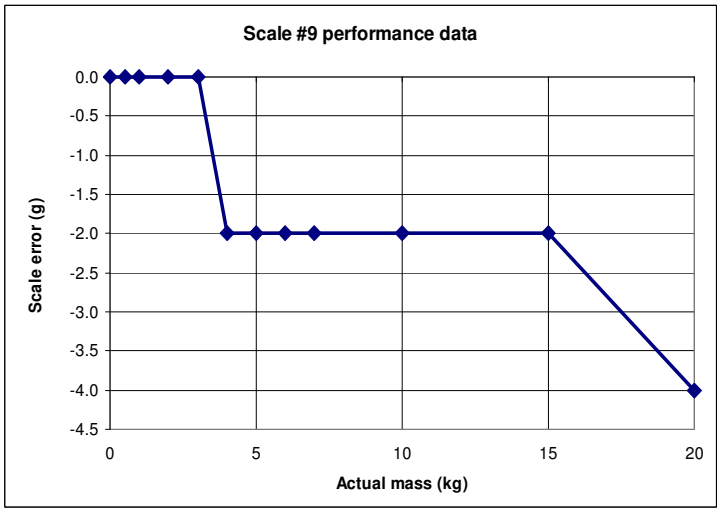
The next scale was adjusted and calibrated after the last newsletter was written. It is about five years old and is used at a small university:



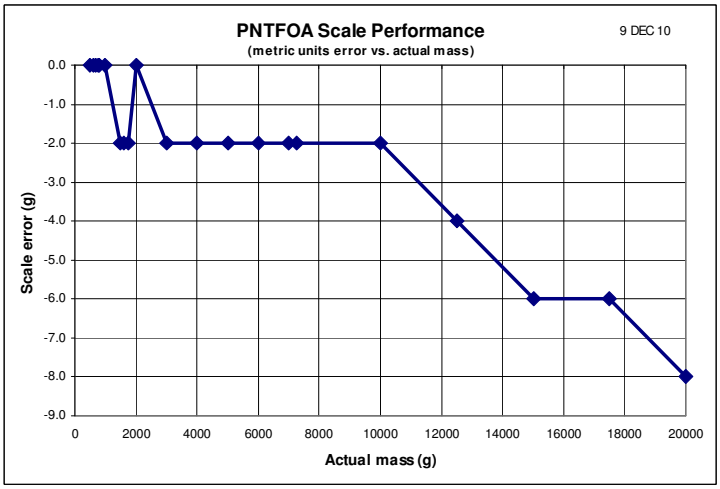
The upper data plot (dark blue) is the pre-adjustment error. The lower data plot is the after adjustment error. This particular scale has a 5 gram resolution. The results after the adjustment are excellent. Since all NCAA implements, except the 35 lb weight, fall under 10 kg, its readings will be true for those implements.

It should be obvious from the above data that adjustment and calibration of scales can greatly increase the accuracy of those scales. This is why scales should be checked at least once a year.

Scale #9 belongs to the PNTF Officials Association. It is part of a Trackmaster kit and consists of a load cell with a separate Mettler-Toledo terminal. Its performance has been monitored for three years. The following graph was presented in the previous article and is representative of the scale's performance most of the time:



However, this scale exhibits an interesting quirk once a year. It is used regularly during the college indoor & outdoor seasons, followed by summer Youth & Masters meets. Then it sits in a basement during the XC season. On first use in the winter it exhibits an error profile like this:



On second use in the season, it reverts back to the first error curve. This is not normal behavior for an electronic scale, and we do not have a definitive explanation as to why it happens. This behavior has been observed for three years in a row because the scale is checked with mass standards prior to every meet. If we had not made regular checks of the scale, this anomalous behavior would not have been detected. Therefore, by buying mass standards or making mass artifacts (see the last newsletter), and using them regularly, one can determine if a scale produces consistent results, exhibits drift over time, or has other anomalous behavior.

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Picking out a scale

In the last newsletter, the following questions were asked:
- How much scale error is too much?
- How much scale error is tolerable for our purposes?

There are no direct answers to these questions in the rule books. However, we can use the rule books to examine this from a different angle.

IAAF Rule 187.1 specifies the throwing implements. Except for the javelin, the implement weights are listed in kilograms to three decimal places. Further on in the throws section, the individual implements are given "range for supply" specs for the manufacturers, which are also kilograms to three decimal places. The USATF rules provide the implement minimum weights for record purposes in kilograms to three decimal places. This ***implies*** a measurement accuracy of one gram, although that is not expressly stated anywhere. This is reasonably close to the ideal "tolerance ratio" of 1:10,000 which is suggested by the Implement Inspector's Handbook.

The new Implement Inspector's Handbook (rev. 2011-0) contains a greatly revised section on scales, including a current table of many scales, their performance and price. In short, most scales that can cover the weights or superweights to an accuracy of ±1 gram cost around
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$1000. This may or may not be achievable, depending on the individual association's finances.

If the "ideal" scale is not affordable, then a tolerance ratio of 1:5,000 is recommended. This will include scales with accuracies of 5 grams, which cost around $500.

This argument supposes that ±5 grams is the maximum error that we should incur in weight measurements. One must consider how much accuracy is enough. How much accuracy is not enough? How much is too accurate (i.e., too expensive)? Consider the following two cases:

> Scale #1 has an actual accuracy of 5 grams (±5 g). This means, depending on its adjustment, it could show a true 4.000 kg mass standard to weigh anywhere between 3.995 kg and 4.005 kg (that is, anywhere between 5 grams low to 5 grams high). Since the ±5 g performance is within the manufacturer's stated tolerance, the scale will be deemed to be working properly. In the real world, this means the scale *could* indicate an illegal 3.995 kg shot to weigh 4 kg, if its adjustment happened to be high in its tolerance band. Or it *could* indicate a legal 4.004 kg shot to weigh 3.999 kg, if its adjustment happened to be low in its tolerance band.
>
> Scale #2 has an actual accuracy of ±1 gram. This means it could show a true 4.000 kg mass standard to weigh between 3.999 kg and 4.001 kg. This means the scale *could* indicate an illegal 3.999 kg shot to weigh 4 kg, if its adjustment happened to be high in its tolerance band. Or it *could* indicate a legal 4.000 kg shot to weigh 3.999 kg, if its adjustment happened to be low in its tolerance band.

Clearly, Scale #2 will cause fewer illegal implements to be passed, and fewer legal implements to be disqualified.

Based on the above, it is recommended that scales used in "big deal" meets should have accuracies no worse than 1 or 2 grams.

Ideally, scales used in lower-level meets should also be of the same accuracy (±1-2 grams), but if the budget does not allow such a purchase, ±5 grams is the next recommendation.

A scale with an accuracy of ±10 grams can not be recommended because a great many underweight implements will not be detected by such a scale.

For those who are interested, the IAAF Calibration and Testing Manual contains a short section on scales. It is available at:
http://www.iaaf.org/mm/Document/Competitions/TechnicalArea/05/84/99/20101012110622_httppostedfile_CalibrationManual_2010_online_22551.pdf

UPDATED DOCUMENTS FOR 2011

The **W&M Handbook** (rev. 2011-0) has been updated for this year. It contains the implement changes made during the annual meeting. The section on weighing scales has been extensively revised, along with other changes throughout the document. Changed paragraphs are indicated with vertical bars in the margin. It is available at:
http://www.usatf.org/groups/officials/resources/weights-and-measures/

The following are new or updated references:

- Weights & Measures Clinic Handout
- Implement Inspection Form
- Implement Specifications

They are also available at:
http://www.usatf.org/groups/officials/resources/weights-and-measures/

The **Ultraweight Throwing Rules Supplement Manual** is available at:
http://www.pntf.org/masters/documents/Ultraweight_Rules_Monograph_12-14-08.pdf

Past **EFSS newsletters** are located at:
http://www.usatf.org/groups/officials/newsletters/#efs

Ultraweight throwing square drawings:
http://home.comcast.net/~ikstrums/uw-throwing-square-dwg.pdf