

## FRAME SCORES IN BEEF CATTLE

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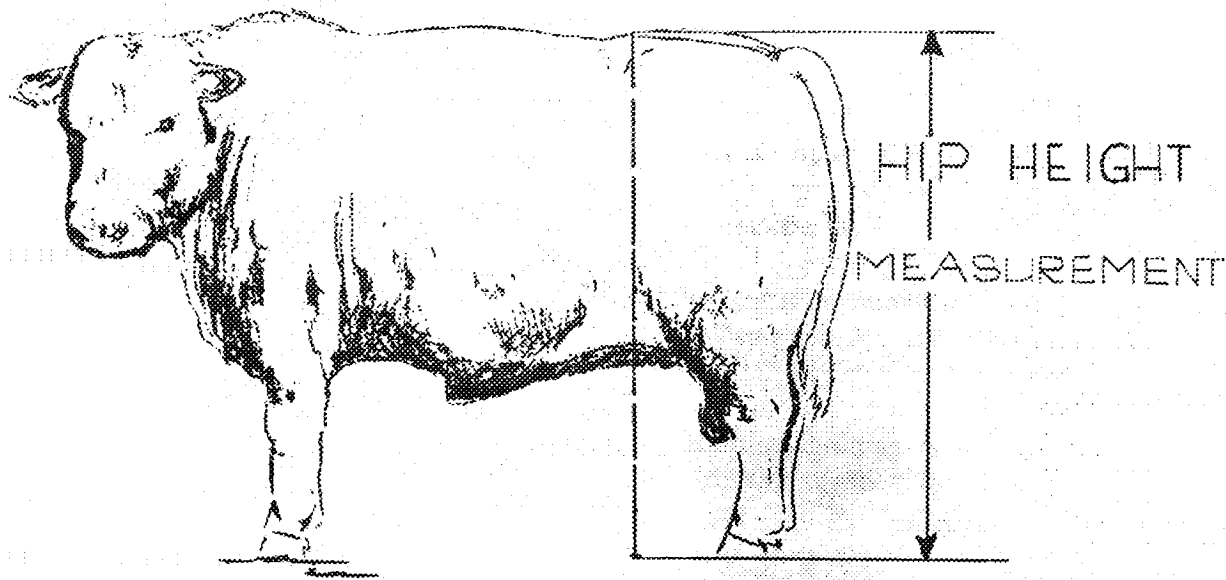
Frame score is a convenient way of numerically describing the skeletal size of cattle and is frequently reported as supplementary information to weight and other growth performance data. Frame scores usually range from 2 to 9 and are calculated from a combination of height at the hip and age of the animal. It is used to estimate the growth pattern and potential mature size of an animal. Frame scores are moderately heritable (.40) and they can be used to make directional changes in skeletal size of beef cattle by selection.

No one frame size for an animal will be best for all feed resources, breeding systems and markets. Considerable variation exists among cattle for frame score or size. Frame score is related to slaughter weights at which cattle should attain a given quality grade or attain a given fat thickness. Smaller numeric frame scores are associated with cattle that are short in stature for their age. They tend to be early maturing, finish for slaughter at lighter weights and mature at lighter weights than higher frame scored animals. Large frame score animals are reflective of cattle that are tall for their age, have a slower rate of maturity and finish and mature at relatively heavy body weights.

Most animals should maintain their same frame score throughout their life. This allows one frame score value to be used regardless of when the animal was evaluated. However, the frame score will change for animals that mature earlier or later compared with average animals. Environmental factors can also alter an animal's genetic capability for growth pattern or performance. Nutritional level is a major factor. Cattle that are denied adequate nutrition will be below average for skeletal growth while animals fed extremely high levels may accelerate their growth pattern.

The Beef Improvement Federation (BIF) recommends that height measurement for frame score be taken at a point directly over the hooks as illustrated in **figure 1**. Hip height measurements can be taken with specifically marketed hip height measurement sticks or modifying the inside of the working chute or scales with a grid marked in height increments and sighting across the animal's hip. For accurate measurements it is best to have the animal's legs set squarely and head in a normal position.

BIF recommended procedures are available to adjust actual height measurements to standard performance testing 205-day weaning and 365-day yearling end points. Hip heights adjusted to a 205-day basis must be collected between 160 and 250 days of age which is similar to the requirements for collecting weaning weights. In order to adjust hip heights to a 365-day basis, cattle must be at least 330 days of age at the time the measurement is taken. Age of calf and sex of calf adjustments for hip height are shown in Table 1. These may not be the same for all breeds since different breed associations have their own adjustment factors for their own breed. The following example illustrates the adjustment of a 220 day old bull calf that actually measured 43.5 inches to a 205-day basis of 43.01 inches.  $\{43.5 + [(205 - 220) * .033]\} = 43.01$




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**TABLE 1.** 205-day and 365-day height adjustment factors and formulas

**205-day height**

Adjusted height = {actual height + [(205 - actual age) X age of calf adjustment]}

Age of calf adjustments for Weaning Height

<u>Bulls</u>	<u>Heifers</u>
0.033	0.025

**365-day height**

Adjusted height = {actual height + [(365 - actual age) X age of calf adjustment]}

Age of calf adjustments for Yearling Height

	<u>Bulls</u>	<u>Heifers</u>
under 365 days	0.033	0.025
over 365 days	0.025	0.025

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Frame score can be determined from the actual hip height measurement if the age of the animal is known. Beef Improvement Federation Frame Score Charts and formulas shown in Table 2 allow a person to approximate frame score for an animal with a given hip height measurement and known age. Separate charts and formulas exist for bulls and heifers due to differing rates of skeletal growth between sexes.

### Bull Hip Height (inches) Frame Score for Ages 5 to 21 Months

Age in Months	Frame Score								
	1	2	3	4	5	6	7	8	9
5	33.5	35.5	37.5	39.5	41.6	43.6	45.6	47.7	49.7
6	34.8	36.8	38.8	40.8	42.9	44.9	46.9	48.9	51.0
7	36.0	38.0	40.0	42.1	44.1	46.1	48.1	50.1	52.2
8	37.2	39.2	41.2	43.2	45.2	47.2	49.3	51.3	53.3
9	38.2	40.2	42.3	44.3	46.3	48.3	50.3	52.3	54.3
10	39.2	41.2	43.3	45.3	47.3	49.3	51.3	53.3	55.3
11	40.2	42.2	44.2	46.2	48.2	50.2	52.2	54.2	56.2
12	41.0	43.0	45.0	47.0	49.0	51.0	53.0	55.0	57.0
13	41.8	43.8	45.8	47.8	49.8	51.8	53.8	55.8	57.7
14	42.5	44.5	46.5	48.5	50.4	52.4	54.4	56.4	58.4
15	43.1	45.1	47.1	49.1	51.1	53.0	55.0	57.0	59.0
16	43.6	45.6	47.6	49.6	51.6	53.6	55.6	57.5	59.5
17	44.1	46.1	48.1	50.1	52.0	54.0	56.0	58.0	60.0
18	44.5	46.5	48.5	50.5	52.4	54.4	56.4	58.4	60.3
19	44.9	46.8	48.8	50.8	52.7	54.7	56.7	58.7	60.6
20	45.1	47.1	49.1	51.0	53.0	55.0	56.9	58.9	60.9
21	45.3	47.3	49.2	51.2	53.2	55.1	57.1	59.1	61.0

The following equation should only be used for bulls between the ages of 5 and 21 months:  
 Frame Score = -11.548 + 0.4878 (Ht.) - 0.0289 (Days of Age) + 0.00001947 (Days of Age)<sup>2</sup> + 0.0000334 (Ht.) (Days of Age).

### Mature Bull Hip Height (inches) Frame Score

Age in Months	Frame Score										
	1	2	3	4	5	6	7	8	9	10	11
24	46.4	48.3	50.3	52.3	53.9	56.0	58.0	60.0	62.0	64.0	66.0
30	47.3	49.3	51.3	53.2	54.9	57.0	59.0	61.0	63.0	65.0	67.0
36	48.0	50.0	51.9	53.8	55.5	57.5	59.5	61.5	63.5	65.5	67.4
48	48.5	50.4	52.3	54.1	55.9	58.0	60.0	62.0	63.9	65.8	67.7

### Heifer Hip Height (inches) Frame Score for Ages 5 to 21 Months

Age in Months	Frame Score								
	1	2	3	4	5	6	7	8	9
5	33.1	35.1	37.2	39.3	41.3	43.4	45.5	47.5	49.6
6	34.1	36.2	38.2	40.3	42.3	44.4	46.5	48.5	50.6
7	35.1	37.1	39.2	41.2	43.3	45.3	47.4	49.4	51.5
8	36.0	38.0	40.1	42.1	44.1	46.2	48.2	50.2	52.3
9	36.8	38.9	40.9	42.9	44.9	47.0	49.0	51.0	53.0
10	37.6	39.6	41.6	43.7	45.7	47.7	49.7	51.7	53.8
11	38.3	40.3	42.3	44.3	46.4	48.4	50.4	52.4	54.4
12	39.0	41.0	43.0	45.0	47.0	49.0	51.0	53.0	55.0
13	39.6	41.6	43.6	45.5	47.5	49.5	51.5	53.5	55.5
14	40.1	42.1	44.1	46.1	48.0	50.0	52.0	54.0	56.0
15	40.6	42.6	44.5	46.5	48.5	50.5	52.4	54.4	56.4
16	41.0	43.0	44.9	46.9	48.9	50.8	52.8	54.8	56.7
17	41.4	43.3	45.3	47.2	49.2	51.1	53.1	55.1	57.0
18	41.7	43.6	45.6	47.5	49.5	51.4	53.4	55.3	57.3
19	41.9	43.9	45.8	47.7	49.7	51.6	53.6	55.5	57.4
20	42.1	44.1	46.0	47.9	49.8	51.8	53.7	55.6	57.6
21	42.3	44.2	46.1	48.0	50.0	51.9	53.8	55.7	57.7

The following equation should only be used for heifers between the ages of 5 and 21 months:  
 Frame Score = -11.7086 + 0.4723 (Ht.) - 0.0239 (Days of Age) + 0.0000146 (Days of Age)<sup>2</sup> + 0.0000759 (Ht.) (Days of Age).

### Mature Cow Hip Height (inches) Frame Score

Age in Months	Frame Score										
	1	2	3	4	5	6	7	8	9	10	11
24	43.1	45.0	46.9	48.8	50.7	52.5	54.5	56.4	58.2	60.1	62.0
30	43.8	45.8	47.5	49.4	51.3	53.1	55.1	57.0	58.9	60.8	62.5
36	44.2	46.1	48.0	49.8	51.8	53.6	55.5	57.2	59.2	61.0	62.8
48	44.6	46.5	48.2	50.0	52.0	53.9	55.8	57.5	59.4	61.2	63.0