CWS INDUSTRIES (MFG) CORP.

Bucket Terminology
Hydraulic Excavators
Link to: Bucket Terminology - Wheel Loader

As in other parts of the heavy equipment industry, there are numerous terms used to describe the same thing. We've picked on some of the common terms and their synonyms that are used when describing Hydraulic Excavator Buckets. Wherever possible we have used hot links to pictures and diagrams to graphically define terms instead of using written definitions.

Visit our page Bucket Rating - Hydraulic Excavators for detailed information on calculating the capacity of these buckets.

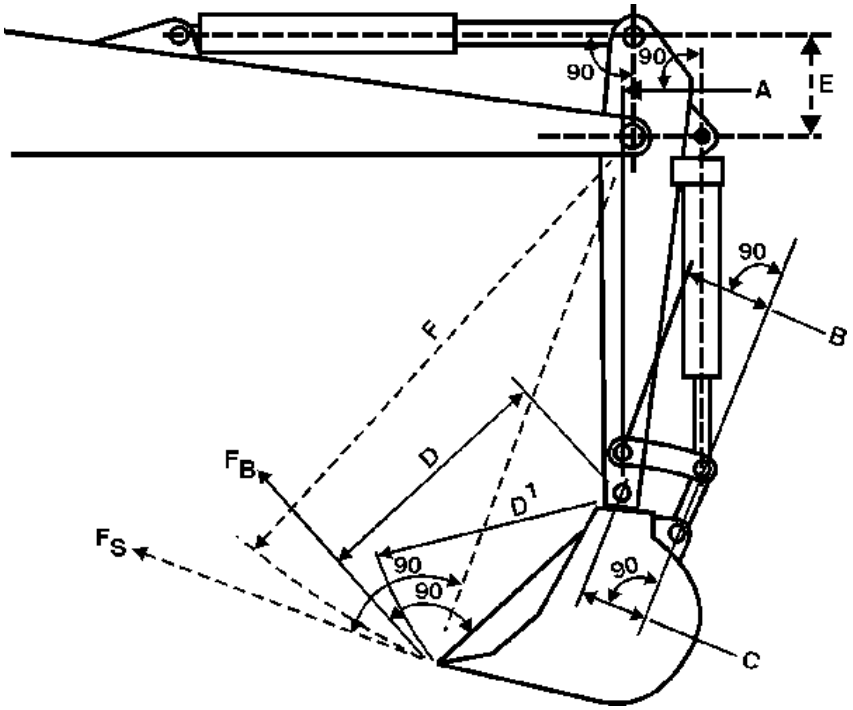
Bucket Types

IMAC	Optional
GP Standard	General Purpose Trenching Standard Duty
GP Heavy Duty	General Purpose Heavy Duty Digging Trenching
Extreme Service	Rock Road Building Pipe Lining
Cleanup	Light Material Ditch Cleaning

CWS	Optional
PowerTwist	PowerTilt Side Tilt Twist A Bucket
Trapezoidal	Trench Bottoming Tapered Side
PowerClam	Clamshell
Clamshell	Dangling Free Hanging
Vee Bottom	Frost Shale
Bucket Clamp	Thumb

Bucket Construction Terminology

Standard No. 3. The values may not be directly com-parable to forces for machines rated by other methods than those described below.



F_B = Radial tooth force due to bucket cylinder

$$= \frac{\text{Bucket cylinder force}}{\text{Arm D length}} \left(\frac{\text{Arm A x Arm C}}{\text{Arm B}} \right)$$

Cylinder force = (Pressure) x (End area of cylinder head)

Arm D = Bucket tip radius

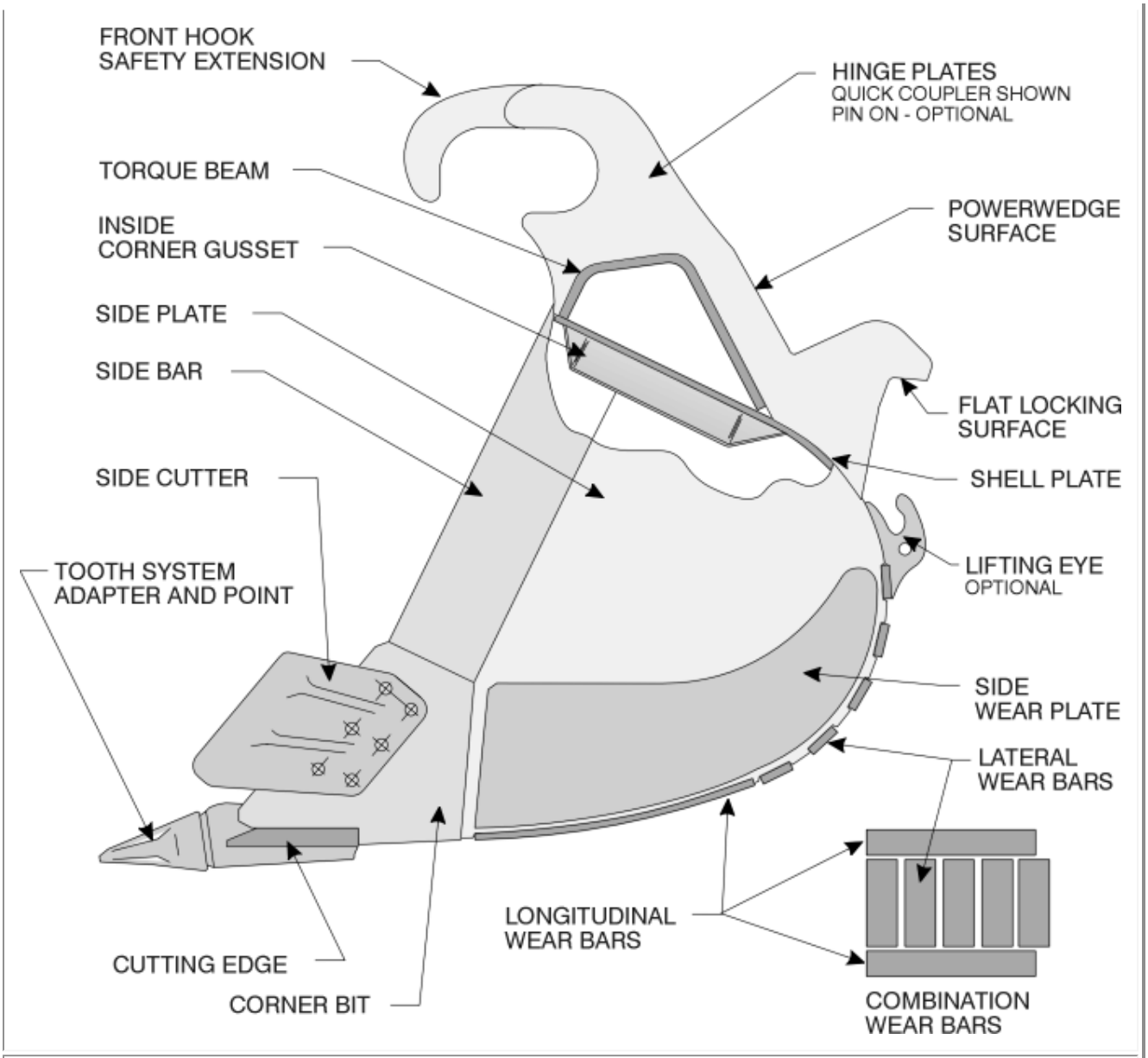
Maximum radial tooth force due to bucket cylinder (bucket curling force) is the digging force generated by the bucket cylinder(s) and tangent to the arc of radius D 1 . The bucket shall be positioned to obtain maximum output moment from the bucket cylinders(s) and connecting linkages. When calculating, maximum F B occurs when the factor — Arm A times Arm C divided by Arm B — becomes the maximum.

F_S = Radial tooth force due to stick cylinder

$$= \frac{\text{(Bucket cylinder force) x (Arm E length)}}{\text{(Arm F length)}}$$

Arm F = Bucket tip radius + stick length

Maximum radial tooth force due to stick cylinder (stick crowd force) is the digging force generated by the stick cylinder(s) and tangent to the arc of radius F. The stick shall be positioned to obtain the maxi-mum



Heaped Capacity

Volume in the bucket under the strike off plane plus the volume of the heaped material above the strike off plane, having an angle of repose of 1:1 with-out any consideration for any material supported or carried by the spillplate or bucket teeth.

The Committee on European Construction Equipment (CECE) rates heaped bucket pay loads on a 2:1angle of repose for material above the strike off plane.

See Bucket Rating - Hydraulic Excavators, for information on calculating bucket capacity.

CURL AND CROWD FORCES

Bucket penetration into a material is achieved by the bucket curling force (F B) and stick crowd force (F S). Rated digging forces are the digging forces that can be exerted at the outermost cutting point. These forces can be calculated by applying working relief hydraulic pressure to the cylinder(s) providing the digging force. The digging forces listed on next page conform with SAE Standard J1179 and PCSA

output moment from the arm cylinder and the bucket positioned as described in the bucket force rating. When calculating, maximum F S occurs when the axis in the stick cylinder working direction is at a right angle to the line connecting the stick cylinder pin and the boom nose pin.

Bucket Selection Considering Bucket Curl and Stick Crowd Forces

The combination of the excavator's stick crowd force and bucket curling force give this machine con-figuration more effective bucket penetration force per mm (inch) of bucket cutting edge than is avail-able with other machine types such as wheel and track loaders.

As a result of high penetration force, an excavator bucket is comparatively easy to load. Also, the higher unit breakout forces allow the excavator's economic application range to be extended farther into the tougher soils (coral, caliche, shale, limestone) before blasting or ripping is required.

To take full advantage of an excavator's high penetration forces, buckets should be selected so they are well matched to soil conditions that are encountered. The two important things to consider are bucket width and bucket tip radius.

As a general rule, wide buckets are used in easily dug soil and narrow buckets in harder material. In hard rocky soils, tip radius also has to be considered in bucket selection. Because the shorter tip radius buckets provide more total bucket curling force than the long tip radius buckets, they are generally the easiest to load. A good rule of thumb when selecting a CWS bucket for hard material is to choose the narrowest bucket that has a short tip radius.

Other factors such as trench bottom width specifications, manbox size, or the desire to conserve bedding material may also influence excavator bucket selection.