Wisconsin Track Coaches Clinic 2016

Packet #2

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COACHING BASIC ADJUSTMENTS FOR CONSISTENCY AND SAFETY / ASTM PADDED PLANT BOX WORK ITEM

The relationships between technique, grip height, approach run, and pole stiffness are essential to understanding safe and efficient pole vaulting. This is sometimes called “balancing the pole vault energy equation”. Simply put , it means that the vaulter should make hand hold and pole stiffness adjustments on a jump by jump basis so that he or she are landing safely in the center of the landing pads.
Please note the following rules of thumb, and incorporate them into a program. Keep in mind that the relationships between these items are the basis for improving technique as well as safety. These adjustments are continual, because they occur on a jump-by-jump basis.
Students should:

* Lower their grip if they are not penetrating deep enough onto the landing pad to produce a safe vault.

* Lower their grip if they are landing near the side edges of the pad.

* Lower their grip if they are over bending their pole (more than 90 degrees).

* Raise their grip if they are not over bending the pole but are landing too deep in the pit.

* Go to a slightly stiffer pole if they are over bending their pole and landing well into the pit.

* Go to a softer or shorter pole (but never under their body weight) if they have mastered the progression outlined above and they can’t bend the pole.

* Check their take-off step on a regular basis. They should adjust the starting point of their run so that their take-off foot is directly under their top hand at the moment of leaving the ground.

* Never adjust the grip upward in increments larger than two or three inches per jump.

IV. UNDERSTANDING BASIC CONCEPTS OF THE POLE VAULTING DISCIPLINE

Advice for Vaulters...The key to practicing safety and acquiring basic skills is understanding the task of pole vaulting, its risks, and its mechanics. If novice vaulters absorb the following concepts, they’re off to a good start. Here are ten important concepts. hey will find that these concepts become natural instincts and that new ways of looking at themselves and their performances will occur to them. When this happens, they make mental or paper notes which help many athletes advance to the next level.
Here are an arbitrary ten:

1. A short run with a low grip is the safest and fastest way to learn technique.

2. Students should not progress to the next skill until they have mastered the one that precedes it.

3. Pole bend is a result of proper size poles and skill mastery.

4. Pole bend is not encouraged or recommended until basic skills have been mastered.

5. The proper size pole for bending can't be can't be determined until all basic skills have been mastered from five lefts. Good basic technique helps athletes vault higher and more safely.

7. Understand the progression of poles.

8. Put more emphasis upon clearing bars above the hand-hold, and less emphasis upon high hand-hold.

9. De-emphasize pole bending; it is best to first learn with no bend in the pole.

10. Focus on high hands and jumping up at take-off.

V. SUPERVISION

Advice to Adult Supervisors...For those who participate wisely, pole vaulting is fun and very rewarding. Unlike coaches, pole vaulting supervisors need not be experts in mechanics, but they should be accomplished in relationships—likable and competent facilitators of plans and organizers of people.

Vaulters do not need motivation. They will be the first to arrive at practice and the last to leave.

The lessons of pole vaulting are similar to those of life: they reflect the relationships between meaningful preparation, conceptualization, work and rest, satisfaction and luck, the law of averages, educated guesses and conquering fears, confronting problems and making adjustments. The pole vault supervisor needs to understand these interactions to provide a fun and risk-free environment.

Using the PLZ as a coaching tool:

Overview

Use the PLZ as a guide to help both the athlete and the coach make safety and performance adjustments. The basic idea is to get the vaulter landing in the center portion of the PLZ all the time by managing his or her energy equation. If the vaulter is landing near the edges, then some adjustments must be made in order to improve performance and safety.

Simple rules of thumb

For the safest and most efficient vaulting, the vaulters head and shoulders should land inside the coach's box on all drills and short or long run vaulting. By understanding the concepts of the pole resistance and energy input necessary to move the pole to vertical, the coach and vaulter can easily make the proper adjustments for efficient and safe vaulting. For illustration purposes, all descriptions are made assuming a right-handed vaulter; that is the vaulters top hand on the pole is his right hand.

Blowing Through

If the vaulter's head and shoulders are landing on or near the rear of the preferred landing zone, it is called "blowing through". When a vaulter is blowing through, he is usually hitting bars on the way up, even if the standards are pushed back to the maximum allowed (30"), and he is inverted as far a possible. The cure for blowing through is to slow the speed at which the pole rises to vertical. This can be done by one of the following methods:

Three Methods for slowing Pole Speed

1. For most beginning and intermediate vaulters a slightly stiffer pole (5 pounds) will help slow the pole speed down. In pole vaulting, “blowing through” is a “good problem”, because it means that the vaulter is probably running and planting the pole aggressively. However, since he or she is putting so much energy into the pole, the pole rolls too fast (too much pole speed), so he hits most bars off on the way up, and lands too deep in the pit. In general, if the vaulter is blowing through the pole will be past vertical at the moment of push-off.

2. If the vaulter is landing deep in the pit (beyond the coaches box) and is not over-bending the pole (less than 90 degrees), he usually can simply raise his/her grip to slow the pole speed down. Raising the grip under these circumstances should be done in graduated increments of 2 or 3” per vault until the desired landing location, and pole bend are achieved. Keep in mind, that in most cases, as the grip is raised, the pole gets slightly softer. This concept is outlined in our beginning skill progressions paper. Remember, that as the grip goes up so must the step come out farther away from the planting box, so that the take-off toe is directly under the top hand at the moment of lift off.

3. If a stiffer pole is not available, and the pole is over bending making it impossible to raise the grip any further, the vaulter may achieve the desired pole speed by shortening the run one left. When the run is shortened, the take-off speed is slightly reduced. As a rule of thumb, one left in approach distance is equal to twice the vaulters height. A 6’ tall vaulter will move up approximately 12’ for a one left adjustment. Since the basic formula for energy into to the pole is body weight x take off speed the vaulter can easily apply this simple theory so that their energy input may better equal the resistance the pole offers. For example, a vaulter who was blowing through from 6 lefts, may land perfectly in the middle of the coaches box from 5 lefts on the same pole with the same grip. However, it is always a good idea to lower the vaulter’s handhold slightly for the first few jumps when shortening the approach a left, thus increasing the likely hood of success.

Five methods for increasing pole speed

(In efficient pole vaulting the vaulter must “roll the pole”, so that it is perfectly vertical in the box at the moment the vaulter’s release.) If the vaulter does not roll his pole to vertical then they must try to find a way to increase is or he pole speed.

1. **Run Faster.** By running faster the vaulter puts more energy into the pole and enables it to roll to the vertical plane better.

2. **Plant Better.** By planting better the vaulter has a higher take-off angle and therefore can roll the pole to vertical more efficiently.

3. **Lower Hand Hold.** A Lower hand hold requires less energy (runway speed) to move the pole to vertical.

4. **Stay Right Side Up Longer.** By staying right side up longer just after the take-off the vaulter improves his or her efficiency and enables the pole to roll to vertical more easily.

5. Move To Softer Pole. Softer poles, (pole with lower weight ratings) offer less resistance and therefore are more easily rolled to vertical.

6. Swing Better. The vaulter uses the swinging motion of his legs, (or leg), to invert his body and roll the pole. When this swinging motion is done properly it enables more pole speed.

If the vaulter is landing near the sides of the PLZ (the vaulter may also be spinning), the vaulter needs to lower his grip slightly, and learn how to plant and swing in a straight line into the middle of the pit. These drills are outlined in the beginning skills progression. It is important to note, that going to the side may also be the result of over bending the pole, gripping too high on the pole, not jumping up sufficiently in to the pole, or jumping around the pole, instead of straight ahead at take off (some beginners seem to want to jump around the pole rather than next to it). Also, planting the pole to one side, or the other, at take off will cause the going to the side problem. Sometimes, it is best to view some of these vaults from the back of the runway to determine which of the above technique flaws is causing the problem.

Landing Short

If the vaulter is landing with his head and shoulders near the front of the PLZ (closer to the planting box side than is suggested) he usually needs to lower his grip and/or perhaps go to a slightly softer pole. (Remember that a vaulter must use a pole that is rated above their body weight.) This type of jump is commonly known as “stalling out”, or “coming up short”. Stalling out is usually the result of a poor run, poor plant, too stiff a pole, or too high a handhold. Any of these can cause the vaulter come up short and land in the front-most portion of the landing pads, or worse yet, in the box. (Softer poles and lower grips offer less resistance to getting the pole to rotate or “roll to vertical”. A vaulter who “rolls the pole” all the way to vertical has a greater chance to land in a safe position on the pads. This is the essence of pole vaulting: selecting the proper pole, and hand hold height on any given day which yield the perfect amount of “pole speed”, so that the pole rolls to vertical time after time. It should always be the goal of the coach and the vaulter to select the proper hand-hold height and pole size, on every single jump in practice and meets. By adjusting the pole size, grip height, and the approach length, the vaulter has three variables to work with to achieve proper pole speed.

The Pole Vault Energy Equation And How Its Applies To Safety

Kinetic Energy

The vaulter’s speed and take off technique create his potential for height. In pole vaulting we say that when kinetic energy is combined with the take-off angle it yields the vaulters potential for height.

Energy Equation

The vaulter’s runway speed, and take-off technique create his or her kinetic energy in any pole vault attempt. This energy determines the handhold height and pole stiffness most appropriate for the vaulter. When the vaulter selects the proper handhold and pole size that matches his take-off speed, he produces the perfect amount of pole speed, so that the rotates (rolls) to vertical, just as he or she pushes off to clear the bar. When this happens, the vaulter has “balanced his or her energy equation” so that, he or she is vaulting safely and with optimum efficiency.

Energy input

The speed at which the vaulter takes off, combined with his/her jump up off the ground, and the rigidity of his/her arms at take-off all combine to form the vaulters basic kinetic energy. Vaulters with greater kinetic energy can grip the pole higher and jump on stiffer poles.

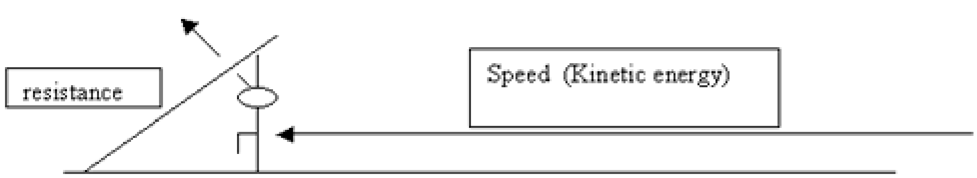

FIG 1.1

Pole Speed

The rate, or speed, at which the pole rises to the vertical position. With perfect pole speed the pole rises to straight up and down vertical at the moment the vaulter releases the pole to clear the bar. In this type of jump the vaulter will land in the center of the PLZ. Pole speed is primarily affected by the vaulters runway speed and secondarily affected take-off and swing up mechanics.

Square or lined up take-off

When viewed from the front or back the vaulter should leave the ground in a position of alignment. The vaulter's body is straight up, neither leaning right or left, and the top hand is positioned over the vaulter's head at the moment of take-off.

Vertical pole

For safe and efficient vaulting the vaulter must select a hand-grip and pole size which best fits his or her running speed and technical efficiency. This process of adjustments is called balancing the pole vault energy equation. The goal of these adjustments is to enable the vaulter to "roll the vaulting pole to vertical", so that he or she can jump with proper technique and land safely on the landing pads. Additionally, this type of energy balanced vault , when rehearsed often enough in practice, also produces the most technically efficient vaults, so that they can clear bars higher relative to their top hand holds, and thus ultimately can vault much higher.

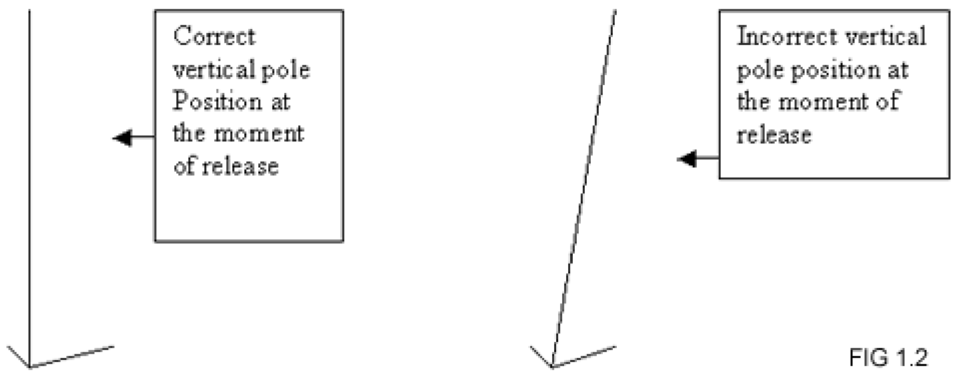

FIG 1.2

Resistance

(also known as resistance to penetration) Resistance is a term used to describe how hard it is to penetrate and land safely on the pads. The resistance a pole offers is predetermined by two components: The stiffness of the pole (length and Max weight), and the handhold the vaulter chooses. If the vaulter chooses too high a grip, or too stiff a pole for his take off speed and mechanics he/she will not be able to execute proper technique, and consequently, may not be in position to land safely on the pit.

The resistance a pole offers is expressed by the inter-relationship between its length and weight values. In general terms 6" in length of a pole equals approximalty 10 pounds in weight. This relationship and the relationships between other poles are easily seen in the relative resistance chart in Chapter 4.

Penetration

Is a pole vaulting term used to describe getting the pole sufficiently to vertical to land in the PLZ.

Rolling the pole

A descriptive term many vaulters use to describe the feeling the have after the leave the ground whereby the pole is lifting them and moving toward vertical. When the vaulter is rolling the pole with too much energy but not over-bending it is called “blowing through”. When the pole is not rolling sufficiently and the vaulter is coming up short in the pit it is called “stalling out”.

Pole Stiffness

(Resistance) In general terms, the resistance a pole offers to penetration (rolling to vertical), is expressed in its length and weight. Poles that are stiffer, offer more resistance to rolling to vertical (so they help slow pole speed) and offer greater potential for high jumps. Softer poles are easier to roll to vertical, but offer less potential high jumps. As a rule of thumb the relationship between pole length and pole stiffness is approximately 6” in pole length equals 10 pounds in stiffness. So that a 12’ 120 is approximately 10 pounds softer than a 12’6 120.

Grip Height

(Resistance) Grip height measured from the bottom of the pole to the top hand, is another form of resistance to penetration (rolling the pole to vertical). As the vaulter raises his grip two things happen. First and most importantly, the axis through which the hands must pass becomes greater, increasing the poles resistance to rising to vertical. Secondly, the pole becomes slightly softer as it is held higher, thus slightly reducing its resistance to penetration, and returning its unbending energy more slowly.

Push-Off Efficiency

Perhaps the greatest indicator of pole vaulting proficiency is the athletes ability to clear cross-bars above his or her hand-hold height. In general terms, the greater the athlete can push–off above his or her hand- hold, the greater is said to be his or her push-off efficiency. Push off efficiency is the result of proper energy equation management over a period of time so that the vaulter has many opportunities practice proper technique with the pole getting to vertical so that he or she can land safety on the pads.

Grip Height Plus Push-Off Equals Vaulting Performance

The vaulters hand-hold height plus his or her push off efficiency are key determiners in his or her performance. For instance, a vaulter using a 13’ grip to clear a 13’ cross bar would require a 8” push off. Keep in mind the box is approximalty 8” deep.

Take off Angle

The distance between the ground under the vaulters foot at the moment of take off and his or her top hand. The greater this distance, the higher the angle of the pole is as it makes contact with the back of the planting box. In general, taller vaulters with longer arms will have higher take off angles than shorter vaulters with shorter arms. Having a higher top hand position at take off is a mechanical advantage since the pole must rotate (roll) less distance to get to vertical. In general a high take off angle allows the vaulter to grip the pole higher. Beyond the obvious limitations of body type, the vaulter can do several things to increase the height of the take-off angle:

1. Be sure that top arm is extended 100% above head prior to pole tip entering the planting box.

2. Leave the ground so that the take off foot is directly below the top hand at the instant of the pole striking the back of the box.

3. Jump up in the direction the pole is rolling.

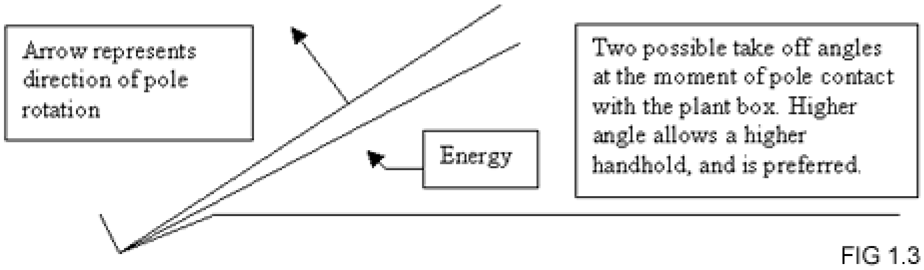

FIG 1.3

Pole Bend

Bending the pole allows the vaulter to grip higher because it reduces the resistance of hand-hold height. Effectively, when the pole bends, the vaulter is actually holding lower than his actual measured grip when the pole is straight. This is the reason vaulters can vault higher on bending poles. As the vaulter begins to learn to bend the pole he or she will be able to raise his or her grip dramatically. It is during this time frame that the PLZ becomes an important coach's tool for safety. Many times during these early stages of bending that control problems develop.

Over bending

Also known as "Smushing" or "crushing" the pole. That type of vault where, the vaulter bends the pole beyond its suggested maximum amount (90degrees). In general producing a slow unbending or return, and disrupting the vault. Many times is produced by over-gripping (trying to hold too high).

Over gripping

Gripping the pole too high for available kinetic energy. Usually the result is too much pole bend or landing short or both.

Under gripping

Holding the pole too low for kinetic energy and take-off angle results in blowing through

Specification for Poured in Place Padded Pole Vault Plant Box

Draft

Abstract

This specification covers minimum requirements of size and physical characteristics of materials for pole vault plant boxes padding and installation intended for users attempting heights up to 20'3", 6.20m. Surveys by Boden (2001), and others have shown that falls into the pole vault box have caused significant injuries to some pole vaulting participants. Leg and arm fractures are the most common forms of injuries in plant box landings. But severe head injuries, paralysis, and even death are also related to falls onto the pole vault box rim. Additionally injuries are common as the result of improperly installed plant boxes resulting in back landings in the box area, often resulting in sever head injuries as a result of the head striking the pole slide from heights up to 8' , 2.45m, . The rules makers for track and field specify the dimensions of the pole vault box only.

Additionally, nearly all plant boxes currently in use offer no padding to any portion of the plant box area. Use of appropriate impact-attenuating structural, loose fill and surfacing materials, when combined with proper installation procedures and around the will help reduce force impacts into the plant box wide margins, and thus improve safety. Additionally, damage to the bottom of vaulting poles, (ong a problem) will be reduced greatly. Currently, there are no standard specifications for the pole vault box.

Introduction

This specification specifies impact attenuation requirements for pole vault plant boxes and dimensional ranges for improved pole vault safety. Additionally, it provides a means for determining impact attenuation performance using a test method that simulates the impact of a pole vaulter's head when impacting specific key areas of the pole vault plant box. This method quantifies the impact in terms of Gmax and HIC scores. The standard includes procedures allowing surfacing materials to be performance rated before installation and also be tested after installation for compliance with the specification. The purpose of this specification is to reduce the frequency and severity of fall related injuries to pole vaulter's by establishing a uniform and reliable means of comparing and specifying the impact attenuation of pole vault planting boxes. Additionally, to improve pole vault safety by reducing the front edge of the plant box below the surface of the runway in front of it. Its use will give designers, manufactures, installers, prospective purchasers, owners and operators of pole vault facilities a means of objectivity in assessing performance of surfacing materials and padding under and around pole vault plant boxes, and hence reducing the associated injury risk.

1. Scope

1.1 This specification covers the dimensional requirements of size, physical characteristics of materials, standard testing procedures, instillation and labeling and identification of padded pole vault plant boxes using the poured in place plant box installation methodology.

1.2 *Units*—The values stated in either SI units or inch/pound units are to be regarded separately as standard. The values stated in each system may not be exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in nonconformance with the standard

1.3 Force impact values shall be described using both Head Injury Criteria (HIC) and G-max.

1.4 Great care has been given to the installation methodology described here in, so that it is useful in the wide variety singular and multi purpose play areas of facilities where pole vaulting is done.

1.5 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2.0 Plant Box area definitions

2.1.1 *pole vault box, n* - the trough at the end of the pole vault runway. It has four sides: a downward sloping floor or pole slide, two sidewalls, and a strike plate. A vaulter directs the lower end of the vaulting pole into the pole vault box. The back wall of pole vault box known as the stop board stops the forward motion of the end of the pole while allowing the pole to rotate about its end as the vaulter leaves the ground and completes a vault.

2.1.2 plant box area perimeter , n – The areas directly around the top edges of the sidewalls, strike plate, and front edge of a pole vault plant box .

2.1.3 padded pole vault planting box, n - A planting box which offers superior shock attenuation to its entire structure and surrounding area in the vertical plane, yet is stable in the horizontal plane.

2.2.1 *stop board, n* – The nearly vertical wall at the rear of the plant box which stops the tip of the pole from moving forward as the vaulter takes off the ground.

2.2.2 *upper stop board, n* - The top 10% of the stop board just below the surface of the runway.

2.2.3 upper s*top board antifriction curve, n* - The area of the stop board just below the surface of the runway, which is slightly curved away from the middle of the plant box to reduce frictional damage to the bottom of vaulting poles.

2.2.4 *pole strike area, n* - The reinforced area of the bottom of the stop board where the tip of a vaulting pole stops moving forward as the vaulter leaves the ground. (Also called the “strike plate”)

2.2.4 medial stop board area, n - The central reinforced area of the stop board above the pole strike and below the stop board curve.

2.3.0 point of rotation, n -The location in the lowest point of the plant box where the rotational ledge adjoins the stop board, this is the point around which the tip of the vaulting pole rotates as the pole rises to vertical.

2.3.1 *stop board-strike plate angle, n* - The angle at which the pole rotational area and the bottom of the stop board adjoin.

2.3.2 rotational ledge, n – The bottom pan area nearest the strike plate upon which the tip of the vaulting pole rotates and carries the full weight of the vaulter and the pole.

2.3.3 *rotational ledge padding, n* - The padding beneath the rotational ledge.

2.3.3 *pole strike anchor, n*- The materials directly behind the lower portion of the strike plate which secures the padded plant box in its horizontal position.

2.3.4 *stop board anchor padding,* n – Sub surface padding between the outside of the stop board and the anchor.

2.3.5 *Strike plate-pole rotational assembly, n* - Structurally reinforced area where the pole tip strikes the stop board

2.4.0 *flexible structural pole slide, n* - The structural material which allows a vaulting pole to freely slide to its intended position against the stop, yet offering sufficient flexibility to reduce the impact of a falling human body.

2.4.1 *pole slide texture , n* – the general texture of the structural materials which allows the pole tip to slide freely smoothly from the front opening of the box to the strike plate area.

2.4.2 upper pole slide, n - The area of the pole slide nearest the front opening.

2.4.3 *medial pole side* , n The central areas of the pole side

2.4.4 *lower pole side, n* - - The area of the pole slide nearest the stop board/strike plate area.

2.4.5 *lateral pole slide, n* - those areas along the sides of the pole slide near where the pole side structure meets the side wall structure.

2.4.6 *pole slide padding, n* – Shock absorptive material, or materials directly beneath the flexible pole slide structure.

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2.5.0 *front opening, n* - The opening at the front of the plant box nearest the approach runway.

2.5.1 *front edge lip (aka: "The lip"), n* - A descriptive term used by vaulter's to describe a front edge of a of a pole slide which is above the surface of the runway, thus creating an impediment to the pole sliding safely info the plant box. Note: exposed and or elevated front lips have caused many accidents resulting in serious injuries.

2.5.2 *front opening anchor, n* The vertical angle formed by the structural material which comprises the upper pole slide (trey) for the purpose of attaching to the front edge of the pole vault runway. Also called the glue edge or front lip hold down.

2.6.0 *structural side walls, n* – The flexible structural inner walls which enclose the lateral sides of the planting area so that they maintain proper shape and alignment and smoothness, during installation and use, they form the upper portions of the trey.

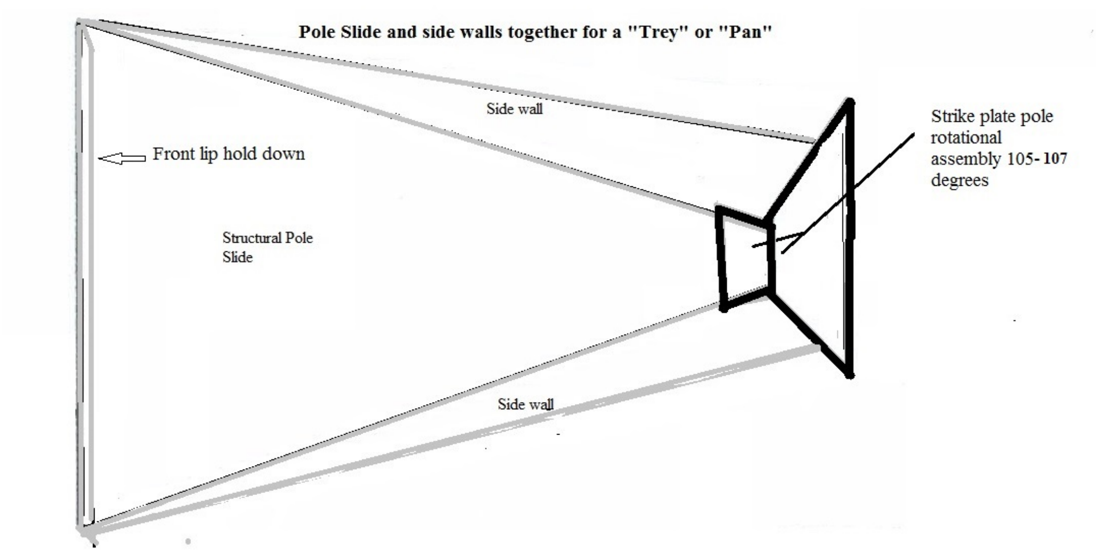
2.6.1 *upper side walls, n* - Those areas of the side walls nearest the runway surface.

2.6.2 *rim anvil effect, n* - The extremely high force impact potentials of the exterior rim edges created by traditional plant box structure and installation methods currently being used.

2.6.3 lower structural side walls, n -Those areas of the side walls nearest the pole slide combine with the lateral side walls to form a structural unit called the plant box trey.

2.6.4 structural side wall / lateral Pole Slide intersection, n - the smooth structural area's where the pole slide meets the smooth areas of the lower side walls, forming a smooth integrated structural symmetry.

Plant Box Structural Component System



2.6.4 side wall stop board intersections, n The lateral places where the side walls meet the stop board.

2.6.5 padded side wall rim, n - Those padded upper portions of the plant box sidewalls; above the structural components which form lower side walls, yet provide a traditional flared sidewall shape.

2.6.6 *plant box trey, n* - The structural combination of smooth side walls and smooth pole slide which form a unified structural entity for the purpose of guiding the tip of the vaulting pole to the stop board (pole strike).

2.6.7 side wall padding, n - padding attached to the structural components of the side walls and extending above them.

2.6.8 *padded side wall rim, n* - The combination of padding components, loose fill, and runway surfacing materials which extend above the structural components of the sidewalls and strike plate around the upper most edges of the plant box side walls .

2.7.0 *padded stop board rim, n* – The combination of padding components and runway surfacing materials which pad the top of the strike plate rim and blend into the same elevation as the surrounding runway surface.

2.8.0 p*lant box underlayment, n* – The loose fill materials in the area underneath the pole slide and surrounding the side walls.

3.0 *pole vault use zone, n* – The area beneath and surrounding a pole vault landing pit and its approach runway.

4.0 s*urfacing materials, n* –The materials used to cover the areas around pole vault use areas.

4.1.3 *loose fill, n* - a compliant layer of small independently moveable components; for example wood fiber, bark, pea gravel, shredded foam, mulch, and shredded rubber, which help to provide shock absorption and aid in water matriculation.

4.1.4 *aggregate surface , n* - A loose fill type surface in which the compliant top layer is made of particulate materials (for example) sand, gravel crushed marble, pea gravel, slag, rubber mulch or cinders.

4.1.5 *unitary Surface, n* – A complaint top layer of one or more material components bound together to form a contiguous surface: for instance; concrete, asphalt molded foam, gymnastic mats, urethane, rubber mat and other similar composites and or combinations of composites.

4.1.7 *runway surface*- The exposed upper most surface of a pole vault runway. Typically, but not limited to ground rubber particles, asphalt, cinders, dirt and or poured rubber and other common rubber mat materials rubber mat materials.

4.1.8 *runway structural underlayment, n* - The material or materials used to create a platform upon which a runway surface is installed. Examples of typical sub bases are : concrete, asphalt, plywood or structural steel, or road base, dirt, decomposed granite ect.

4.2.0 *closed cell foam, n -* Rigid Cellular Polystyrene foamed plastic insulation designed for sub floors and in ground installation which offers superior padding, low water absorption, long lasting durability.

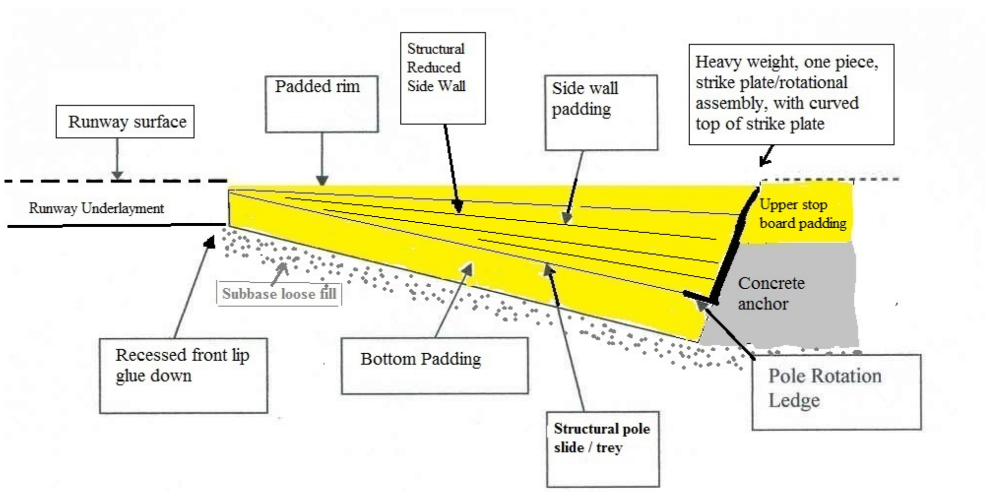
4.2.1 *rubberized track/ runway surface, n –* The upper most layer of rubber surfacing material used in running track and field event runways.

4.2.2 *plant box sub base, n-* the areas directly underneath the plant box structure and its padding.

4.2.3 *loose fill material, n – such as pea gravel of shredded rubber mulch.*

4.2.4 *sectional elevated runway, n -* portable runways above ground level typically constructed of wood or steel, built in sections for portability with fasteners for connectivity.

Pole Vault Planting Box Profile

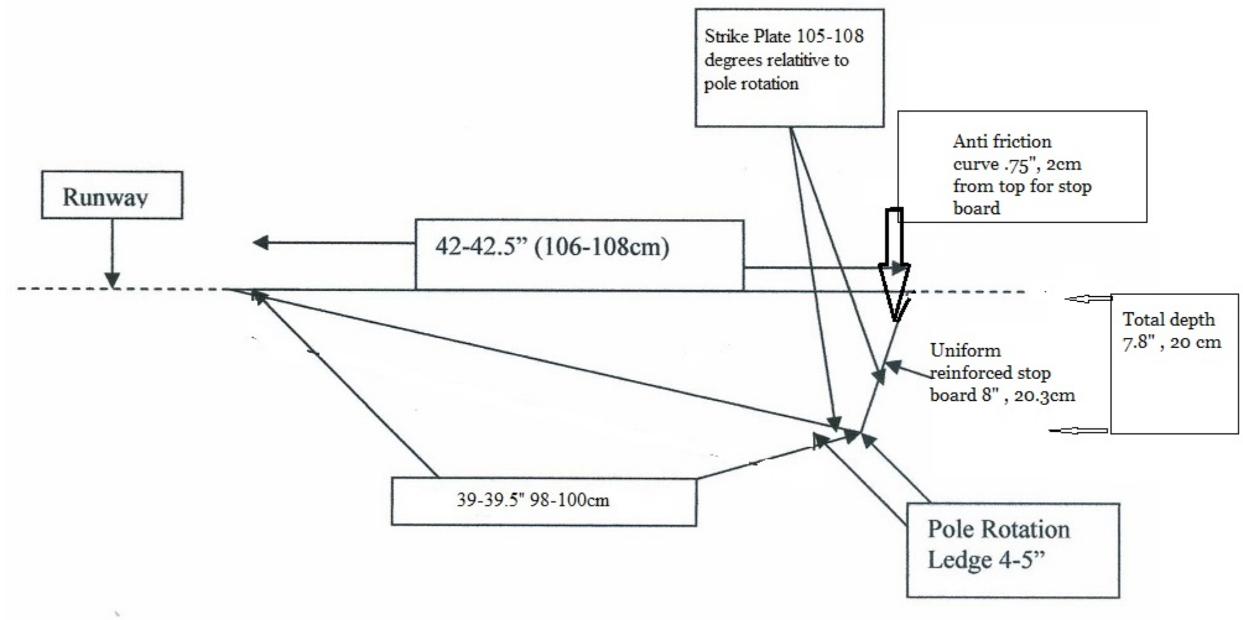


5.0 **Dimensions**

5.1.0 Overall inside dimensions of a pole vault planting box are based upon the current size specified by the rules of track and field. The box shall be between 42" and 42.5 " (106-108cm) long from front opening nearest the runway to the top of the back of the stop bard. The front opening shall be 23.62" (60cm) wide and the top opening of the stop board shall be 16.1"(40.8cm). The side walls shall be angled 120 degrees from the pole side and the strike plate shall be angled between 105 and 108 degrees from the pole slide to allow the pole to bend undisturbed.

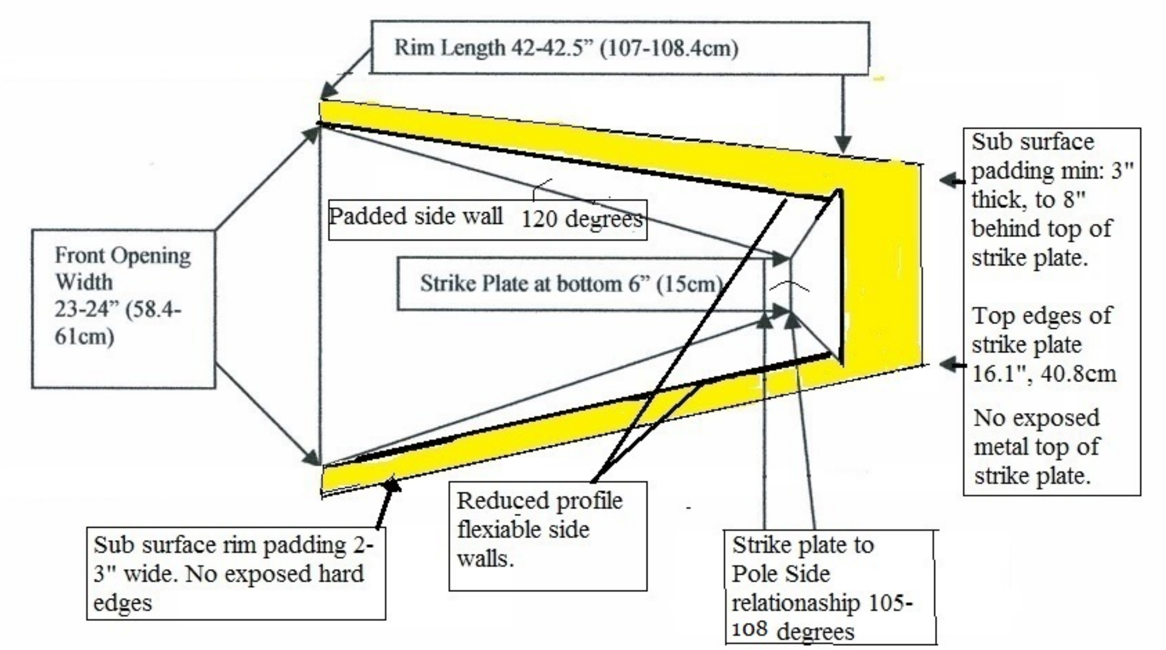
The depth of the plant box shall be 7.87" (20cm) from its lowest point where the strike plate meets the pole slide to the top surface of the runway surrounding it. .

Pole Vault Planting Box Profile with Dimensions



Pole Vault Planting Box Top View

Figure 4



Physical Characteristics of Materials

Strike Plate

5.2.0 The strike plate shall be made of a minimum of ¼", (5.0 cm) plate steel or Iron or other suitable non-corrosive materials which meet or exceed ASTM A36, and will not deform or deteriorate after thousands of pole strikes.

5.2.1 The bottom 7.3" (18.54cm) to 7.8" (19.8cm) of the strike plate strike plate shall offer a uniformly flat surface reinforced surface from the point where it meets the pole rotation extended up approximately 90% of the strike plate total height. The top edge of the strike shall be imbedded under a minimum of ¼" (6.0 mm), and a maximum of ½" (12mm) of rubber track surface.

5.2.2 The top .75" mm) of the strike plate shall be curved away from the runway between 1/16" (16mm), and 1/8" (32mm) to help reduce friction to the bottom of a bending/rotating pole. The top inside edge of the strike plate (facing the runway) shall be rounded so as to not have a sharp edge.

5.2.3 The bottom 5.8" (14.7cm) of the strike plate shall have a secure anchor immediately behind it. Depending on the conditions, this may be done with concrete, packed road base, packed dirt , or asphalt (in ground applications), or wood or steel in elevated runways.

5.2.4 The interior edges of the pole stop where they meet the side wall and the bottom of the pole slide shall be calked with exterior water proof sealant which meets or exceeds ASTM C920 class 25, or C834, type C.

5.2.5 Th**e** pole strike area shall be between 105 and 107 degrees in relationship to the pole slide/bottom pan area.

Pole Rotational Area

5.2.6 The strike plate angle relative to the pole rotational area shall be between 105 and 107 degrees.

5.2.7 The pole rotational area and the pole slide shall be the same angle relative to the bottom of the strike plate.

5.2.8 The area under the pole rotation may be padded the same as the pole slide.

5.2.9 The area directly underneath the pole rotational area padding shall consist of ½ or ¾" pea gravel or tire shreds. (tire shreds or rubber mulch ASTM ?)

Pole Slide / Lip

5.3.0 **T**he front edge of the planting box, also known at the front lip, shall be imbedded under a minimum of 3/8', 10mm, and a maximum of 5/8' 15 mm of the runway surfacing material. The front edge of the pole slide (the lip) shall not be exposed or above the surface of the runway. This allows poles to slide on the top of the runway surface and enter the front of the box undisturbed.

5.3.1 The pole slide shall be smooth and uniform so that the pole may side to the strike plate undisturbed.

5.3.2 The front edge of the pole slide shall be anchored to the front edge of the runway underlayment with a glue down flange a minimum of 1.5”, 3.8cm deep from the front edge of the front opening using rubberized track surfacing materials which meet or exceed ASTM F2157 -09, or sealer/ adhesive which meets or exceeds ASTM C920 class 25, or C834, type C.

5.3.3 The structural yet flexible pole slide shall be of Marine Grade hi density plastic or non corrosive metal which meets or exceeds A123-13 specification for galvanization.

5.3.4 The structural portion of the side walls and the pole slide shall be formed from a single piece to form a singular structural unit called a trey, and thus ensure a smooth and uniform structure down which the pole must slide undisturbed.

5.3.5 The trey functions to provide a smooth cover for the padding and sub base materials.

5.3.6 The plant box area side walls and pole slide structures shall have min of 1” of closed cellular polystyrene boards with or with out facings or coatings which meets or exceeds ASTM C578

Side Walls/ Rim

5.4.0 The flexible lower structural side walls shall be padded with no less than 1” of closed cellular polystyrene boards with or without facings or coatings made by molding (EPS) or extrusion (XPS) of expandable polystyrene which meets or exceeds ASTM C578.

5.4.1 In order to provide improved shock attenuation the upper side walls shall be padded with polystyrene which meets or exceeds ASTM C578. They shall be covered with a minimum of 1/3” and a maxium of 1” of rubber mat track surface which meets or exceeds ASTM F2157 -09 Standard Specification for synthetic running surfaces.

6.0 Significance and Use

6.1 The dynamic data obtained with the procedures given in this specification measure the cushioning properties of the planting boxes tested.

6.2 The interior size of the pole vault planting box is specified with respect to the current rules in the sport.

6.3 The dimensions of the pole vault box are specified with respect to the dimensions of the pole vault box and the kinematics of typical pole movement in the pole vault box

6.4 The over all shock attenuation improvements outlined in this document represent a 85-95% improvement over the current norm in use today.

6.5 The materials used as underlayment have a significant effect on the shock Attenuation capabilities.

6.6 Currently, most in ground plant box installs have 6-10" of concrete underneath ¼" plate steel side walls and pole slides.

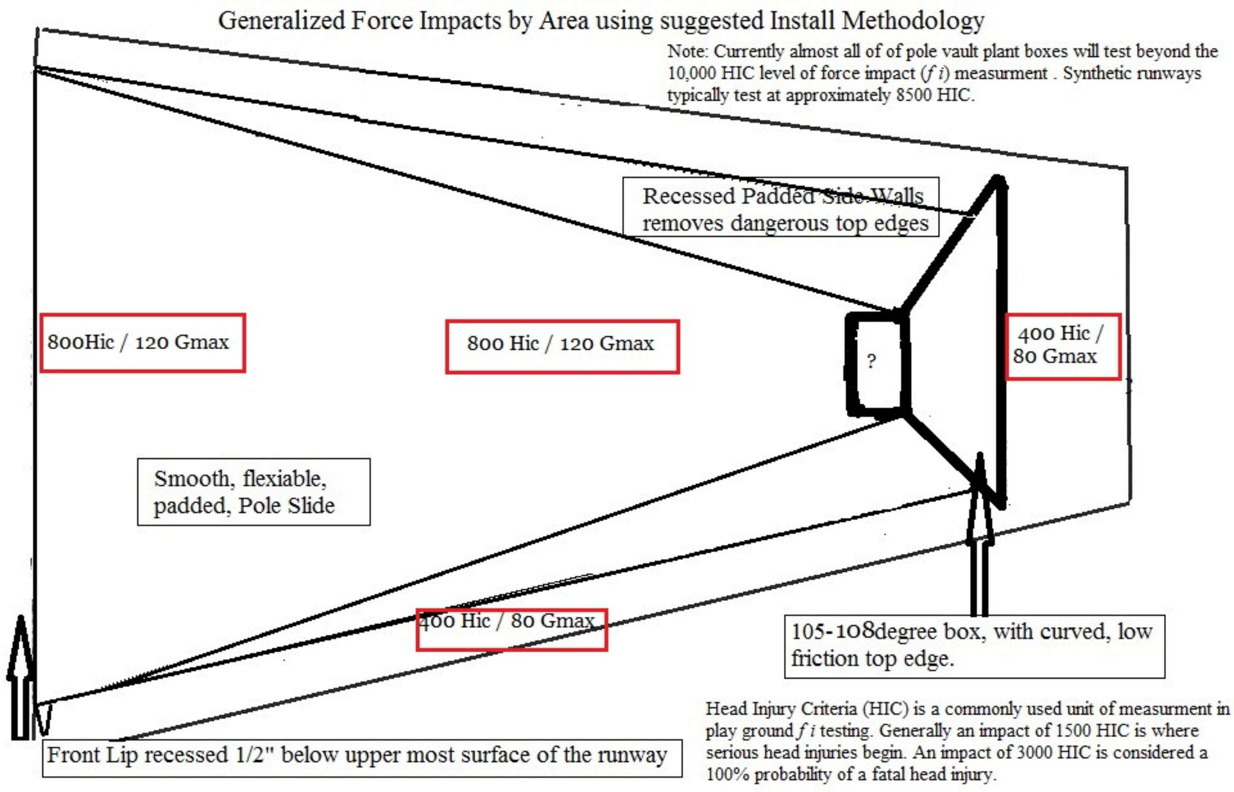
6.7 Elimination of all possibility of an elevated front edge over the life span of a plant box will greatly reduce the likely of tip catching on the front edge accidents/injuries.

6.8 Padding the rim will help to reduce potential force impacts onto this highly dangerous area by another 50% beyond the current collar on hard surfaces capabilities.

6.9 Padded plant box installs with subsurface padding as outlined in this document is low cost, long lasting and relatively easy to accomplish.

6.10 Great care has also been taken to produce a padded plant box area which can be completely coverable or plugged so that the play area is useable for other activities without endangering participants.

Suggested Maximum force impact by Location



7. Force Impact Testing

7.1.0. Definitions of Force Impact Terms

7.1.1 *Impact* – Contact caused by a moving object striking another object and during which one of the objects is subject to high de-acceleration.

7.1.2 *Critical Fall Height* (CFH) – A measure of the impact attenuation performance of a surface of surfacing materials. Defined as the highest theoretical drop height from which a surface meets the impact attenuation performance criterion specified by this specification. The critical fall height approximates the maximum fall height from which a life threatening head injury would not be expected to occur. .

7.1.3 *Impact attenuation* – The property of a surface or landing pad that through localized and general deformation absorbs the energy of an impact in a way that reduces the magnitude of peak impact force and peak acceleration.

7.1.4 *Impact test* – A procedure in which the impact attenuation of a pole vault landing mat component or plant box is determined by measuring the acceleration of a missile dropped on to the surface.

7.1.5 *Impact test results* – One or more measured or calculated values from one or more tests used to define the impact attenuation of a surface or pole vault landing system component.

7.1.6 *g*- The acceleration due to earth's gravity at sea level, having a standard value od 9.80665m s-. The standard value may be approximated as 32.174 ft/s2. Accelerations may be expressed in units of g = the acceleration due to gravity.

7.1.7 *Impact test Location* – The point on the surface that is selected as the target of an impact test.

7.1.8 *g-max* – The maximum acceleration of a missile during an impact, expressed in g-units

7.1.9 *Head Injury Criteria (HIC*) – A specific integral of the acceleration-time history of an impact, used to determine relative risk of head injury.

7.2.0 *Impact Test System*—The test apparatus described in Section 8 of ASTM F1292 Standard Specification for Impact Attenuation of Surfacing Materials within the Use Zone of Playground Equipment is used. A free-fall impact test system shall be used.

7.2 .1 *Missile*—The missile used is described in section 8.2.1 of ASTM F1292 Standard Specification for Impact Attenuation of Surfacing Materials within the Use Zone of Playground Equipment.

8. Conditioning

8.1 Pole vault box's shall be tested under ambient conditions that match those of intended use.

8.2 Padded pole vault plant boxes should be periodically checked for wear and tear on the pole slide and strike plate areas. The materials and installation method are designed to give the uses maximum safety and product longevity.

9. Impact Testing Procedures

9.1 The pole vault box shall be tested as it is installed using the impact testing procedures for Installed Surface Performance Test (Field Test) of ASTM F1292 Standard Specification for

Impact Attenuation of Surfacing Materials within the Use Zone of Playground Equipment with the following conditions:

9.1.1 If the pole vault box is tested at its use site, it shall be tested in situ but with the front buns and any other encroaching components of the pole vault landing system removed so that the testing apparatus may easily access the test location.

9.1.3 The impacting missile shall be dropped from a height of 3.80 m (12 ft. 5 in.) above the impact test location. The 3.80 m (12 ft. 51⁄2 in.) drop height is measured from the intended test location to the lowest point on the impacting missile.

9.1.4 Three consecutive impact tests shall be performed at each impact test location. Calculate the average *g*-max and HIC score for each impact test location by averaging results from the second and third impacts.

9.1.5 Impact tests shall be completed on the pole vault box the following three locations in any order:

9.1.6 On the centerline of the pole slide half way between the front lip and the pole strike. Suggested maximum shock attenuation values: 800Hic / 120 gmax

9.1.7 On the top edge of either of the side walls half way between the stop board and the front lip. Suggested maximum shock attenuation values :400 Hic / 80 Gmax

9.1.8 Three inches behind the center of the top of the stop board, Suggested maximum shock attenuation values : 400 Hic / 80 Gamx

10. Report

10.1 Report the following information:

10.1.1 *Requesting Agency Information:*

10.1.1.1 The name, address, and telephone number of the person or entity requesting the test.

10.1.2 *Testing Agency Information:*

10.1.2.1 The name, address, and telephone number of the testing agency.

10.1.2.2 The name and signature of the test operator.

10.1.2.3 Date(s) tests were performed.

10.1.2.4 Date of the report.

10.1.3 *Description of the Test Apparatus:*

10.1.3.1 Test equipment type and manufacturer.

10.1.3.2 Date of most recent accelerometer calibration certificate.

10.1.4 *Test Results*—The following shall be reported for each series of impact tests:

10.1.4.1 Whether the sample was dry, wet, or frozen.

10.1.4.2 The ambient air temperature measured after the final drop in each series.

10.1.4.3 The drop height and impact velocity or fall time.

10.1.4.4 The *g*-max and HIC value for each drop and the average *g*-max and HIC value for the last two drops of each series.

10.1.4.5 The location of each impact test on the pole vault box .

10.1.5 *Description of the Pole Vault Box :*

10.1.5.1 The address of the test site.

10.1.5.2 The manufacturer and the model name or number of the pole vault box.

10.1.5.3 The dimensions of the pole vault box collar.

10.1.5.4 Names, addresses, and phone numbers of the manufacturer, supplier, and installer of the pole vault box collar, to the extent they are available

10.1.5.5 The condition of the pole vault box, including observations of excessive wear, rips, tears, moisture content, and so forth.

10.1.6 *Test Outcome*—A statement as to whether or not the test sites conformed to the performance requirements of this specification.

10.1.7 *Statement of Specificity*—The following statement: "The results reported herein reflect the performance of the tested pole vault box collar at the time of testing and at the temperature(s) and ambient conditions reported. Performance will vary with temperature, moisture content, and other factors."

11. Instructions and Labeling

11.1 Each Padded Pole Vault Box shall be provided with Instructions for proper assembly and installation.

11.2 Each pole vault box collar shall be permanently labeled with the following items:

11.2.1 Identification of manufacturer,

11.2.2 Model designation,

11.2.3 A warning label limiting the intended use.

11.2.4 Shock attenuation values are based upon proper installation methods and materials.

12. Referenced Documents

ASTM documents :

F1292-12 Standard Specification for Impact Attenuation of Surfacing Materials within the Use Zone of Playground Equipment

F355 - Test Method for Shock –absorbing properties of Playing Surfaces and Materials

F429 - Test Method for Shock-Attenuation Characteristics of Protective Headgear for Football. F2440 - Standard Specification for Indoor Wall/Feature Padding.

F1487 - Consumer Safety Performance Specifications for Playground Equipment for Public Use.

F2075 - Specification for Engineered Wood Fiber for use as a Playground Safety Surface.

F2157 Specification for Synthetic Surfaced Running Tracks

C*920* - 14 Standard Specification for Elastomeric Joint Sealants , continuous immersion, elastomeric sealants, joint sealants, sealants, specification
F2949-12 Specification for Pole Vault Plant Box Collars.
F1162- 12 Specification for pole vault landing systems
A36/ A36m-12 Specification for Structural Plate carbon steel
? B695-04 (2009) Standard Specification for coating of zinc mechanically deposited on iron and steel.
A123-13 Standard specification for hot dip zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
C578 – Specification for Foamed Plastic
F355 Test Method for measurning shock attenuation of PG materials
D2240 – Test method for rubber hardness

C578 – Specification for Foamed Plastic
ASTM C557, E72 - Loctite

ASTM D6270 - 08(2012) Standard Practice for Use of Scrap Tires in Civil Engineering Applications
ASTM F3012 -04 Standard Specification for Engineered Wood fiber for useunder play ground Equipment.
ASTM F3012 -14 Standard Specification for Fill Rubber for use under and around play ground equipment

12.2 Federal Documents:

U.S. Consumer Product Safety Commission, Publication #325, Handbook for Public Playground Safety
U.S. Consumer Product Safety Commission, Special Study: Injuries and Deaths Associated with Children's Playground Equipment. April 2002.
HUD specification ????

Published Studies:
Catastrophic Injuries in Pole Vaulter's – Nine year follow up study, Boden et al , American Journal Of Sports Medicine 2012

International Documents:
British Sports mats BS EN 12503-2:2001

Web Sites
www.IPEMA.org

Bloom HS Chicago Heights, Illinois
Dura Soft Plant box and rubber plug install Dec 2015








Reduces damage to the bottom of the pole, prevents front lip problems, pads bottom and side walls, pads side rails and perimeter.
Works in multi use areas and outdoors all climates.