Idiots Guide to Safe Pole Vaulting

1) 2 Primary Vaulting Goals
   a) Clear the bar
   b) Land safely
      i) THESE ARE THE 2 GOALS ON EVERY COMPETITIVE JUMP!!!!!!
      ii) You always have to balance those 2 goals with the adjustments a Vaulter makes in an effort to jump higher
      iii) It's not bending the pole
      iv) It's not holding high
      v) Those are the results of execution of mechanical tasks

2) How the Vaulter achieves the 2 Primary Goals
   a) Vaulter must execute 2 tasks
   b) 1st Task -The Vaulter attempts to move (rotate) the pole to VERTICAL
      i) Makes no difference if it's stiff or flexible pole, task remains the same
      ii) How the pole rotates to vertical is the barometer of the vaults success or failure and a key to the adjustments the Vaulter needs to make to execute the task.
      iii) Three factors directly affect the Vaulters effectiveness at executing the 1st task.
         (1) Vaulter Speed
         (2) Efficiency
         (3) Pole Resistance
      iv) If you look at nothing else in the vault watch how pole gets to vertical
      v) Accomplishing A - (Pole to Vert) - probability of landing safely goes WAY UP
      vi) Rotating pole a little past vert is WAY better then rotating the pole a little short of vert.

   c) 2nd Task - The Vaulter attempts to move (rotate) to VERTICAL
      i) Basically, the Vaulter attempts to rotate to vertical and perform a hand stand on top of the pole
      ii) Accomplishing the 2nd task is directly impacted by the first task.
      iii) It's easier for a Vaulter to rotate to vertical if he know the pole is going to rotate to vertical
      iv) If Vaulter can accomplish B - (Vaulter to Vert) probability of Clearing Bar goes WAY UP
   d) These 2 tasks are referred to as the double Pendulum

e) How well these two tasks are performed determines the success or failure of the vault.

3) Vaulting Physics – "In Laymen Terms" - How the pole moves to vertical

Three Determining Elements

a) Vaulter speed
b) Vaulters efficiency
c) Poles Resistance

4) 1st Element - Vaulter Speed

a) Running speed is the only source of energy (Kinetic energy)
b) The faster the Vaulter the greater the Kinetic energy
c) In theory, the faster the Vaulter the higher the vault
d) Provided … the 2nd factor

5) 2nd Element - Vaulter Efficiency (Technique)

a) Conservation of energy - How efficient the Vaulter transfers running (kinetic) energy into the poles (gravitational potential) energy
b) The Poles Potential energy – (result of Vaulters efficiency at transferring energy)
c) Things that effect the Vaulters efficiency
   i) Run
   ii) Pole Carry
   iii) Plant
   iv) Take off
   v) Swing

6) 3rd Element – Pole Resistance

2 Components of Pole Resistance

a) Grip Height
   i) Determines Radius of the jump
   ii) Higher grip = Longer Jump Radius = More Resistance = More Energy Needed to Rotate Pole to Vertical
   iii) Taller Vaulter = Shorter Radius
   iv) Shorter Vaulter = Longer Radius

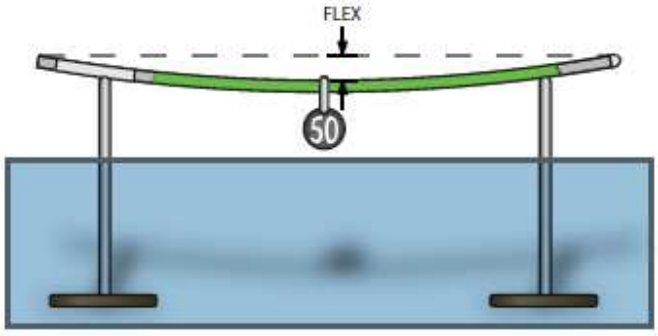
b) Pole Flex #

i) Provides a base-line measurement of poles resistance for a given pole length
ii) More accurate measurement then Weight Rating
iii) Flex Number is the measured value (in centimeters) the pole deflects with a weight applied to it.
iv) Provide an ACCURATE MEASURE OF RESISTANCE

"To a vaulter, flex numbers help describe how flexible -stiff or soft- a pole is going to perform.

To manufacturer's flex numbers are a measure deflection when poles are suspended on two supports of a given span and a weight is hung in between the supports. The amount the pole bends or deflects, measured in centimeters (by most manufacturers), is the flex number.

(The Pole Vault: An Engineers Perspective - Jeffrey P. Watry Senior Engineer Gill Athletics, 2004)



i) Smaller Flex # = Stiffer Pole
ii) Lager Flex # Lighter Pole
iii) Manufactures are proprietary in how they measure flex and as a result are all slightly different.
iv) Gill poles are all measured the same across all pole lines. Carbon poles. FX, Mystic, Skypoles are all consistent from one brand to the next.
v) A 14' 20.0 Gill pole is slightly different than a 14' 20.0 UCS pole or Nordic pole etc
vi) Pole Flex is relative to pole length
   (1) 13' - 21.3 IS NOT EQUEL to 13'6" - 21.3
   (2) Longer poles are measured at longer spans
   (3) Example: 13' pole might have the supports placed 1' from each end so the actual test span (distance between the supports) is 11'

(4)13’6” pole measured span would be 11’6”

(5)Longer pole with the same flex of a shorter pole is stiffer than the shorter pole

(6)Rule of thumb is a 6” longer pole is 10lbs heavier than the same flex # on the shorter pole.

“In layman’s terms, the rule of thumb is that per six inches of grip change, there is a 10lb change in rating. If you use a 14’ 150 lb pole- at 13’6” it would react more like a 161lb rated pole.”

(The Pole Vault: An Engineers Perspective - Jeffrey P. Watry Senior Engineer Gill Athletics, 2004)

b) Test Weight

i) 1.0 in Flex = Approx 5lbs Test Weight

ii) .2 in flex = approx 1 lbs test Weight

2) What determines Grip Height

a) Vaulter Speed + Vaulter Efficiency = Vaulter Force at TO – Pole Resistance determines GRIP

b) Kinetic Energy = Force at Take-Off

c) Force at Take off = Mass, Acceleration (Vaulter Speed) , Vaulter Height + Vaulter Efficiency at Take Off

3) How the flexible pole aids the Vaulter

a) Lessens poles resistance

b) Allows the Vaulter to become more efficient by making it easier to transfer energy

c) Allows Vaulter to move pole to vertical easier

d) Enables the Vaulter to grip higher

e) In some cases the Vaulter gains energy back from the pole

(1)Only if the vaulter rotates upside down and then only if the pole rotates to vertical

4) Common Vault Energy Losses
    a) Running Energy Losers
        i) Poor running mechanics
        ii) Stretching (Especially last step) = Slowing down
        iii) Chopping = slowing down Inconsistent
        iv) Poor running rhythm (not building up speed)
    b) Leaning back at take off
        i) Pole Carry Energy losers
        ii) Low pole carry
        iii) Too much pole movement
        iv) Late pole drop
        v) Early Pole Drop
    c) Plant Energy Losers
        i) Low plant
        ii) Late plant
        iii) Off center plant
        iv) Pulling down
        v) Collapses bottom Arm
        vi) Blocks bottom Arm
    d) Take Off Energy Losers
        i) Leaning Back
        ii) Leaning forward
        iii) Under
        iv) Way Under
        v) Out
        vi) Way Out
    e) Swing Energy Losers
        i) No swing
        ii) Bent swing leg
        iii) Double leg swing
        iv) No knee drive
5) Energy Loss Scoring
    a) Is a result of the actions/in-actions that precede it

b) The only source of energy is the Run
   i) Maybe a little out of the swing if you're real good at it.
   ii) Helps your energy efficiency by helping the vaulter transfer energy.
c) You can't transfer 100% of run energy
   i) You always lose some energy through friction, gravity
d) All other vaulting actions are energy losers
e) The question is how much energy do you create and how much do you lose through the actions of vaulting

6) Grip/Flex Relationship
   a) Poles Rated Flex vs Grip Flex
   b) Lower grip = Stiffer Flex
   c) Lower flex number = stiffer (more resistance)
      i) 14' - 150lbs - 21.2 Flex @ Tested "MAX GRIP" of 13'9
      ii) Same Pole with grip @ 12'9 = 16.8 flex – equivalent to 13' - 170
      iii) 6" lower grip = 10lbs increase in stiffness
      iv) 6" lower grip = 2.2 lower flex

7) The Vaulter/Pole Relationship
   a) The relationship between Vaulter speed, Vaulter efficiency & Pole resistance
   b) Not a static place
   c) Infinite number of adjustments

8) How the pole moves to vertical is a barometer of the jump
   a) Number one thing you watch
   b) Depends on the energy at Take-off
   c) Pole not rotating to vertical = not enough energy at TO
   d)
   e) Too fast or too slow can be equally bad
   f) Vaulters ability to rotate to vertical is a result of the poles rotation to vertical
9) Lack of Control
   a) 100% of vaulting related accidents stem from loss of control
   b) Lack of control is a result of the Vaulter pushing beyond their skill level

c) Lack of control is a result of lack of/or bad mechanics
d) Too much pushing is BAD RISK MANAGEMENT

10) Control Factors
a) Single biggest factor
B) TRYING TO HOLD TO HIGH
c) Not enough pole speed to get to vertical

11) Signs of Grip 'n & Rip 'n
a) Only does a couple "pop-ups" before going back to Long run
b) "Runs through" a lot
c) Every jump is MAX effort
d) Bends the pole A LOT
e) Doesn't get the pole to VERTICAL
f) Standards set to the minimum 15.5"
g) Pole moves (rotates) slowly to vertical
h) Gets "TAPPED"

12) Top Vaulting Myths (Lies)
a) "Gotta Hold HIGH to Jump HIGH"
b) "The more you bend the pole the higher it'll throw you"
c) "Bending the pole is a short cut to success"
d) "You have to force the pole to bend"
e) "Vaulters need to vault BIG every day"
f) The weight label is the "Must Grip Line"

13) Top Truths of Vaulting
a) "It's POLE VAULTING not POLE BENDING"
b) The goal is to move the pole to vertical
c) Safe Vaulting is driven by SOLID MECHANICS
d) Solid Mechanics leads to vaulting EFFECIENCY
e) Efficiency leads to high vaulting
f) Bending the pole is a natural extension of good mechanics
g) You don't have to PUSH to have success

14) Elements of Progressive Vaulting
a) Practices predominantly from 3, 4, 5, 6 "lefts"
b) Starts small and incrementally increases pole, grip & run as the vaulter demonstrates greater mechanical proficiency

15) Vaulting Relativity
    a) Smaller jumps are faster than larger jumps because the radius of the jump is shorter.
    b) The result is that the mechanical elements are of shorter duration in smaller jumps than larger jumps
    c) The mechanics of vaulting stay the same but are relative to the size of the vault in terms of SPEED, FORCE & TIMEING