

Drives Engineering Class Chain

Engineering information



■ A complete line of superior quality engineered conveyor chains are available to meet your exact needs. Drives delivers leading edge solutions with over 100 years of advanced engineering knowledge and experience.

Drives Engineering Information

Selection Guide

The following procedure is useful for economical and quick chain selection.

- Step 1: Confirm the operating conditions of the conveyor
- Step 2: Tentatively select the chain size
- Step 3: Calculate the design chain tension (actual chain tension)
- Step 4: Calculate design pull
- Step 5: Calculate chain tensions
- Step 6: Verify the chain selection

Step 1: Confirm the operating conditions of the conveyor

The following information is needed to design a chain conveyor.

1. Type of conveyor (slat conveyor, bucket elevator, etc.)
2. Method of chain travel (horizontal, inclined, or vertical conveyor)
3. Type, weight, and size of materials to be conveyed
4. Weight of materials to be transported per foot of conveyor length
5. Conveyor speed
6. Conveyor length
7. Lubrication
8. Considerations for special environments

Step 2: Tentatively select the chain size

To tentatively select the chain size, estimate the chain tension (P) by the formulas on the following page. A chain with an allowable load equal to or over the below calculated chain tension may be tentatively selected.

$$P = (M) (C) (f)$$

Where:

P = Chain Pull (Lbs.)

M = Weight of Material Being Conveyed on Conveyor (Lbs./Ft.)

C = Center Distance Between Sprockets (Ft.)

f = Coefficient of Friction (See Table I or II)

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Step 3: Calculate chain tension

Next, the chain tension should be calculated using the actual weight of the conveyor chain and material conveyed.

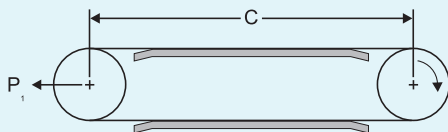
CONVEYOR CHAIN PULL FORMULAS

Horizontal

$$P = C (2.1Mf_m + Wf_w) + J^* + P_1$$

* Where applicable (See next page)

HORIZONTAL - RETURN SIDE SUPPORTED



Inclined

Where the angle of incline is known:

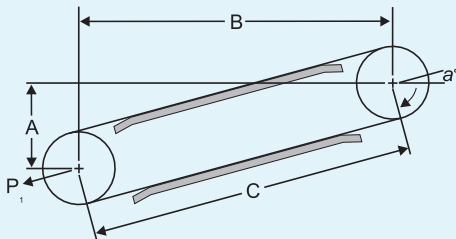
$$P = (Mf_m \cos a + Wf_w \cos a + M \sin a + W \sin a) C + (Mf_m \cos a - M \sin a) 1.1C + J^* + P_1$$

When distances A and B are known:

$$\cos a = \frac{B}{C} \quad \sin a = \frac{A}{C}$$

* Where applicable (See next page)

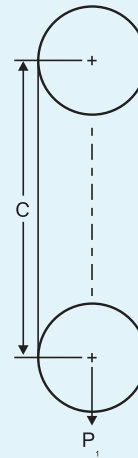
Note: When $(Mf_m \cos a - M \sin a)$ is less than zero, set this quantity to zero.



Vertical

Material Carried:

$$P = (M + W) C + P_1 / 2$$



GLOSSARY

P = Total conveyor pull (lbs.)

P_1 = Take-up force (lbs.)

M = Weight of chains, attachments, slats, etc. and other moving elements of the conveyor per ft. (lbs./ft.)

W = Weight of material per ft. on the conveyor (lbs./ft.) (See Table VI)

f_m = Coefficient of friction of chain sliding or rolling Table II (f_s) or Table I (f_r)

f_w = Coefficient of material sliding in trough Table III (f_w) (Note: When material is carried on chain $f_w = f_m$)

C = Center distance (ft.)

J = Pull (lbs.) caused by sideboard sliding friction (See next page)

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Step 3: Continued

Additional Pull on Conveyor (J) Material Sliding Against Sideboards

$$J = Ch^2/R$$

Where:

h = Height of material in inches

R = Variable factor for different materials (see Table III)

C = Length of conveyor in feet

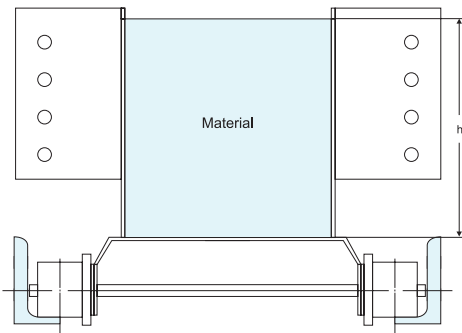


Table I - Coefficient of Chain Rolling Friction (f_r)

| Type of Roller | Dry | Lubricated |
|------------------|------|------------|
| Oversized Roller | 0.12 | 0.08 |
| Standard Roller | 0.21 | 0.14 |

Table II - Coefficient of Chain Sliding Friction (f_s)

| Material | Coefficient | |
|---|-------------|------------|
| | Dry | Lubricated |
| Steel on steel | 0.33 | 0.20 |
| Cast iron or cast steel on same surface | 0.50 | 0.40 |
| Steel on bronze | -- | 0.15 |
| Steel on hardwood | 0.35 | 0.25 |
| Cast iron or cast steel on hardwood | 0.44 | -- |
| Steel on UHMW | 0.25 | 0.15 |

Table III - Material Characteristics

| Material Description | Coeff. of Friction on Steel f_w | Trough Side Factor R |
|----------------------------------|-----------------------------------|----------------------|
| Alum, Lumps | .45 | 25 |
| Alumina | .55 | N/A |
| Aluminum, Dry | .40 | 27 |
| Ammonium Chloride, Crystalline | .79 | N/A |
| Asbestos, Shredded | .58 | N/A |
| Ashes, Coal, Dry - 1/2" | .55 | 35.7 |
| Ashes, Coal, Dry - 3" | .65 | 50 |
| Ashes, Coal, Wet - 1/2" | .55 | 31.3 |
| Ashes, Coal, Wet - 3" | .65 | 38.5 |
| Asphalt, Crushed | .41 | N/A |
| Bagasse | .45 | 167 |
| Barley | .71 | N/A |
| Beans, Castor, Whole, Shelled | .40 | 17.2 |
| Beans, Navy, Dry | .40 | 17.2 |
| Cement, Aerated Portland | .70 | 11.1 |
| Cement, Clinker | .75 | 11.6 |
| Cement, Mortar | .54 | N/A |
| Cement, Portland | .70 | 11.1 |
| Charcoal | .41 | N/A |
| Coal, Anthracite, Culm and River | .55 | 13.3 |
| Coal, Anthracite, Sized - 1/2" | .45 | 15.6 |
| Coal, Bituminous, Mined | .65 | 19.6 |
| Coal, Bituminous, Mined, Sized | .55 | 20 |
| Coal, Bituminous, Mined, Slack | .55 | 27 |
| Coke, Breeze | .70 | 35.3 |
| Coke, Loose | .60 | 38.5 |
| Coke, Petrol, Calcimined | .60 | 38.5 |
| Corn | .40 | 23 |
| Cottonseed, Dry, Not Delinted | .40 | 83.3 |
| Dolomite, Crushed | .54 | N/A |
| Dolomite, Lumpy | .54 | N/A |
| Feldspar | .55 | N/A |
| Flyash | N/A | 14 |
| Gypsum | .64 | N/A |
| Ice, Crushed | .20 | 31.3 |
| Iron Ore, Concentrate | .47 | N/A |
| Lead Ore | .77 | N/A |
| Lime, Ground, Unslaked | .45 | 26.3 |
| Lime, Hydrated | .63 | N/A |
| Lime, Pebble | .55 | 14.7 |
| Limestone, Agricultural | .65 | 7.5 |
| Limestone, Crushed | .70 | 9.1 |
| Limestone, Dust | .55 | 11.1 |
| Phosphate Rock | .42 | N/A |
| Pyrite, Pellets | .58 | N/A |
| Quartz - 100 Mesh | .55 | N/A |
| Rice | .40 | N/A |
| Rubber, Reclaimed, Ground | .53 | N/A |
| Rye | .35 | N/A |
| Salt, Dry, Coarse | .57 | N/A |
| Salt, Dry Bank, Damp | .90 | 5.9 |
| Salt, Dry Bank, Dry | .65 | 7.1 |
| Sand, Foundry, Shake Out | .75 | 13.9 |
| Sand, Silica | N/A | 5.5 |
| Sawdust, Dry | .45 | 167 |
| Slag, Blast Furnace | .48 | N/A |
| Soda Ash, Light | .45 | N/A |
| Soybean, Whole | .41 | N/A |
| Starch | .57 | N/A |
| Urea Prills, Coated | .63 | N/A |
| Wheat | .43 | N/A |
| Wood Chips, Screened | .45 | 48 |

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Step 4: Calculate Design Pull (DP)

$$DP = P \times V \times E \quad (\text{See Tables IV \& V})$$

Using Table V under conveyor speed, read down to the number nearest 1.00 (this will be in the vicinity of the heavy dividing line). Read across to the left to obtain the optimum sprocket size. If space limitations require using smaller sprockets, read across from the right from the number of teeth to the column under conveyor speed - obtain the Speed Correction Factor (E).

Service Factors (V)

Table IV

| V_s | V_L | V_o | V_T |
|--------------------|-------------------------------|---|------------------------|
| Frequency of Shock | Character of Conveyor Loading | Conditions of Operation | Daily Operating Period |
| Infrequent (1) | Uniform or Steady (1) | Relatively clean and moderate room temperature (1) | 8-10 Hours (1) |
| | Moderate Shock (1.2) | Moderately dusty (1.2) | |
| Frequent (1.2) | Heavy Shock (1.5) | Unprotected from weather, dirty corrosive conditions or unusual temperatures within permissible operating range (1.4) | 24 Hours (1.2) |

Note: Service Factor $V = V_s \times V_L \times V_o \times V_T$

Speed Correction Factors (E)

Table V

| No. of Teeth | Conveyor Speed / Feet Per Minute | | | | | | | | | | | | | | |
|--------------|----------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|--------|--------|-------|-------|
| | 10 | 25 | 50 | 75 | 100 | 125 | 150 | 175 | 200 | 225 | 250 | 275 | 300 | 400 | 500 |
| 6 | 0.917 | 1.090 | 1.370 | 1.660 | 2.000 | 2.400 | 2.910 | 3.570 | 4.410 | 5.650 | 7.650 | 10.600 | 16.700 | -- | -- |
| 7 | 0.855 | 0.971 | 1.130 | 1.270 | 1.440 | 1.610 | 1.310 | 2.040 | 2.290 | 2.600 | 2.960 | 3.420 | 3.950 | 8.620 | -- |
| 8 | 0.813 | 0.909 | 1.040 | 1.160 | 1.260 | 1.370 | 1.490 | 1.630 | 1.760 | 1.930 | 2.100 | 2.290 | 2.480 | 3.620 | 6.210 |
| 9 | 0.794 | 0.870 | 0.980 | 1.070 | 1.170 | 1.260 | 1.360 | 1.450 | 1.550 | 1.650 | 1.760 | 1.880 | 2.000 | 2.560 | 2.940 |
| 10 | 0.775 | 0.840 | 0.943 | 1.020 | 1.090 | 1.160 | 1.240 | 1.310 | 1.370 | 1.450 | 1.530 | 1.610 | 1.680 | 2.030 | 2.410 |
| 11 | 0.758 | 0.820 | 0.901 | 0.971 | 1.030 | 1.090 | 1.150 | 1.220 | 1.280 | 1.640 | 1.400 | 1.460 | 1.520 | 1.780 | 2.050 |
| 12 | 0.741 | 0.787 | 0.862 | 0.926 | 0.990 | 1.050 | 1.100 | 1.160 | 1.121 | 1.260 | 1.320 | 1.370 | 1.420 | 1.630 | 1.840 |
| 14 | 0.735 | 0.769 | 0.833 | 0.885 | 0.935 | 0.980 | 1.020 | 1.070 | 1.110 | 1.150 | 1.190 | 1.240 | 1.280 | 1.470 | 1.610 |
| 16 | 0.725 | 0.763 | 0.813 | 0.855 | 0.893 | 0.935 | 0.971 | 1.010 | 1.050 | 1.080 | 1.120 | 1.160 | 1.190 | 1.340 | 1.480 |
| 18 | 0.719 | 0.752 | 0.800 | 0.833 | 0.877 | 0.909 | 0.943 | 0.980 | 1.010 | 1.040 | 1.080 | 1.110 | 1.140 | 1.270 | 1.400 |
| 20 | 0.719 | 0.746 | 0.787 | 0.826 | 0.855 | 0.893 | 0.917 | 0.952 | 0.980 | 1.010 | 1.040 | 1.070 | 1.100 | 1.220 | 1.340 |
| 24 | 0.714 | 0.735 | 0.769 | 0.800 | 0.820 | 0.847 | 0.877 | 0.901 | 0.935 | 0.962 | 0.980 | 1.010 | 1.040 | 1.150 | 1.260 |

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Selection Guide

Step 5: Calculate Chain Tensions (T)

Single strand conveyor $T = DP$

Double strand conveyor $T = (DP) (1.2) / 2$

Triple strand conveyor $T = (DP) (1.2) / 3$

More than three strands Consult Drives Engineering

Note: The 1.2 multiplier is used to provide for possible overload in one strand due to unequal load distribution.

Step 6: Verify the Chain Selection

Compare the chain tension of Step 5 to the maximum recommended working load for the chain. The chain tension should be less than the working load. If the chain tension is much smaller than the working load, try the next smaller chain size. If the chain tension is greater than the working load, try the next larger chain size. Repeat Steps 3-5 for the new chain size.

Helpful Engineering Formulas

Material Weight per Ft. on Conveyor (M) for Bulk Materials (Lb./Ft.)

$$M = \frac{(33.3) (Q)}{S}$$

$$M = \frac{(CFM) (d)}{S}$$

Where:

Q = Capacity (Tons/Hr.)

S = Chain Speed (Ft./Min.)

CFM = Capacity or conveyed material flow rate (Ft.³/Min.)

d = Material density (Lbs./Ft.³)

Chain Speed (S)

$$S = \frac{(P) (N) (RPM)}{12}$$

Where:

S = Speed (Ft./Min.)

P = Chain pitch (In.)

N = Number of teeth in sprocket

RPM = Rotational speed of sprocket

Horsepower (HP)

$$HP = \frac{(t) (rpm) (1.1)}{63,025}$$

$$HP = \frac{(T) (rpm) (1.1)}{5,252}$$

$$HP = \frac{(P) (S) (1.1)}{33,000}$$

Where:

t = Torque transmitted by headshaft (In. Lb.)

T = Torque transmitted by headshaft (Ft. - Lb.)

rpm = Speed of headshaft

P = Total conveyor pull (Lbs.)

S = Chain Speed (Ft./Min.)

Note: 1.1 compensates for motor efficiency.

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CEMA Material Code*

| Drives | Material Characteristics | Code |
|--|---|---------------------|
| Density | Bulk, Density, Loose | Actual Lbs./Cu. Ft. |
| | Very fine - 100 mesh and under | A |
| Size | Fine - 1/8 inch and under | B |
| | Granular - under 1/2 inch | C |
| | Lumpy - containing lumps over 1/2 inch | D |
| | Irregular - stringy, interlocking, mats together | E |
| | Very free flowing - angle of repose less than 20 degrees | 1 |
| Flowability Angle of Repose | Free flowing - angle of repose 20 degrees to 30 degrees | 2 |
| | Average lowing - angle of repose 30 degrees to 45 degrees | 3 |
| | Sluggish - angle of repose 45 degrees and over | 4 |
| | Non-abrasive | 5 |
| Abrasiveness | Abrasive | 6 |
| | Very Abrasive | 7 |
| | Very dusty | L |
| Miscellaneous Characteristics (Sometimes more than one of these characteristics may apply) | Aerates and develops fluid characteristics | M |
| | Contains explosive dust | N |
| | Contaminable, affecting use of saleability | P |
| | Degradeable, affecting use or saleability | Q |
| | Gives off harmful fumes or dust | R |
| | Highly corrosive | S |
| | Mildly corrosive | T |
| | Hygroscopic | U |
| | Interlocks or mats | V |
| | Oils or chemical present - may affect rubber products | W |
| | Packs under pressure | X |
| | Very light and fluffy - may be wind swept | Y |
| | Elevated temperature | Z |

Example: A powdery (200 mesh), light material with a density of 11 Lbs./Cu.Ft. which is free flowing, abrasive, hygroscopic (attracts moisture), explosive, and packs under pressure would have the following material code **11A26NUX**.

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Table VI - Material Characteristics

| Drives | Loose Bulk Density | Material Code |
|--------------------------------------|--------------------|---------------|
| Material Description | Lb./Cu. Ft. | |
| Adipic Acid | 45 | 45A35N |
| Alfalfa, Meal | 14-22 | 18B45WY |
| Alfalfa, Pellets | 41-43 | 42C25 |
| Almonds, Broken | 27-30 | 29C35Q |
| Almonds, Whole, Shelled | 28-30 | 29C35Q |
| Alum, Fines | 45-50 | 48B35U |
| Alum, Lumps | 50-60 | 55B25 |
| Alumina | 55-65 | 58B27MY |
| Alumina, Fines | 35 | 35A27MY |
| Alumina, Sized or Briquette | 65 | 65D37 |
| Aluminate Gel (Aluminate Hydroxide) | 45 | 45B35 |
| Aluminum Chips, Dry | 7-15 | 11E45VN |
| Aluminum Chips, Oily | 7-15 | 11E45Y |
| Aluminum Hydrate | 13-20 | 17C35N |
| Aluminum Oxide | 60-120 | 90A17MN |
| Aluminum Silicate (Andalusite) | 49 | 49C35S |
| Aluminum Sulfate | 45-58 | 52C25 |
| Aluminum, Ore (See Bauxite) | | |
| Ammonium Chloride, Crystalline | 45-52 | 49A45RS |
| Ammonium Nitrate | 45-62 | 54A35NTU |
| Ammonium Sulfate | 45-58 | 52C35TU |
| Antimony, Powder | | A35 |
| Apple Pomace, Dry | 15 | 15C45Y |
| Arsenate of Lead (See Lead Arsenate) | | |
| Arsenic Oxide Arsenolite | 100-120 | 110A35R |
| Arsenic, Pulverized | 30 | 30A25R |
| Asbestos Rock, Ore | 81 | 81D37R |
| Asbestos, Shredded | 20-40 | 30E46XY |
| Ash, Black, Ground | 105 | 105B35 |
| Ashes, Coal, Dry - 1/2" | 35-45 | 40C46TY |
| Ashes, Coal, Dry - 3" | 35-40 | 38D46T |
| Ashes, Coal, Wet - 1/2" | 45-50 | 48C46T |
| Ashes, Coal, Wet - 3" | 45-50 | 48D46T |
| Ashes, Fly (See Flyash) | | |
| Asphalt, Crushed - 1/2" | 45-125 | 45C45 |
| Bagasse | 7-10 | 9E45RVXY |
| Bakelite, Fines | 30-45 | 38B25 |
| Baking, Powder | 40-55 | 48A35 |
| Baking, Soda | 40-55 | 48A25 |
| Barite Barium Sulfate, 1/2" to 3" | 120-180 | 150D36 |
| Barite, Powder | 120-180 | 150A35X |

| Drives | Loose Bulk Density | Material Code |
|---------------------------------------|--------------------|---------------|
| Material Description | Lb./Cu. Ft. | |
| Bark, Wood, Refuse | 10-20 | 15E45TVY |
| Barley, Fine Ground | 24-38 | 31B35 |
| Barley, Malted | 31 | 31C35 |
| Barley, Meal | 28 | 28C35 |
| Barley, Whole | 36-48 | 42B25N |
| Basalt | 80-105 | 93B27 |
| Bauxite, Crushed - 3" | 75-85 | 80D36 |
| Bauxite, Dry, Ground | 68 | 68B25 |
| Beans, Castor, Meal | 35-40 | 38B35W |
| Beans, Castor, Whole, Shelled | 36 | 36C15W |
| Beans, Navy, Dry | 48 | 48C15 |
| Beans, Navy, Steeped | 60 | 60C25 |
| Bentonite - 100 Mesh | 50-60 | 55A25MX |
| Bentonite, Crude | 34-40 | 37D45X |
| Benzene Hexachloride | 56 | 56A45R |
| Bicarbonate of Soda (See Baking Soda) | | |
| Blood, Dried | 35-45 | 40D45U |
| Blood, Dried, Ground | 30 | 30A35U |
| Bone, Ash (See Tricalcium Phosphate) | 40-50 | 45A45 |
| Boneblack | 20-25 | 23A25Y |
| Bonechar | 27-40 | 34B35 |
| Bonemeal | 50-60 | 55B35 |
| Bones, Crushed | 35-50 | 43D45 |
| Bones, Ground | 50 | 50B35 |
| Bones, Whole | 35-50 | 43E45V |
| Borate of Lime | 60 | 60A35 |
| Borax Lumps, 1 1/2" to 2" | 55-60 | 58D35 |
| Borax Lumps, 2" to 3" | 60-70 | 65D35 |
| Borax, Fines | 45-55 | 50B25T |
| Borax, Screenings, -1/2" | 55-60 | 58C35 |
| Boric Acid, Fine | 55 | 55B25T |
| Braunite (See Manganese Oxide) | | |
| Bread, Crumbs | 20-25 | 23B35PQ |
| Brewer's Grain, Spent, Dry | 14-30 | 22C45 |
| Brewer's Grain, Spent, Wet | 55-60 | 58C45T |
| Brick, Ground, -1/8" | 100-120 | 110B37 |
| Bronze, Chips | 30-50 | 40B45 |
| Buckwheat | 37-42 | 40B25N |
| Calcine, Flour | 75-85 | 80A35 |
| Calcium Carbide | 70-90 | 80D25N |
| Calcium Carbonate (See Limestone) | | |

| Drives | Loose Bulk Density | Material Code |
|--|--------------------|---------------|
| Material Description | Lb./Cu. Ft. | |
| Calcium Fluoride (See Fluorspar) | | |
| Calcium Hydrate (See Lime, Hydrated) | | |
| Calcium Hydroxide (See Lime, Hydrated) | | |
| Calcium Lactate | 26-29 | 28D45QTR |
| Calcium Oxide (See Lime, Unslaked) | | |
| Calcium Phosphate | 40-50 | 45A45 |
| Calcium Sulfate (See Gypsum) | | |
| Carbon, Activated, Dry, Fine | 8-20 | 14B25Y |
| Carbon, Black, Pelleted | 20-25 | 23B15Q |
| Carbon, Black, Powder | 4-7 | 6A35Y |
| Carborundum | 100 | 100D27 |
| Casein | 36 | 36B35 |
| Cashew, Nuts | 32-37 | 35C45 |
| Cast Iron, Chips | 130-200 | 165C45 |
| Caustic Soda | 88 | 88B35RSU |
| Caustic Soda, Flakes | 47 | 47C45RSUX |
| Celite (See Diatomaceous Earth) | | |
| Cement, Aerated Portland | 60-75 | 68A16M |
| Cement, Clinker | 75-95 | 85D36 |
| Cement, Mortar | 133 | 133B35Q |
| Cement, Portland | 94 | 94A26M |
| Cerrusite (See Lead Carbonate) | | |
| Chalk, Crushed | 75-95 | 85D25 |
| Chalk, Pulverized | 67-75 | 71A25MX |
| Charcoal, Ground | 18-28 | 23A45N |
| Charcoal, Lumps | 18-28 | 23D45QN |
| Chocolate, Cake, Pressed | 40-45 | 43D25 |
| Chrome, Ore | 125-140 | 133D36 |
| Cinders, Blast Furnace | 57 | 57D36T |
| Cinders, Coal | 40 | 40D36T |
| Clay (See Bentonite, Diatomaceous Earth, Fuller's Earth, Kaolin, & Marl) | | |
| Clay, Brick, Dry, Fines | 100-120 | 110C36 |
| Clay, Calcined | 80-100 | 90B36 |
| Clay, Ceramic, Dry, Fines | 60-80 | 70A35P |
| Clay, Dry, Lumpy | 60-75 | 68D35 |
| Clinker, Cement (See Cement, Clinker) | | |
| Clover, Seeds | 45-48 | 47B25N |

See page 38 for material code explanation.

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Table VI - Material Characteristics

| Drives | Loose Bulk Density | Material Code |
|----------------------------------|--------------------|---------------|
| Material Description | Lb./Cu. Ft. | |
| Coal, Anthracite, Culm and River | 55-61 | 60B35TY |
| Coal, Anthracite, Sized - 1/2" | 49-61 | 55C25 |
| Coal, Bituminous, Mined | 40-60 | 50D35LNXY |
| Coal, Bituminous, Mined, Sized | 45-55 | 48D35QVN |
| Coal, Bituminous, Mined, Slack | 43-50 | 47C45TN |
| Coal, Lignite | 37-45 | 41D35TN |
| Cocoa, Beans | 30-45 | 38C25Q |
| Cocoa, Nibs | 35 | 35C25 |
| Cocoa, Powdered | 30-35 | 33A45XY |
| Coconut, Shredded | 20-22 | 21E45 |
| Coffee, Beans, Green | 25-32 | 29C25PQ |
| Coffee, Beans, Roasted | 20-30 | 25C25PQ |
| Coffee, Chaff | 20 | 20B25MY |
| Coffee, Ground, Dry | 25 | 25A35P |
| Coffee, Ground, Wet | 35-45 | 40A45X |
| Coffee, Soluble | 19 | 19A35PUY |
| Coke, Breeze | 25-35 | 30C37N |
| Coke, Loose | 25-35 | 30D37N |
| Coke, Petrol, Calcimined | 35-45 | 40D37N |
| Compost | 30-50 | 40D45TV |
| Concrete, Pre-Mix, Dry | 85-120 | 103C36U |
| Copper Sulphate Bluestone | 75-95 | 85C35S |
| Copper, Ore | 120-150 | 135D36 |
| Copper, Ore, Crushed | 100-150 | 125D36 |
| Copra, Cake, Ground | 40-45 | 43B45W |
| Copra, Cake, Lumpy | 25-30 | 28D35W |
| Copra, Lumpy | 22 | 22E35W |
| Copra, Meal | 40-45 | 42B35W |
| Cork, Granulated | 12-15 | 14C35YN |
| Cork, Ground, Fines | 5-15 | 10B35NY |
| Corn Cobs, Ground | 17 | 17C25YN |
| Corn Cobs, Whole | 12-15 | 14E35N |
| Corn Ear | 56 | 56D5N |
| Corn Fiber Feed, Dry, Cooled | 15-35 | 25B35 |
| Corn Fiber Feed, Dry, Ground | 15-35 | 25B35 |
| Corn Fiber Feed, Dry, Not Cooled | 15-35 | 25B35 |
| Corn Fiber Feed, Pellets, Dry | 30-40 | 35C35 |
| Corn Fiber Feed, Wet | 15-40 | 28B35 |
| Corn Fiber, Dewatered | 10-25 | 18B35 |
| Corn Fiber, Wet | 15-50 | 33B35PUN |
| Corn Filter Aid | 15-50 | 33B37 |

| Drives | Loose Bulk Density | Material Code |
|--------------------------------------|--------------------|---------------|
| Material Description | Lb./Cu. Ft. | |
| Corn Germ | 21 | 21B35PYN |
| Corn Germ, Dewatered | 30-35 | 33B35PUN |
| Corn Germ, Dry | 30-40 | 35B35 |
| Corn Germ, Expanded Cake | 30-40 | 35B35 |
| Corn Germ, Oil Meal | 30-35 | 33B35 |
| Corn Oil, Cake | 25 | 25D45W |
| Corn Seed | 45 | 45C25PQN |
| Corn Shelled | 45 | 45C25N |
| Corn Sugar | 30-35 | 33B35PUN |
| Corn Sugar, Crystalline, Dry | 25-60 | 43B35 |
| Corn Sugar, Crystalline, Wet | 30-60 | 45C35 |
| Corn, Cleanings | 25-30 | 28B35PY |
| Corn, Cracked | 40-50 | 45B25PN |
| Corn, Grits | 40-45 | 43B35PN |
| Corn, Steeped | 40-60 | 50D |
| Cornmeal | 38-40 | 39B35PWN |
| Cottonseed, Cake, Crushed | 40-45 | 43C45W |
| Cottonseed, Cake, Lumpy | 40-45 | 43D45W |
| Cottonseed, Dry, Delinted | 22-40 | 31C25X |
| Cottonseed, Dry, Not Delinted | 18-25 | 22C45XY |
| Cottonseed, Flakes | 20-25 | 23C35WY |
| Cottonseed, Hulls | 12 | 12B35Y |
| Cottonseed, Meal, Expeller | 25-30 | 28B45W |
| Cottonseed, Meal, Extracted | 35-40 | 37B45W |
| Cottonseed, Meats, Dry | 40 | 40B35W |
| Cottonseed, Meats, Rolled | 35-40 | 38C45W |
| Cracklings, Crushed | 40-50 | 45D45W |
| Cryolite, Dust | 75-90 | 83A36L |
| Cryolite, Lumpy | 90-110 | 100D6 |
| Cullet, Fines | 80-120 | 100C37 |
| Cullet, Lumps | 80-120 | 100D |
| Culm (See Coal, Anthracite) | | |
| Cupric Sulphate (See Copper Sulfate) | | |
| Detergent (See Soap, Detergent) | | |
| Diatomaceous Earth | 11-17 | 14A36Y |
| Dicalcium Phosphate | 40-50 | 45A35 |
| Disodium Phosphate | 25-31 | 28A35 |
| Distiller's Grain, Spent, Dry | 30 | 30B35 |
| Distiller's Grain, Spent, Wet | 40-60 | 50C45V |
| Dolomite, Crushed | 80-100 | 90C36 |
| Dolomite, Lumpy | 90-100 | 95D36 |
| Earth, Loam, Dry, Loose | 76 | 76C36 |

| Drives | Loose Bulk Density | Material Code |
|-------------------------------------|--------------------|---------------|
| Material Description | Lb./Cu. Ft. | |
| Ebonite, Crushed | 63-70 | 67C35 |
| Egg, Powder | 16 | 16A35MPYN |
| Epsom Salts (See Magnesium Sulfate) | 40-50 | 45A35U |
| Ethane Diacid, Crystals | 60 | 60B35QS |
| Feldspar, Ground | 65-80 | 73A37 |
| Feldspar, Lumps | 90-100 | 95D37 |
| Feldspar, Powder, -200 Mesh | 100 | 100A36 |
| Feldspar, Screenings | 75-80 | 78C37 |
| Ferrous Sulfide, -1/2" | 120-135 | 128C26 |
| Ferrous Sulfate | 50-75 | 63C35U |
| Ferrous Sulfide, -100 Mesh | 105-120 | 113A36 |
| Fish, Meal | 35-40 | 38C45P |
| Fish, Scraps | 40-50 | 45D45 |
| Flaxseed | 43-45 | 44B35X |
| Flaxseed Cake Linseed Cake | 48-50 | 49D45W |
| Flaxseed Meal Linseed Meal | 25-45 | 35B45W |
| Flour, Wheat | 33-40 | 37A45LP |
| Flue Dust, Basic Oxygen Furnace | 45-60 | 53A36LM |
| Flue Dust, Blast Furnace | 110-125 | 118A36 |
| Flue Dust, Boiler H. Dry | 30-45 | 38A36LM |
| Fluorspar, Fines | 80-100 | 90B36 |
| Fluorspar, Lumps - 1 1/2" to 3" | 90-100 | 100D36 |
| Flyash | 30-45 | 38A36M |
| Flyash, Coal | 30-60 | 45A36M |
| Flyash, Fluidized Bed | 60-90 | 75A36 |
| Foundry Sand, Dry (See Sand) | | |
| Fuller's Earth, Calcined | 30-40 | 35A25 |
| Fuller's Earth, Dry, Raw | 30-40 | 35A25 |
| Fuller's Earth, Oily, Spent | 60-65 | 63C45W |
| Galena (See Lead Sulfide) | | |
| Gelatine, Granulated | 32 | 32B35PU |
| Gilsonite | 37 | 37C35 |
| Glass, Batch Wool & Container | 80-100 | 90C37 |
| Glue, Ground | 40 | 40B45U |
| Glue, Pearl | 40 | 40C35U |
| Glue, Veg. Powdered | 40 | 40A45U |
| Gluten Cake, Wet | 30-50 | 40C45 |
| Gluten, Meal, Dry | 30-40 | 35B35P |
| Granite, Fines | 80-90 | 85C27 |
| Grape, Pomace | 15-20 | 18D45U |

See page 38 for material code explanation.

Drives Engineering Information

Table VI - Material Characteristics

Made in U.S.A.

| Drives | Loose Bulk Density | Material Code |
|------------------------------------|--------------------|---------------|
| Material Description | Lb./Cu. Ft. | |
| Graphite, Flakes | 40 | 40B25LP |
| Graphite, Flour | 28 | 28A35LMP |
| Graphite, Ore | 65-75 | 70D35L |
| Guano, Dry | 70 | 70C35 |
| Gypsum, Calcined | 55-60 | 58B35U |
| Gypsum, Calcined, Powdered | 60-80 | 70A35U |
| Gypsum, Raw - 1" | 70-80 | 75D25 |
| Hay, Chopped | 8-12 | 10C35Y |
| Hexanedioic Acid (See Adipic Acid) | | |
| Hominy, Dry | 35-50 | 43C25P |
| Hops, Spent, Dry | 35 | 35D35 |
| Hops, Spent, Wet | 50-55 | 53D45V |
| Ice, Crushed | 35-45 | 40D35 |
| Ice, Cubes | 40-45 | 42C35 |
| Ice, Flaked | 33-35 | 34D35 |
| Ice, Shells | 33-35 | 34D45 |
| Ilmenite, Ore | 140-160 | 150D37 |
| Iron Ore, Concentrate | 120-180 | 150A37 |
| Iron Oxide Pigment | 25 | 25A36LMP |
| Iron Oxide, Millscale | 75 | 75A35LM |
| Iron Pyrites (See Ferrous Sulfide) | | |
| Iron Sulfate (See Ferrous Sulfate) | | |
| Iron Sulfide (See Ferrous Sulfide) | | |
| Iron Vitriol (See Ferrous Sulfate) | | |
| Kafir Corn | 40-45 | 43C25 |
| Kaolin Clay | 63 | 63D25 |
| Kaolin Clay, Tale | 42-56 | 49A35LMP |
| Kryalith (See Cryolite) | | |
| Lactose | 32 | 32A35PUN |
| Lamp Black (See Carbon Black) | | |
| Lead Arsenate | 72 | 72A35R |
| Lead Arsenite | 72 | 72A35R |
| Lead Carbonate | 240-260 | 250A35R |
| Lead Ore, -1/2" | 180-230 | 205C36 |
| Lead Ore, -1/8" | 200-270 | 235B35 |
| Lead Oxide, -200 Mesh Red Lead | 30-180 | 105A45LP |
| Lead Oxide, -100 Mesh Red Lead | 30-150 | 90A45P |
| Lead Sulfide, -100 Mesh | 240-280 | 260A45RX |
| Lignite (See Coal, Lignite) | | |

| Drives | Loose Bulk Density | Material Code |
|------------------------------------|--------------------|---------------|
| Material Description | Lb./Cu. Ft. | |
| Limanite, Ore, Brown | 120 | 120C47 |
| Lime, Ground, Unslaked | 60-65 | 63B35U |
| Lime, Hydrated | 40 | 40B35LM |
| Lime, Hydrated, Pulverized | 32-40 | 36A35LM |
| Lime, Pebble | 53-56 | 55C25U |
| Limestone, Agricultural | 68 | 68B35 |
| Limestone, Crushed | 85-90 | 88D36 |
| Limestone, Dust | 55-95 | 75A46MY |
| Lindane (See Benzene Hexachloride) | | |
| Linseed (See Flaxseed) | | |
| Litharge (See Lead Oxide) | | |
| Lithopone | 45-50 | 48A32535MR |
| Magnesium Chloride (Magnesite) | 33 | 33C45 |
| Maize (See Milo) | | |
| Malt, Dry, Ground | 20-30 | 25B35NP |
| Malt, Dry, Whole | 20-30 | 25C35N |
| Malt, Meal | 36-40 | 38B25P |
| Malt, Sprouts | 13-15 | 14C35P |
| Manganese Dioxide | 70-85 | 78A35NRT |
| Manganese Ore | 125-140 | 133D37 |
| Manganese Oxide | 120 | 120A36 |
| Manganese Sulfate | 70 | 70C37 |
| Marble, Crushed | 80-95 | 88B37 |
| Marl (See Clay) | 80 | 80D36 |
| Meat, Ground | 50-55 | 53E45QTX |
| Meat, Scrap, W/bone | 40 | 40E46 |
| Mica, Flakes | 17-22 | 20B16MY |
| Mica, Ground | 13-15 | 14B36 |
| Mica, Pulverized | 13-15 | 14A36M |
| Milk, Dried, Flake | 5-6 | 6B35PUYN |
| Milk, Malted | 27-30 | 29A45PXN |
| Milk, Powdered | 20-45 | 33B25PMN |
| Milk, Powdered, Whole | 20-36 | 28B35PUX |
| Milk, Sugar | 32 | 32A35PXN |
| Mill Scale Steel | 120-125 | 123E46T |
| Milo, Ground | 32-36 | 34B25 |
| Milo, Maize Kafir | 40-45 | 43B15N |
| Molybdenite Powder | 107 | 107B26 |
| Monosodium Phosphate | 50 | 50B36 |
| Mortar, Wet | 150 | 150E46T |
| Mustard, seeds | 45 | 45B15N |
| Naphtalene, Flakes | 45 | 45B35 |

| Drives | Loose Bulk Density | Material Code |
|--|--------------------|---------------|
| Material Description | Lb./Cu. Ft. | |
| Niacin Nicotinic Acid | 35 | 35A35P |
| Oats | 26 | 26C25MN |
| Oats, Crimped | 19-26 | 23C35 |
| Oats, Crushed | 22 | 22B45NY |
| Oats, Flour | 35 | 35A35 |
| Oats, Hulls | 8-12 | 10B35NY |
| Oats, Rolled | 19-24 | 22CNY |
| Oleo Margarine | 59 | 59E45PWX |
| Orange, Peels, Dry | 15 | 15E45 |
| Oxalic Acid, Crystal Ethane Diacid Crystal | 60 | 60B35QSU |
| Oyster, Shells, Ground | 50-60 | 55C36T |
| Oyster, Shells, Whole | 80 | 80D36TV |
| Paper, Pulp, -4% | 62 | 62E45 |
| Paper, Pulp, 6% to 15% | 60-62 | 61E45 |
| Paraffin, Cake, -1/2" | 45 | 45C45 |
| Peanut Meal | 30 | 30B35P |
| Peanuts, Clean, Shelled | 15-20 | 18D35Q |
| Peanuts, Raw, Uncleaned, Unshelled | 15-20 | 18D36Q |
| Peanuts, Shelled | 35-45 | 40C35Q |
| Peas, Dried | 45-50 | 48C15NQ |
| Perlite, Expanded | 8-12 | 10C36 |
| Phosphate Disodium (See Sodium Phosphate) | | |
| Phosphate Rock, Broken | 75-85 | 80D36 |
| Phosphate Rock, Pulverized | 60 | 60B36 |
| Phosphate Sand | 90-100 | 95B37 |
| Phosphate, Acid, Fertilizer | 60 | 60B25T |
| Plaster of Paris (See Gypsum) | | |
| Plumbago (See Graphite) | | |
| Polystyrene Beads | 40 | 40B35PQ |
| Polyvinyl Chloride, Pellets | 20-30 | 25E45PQT |
| Polyvinyl Chloride, Powder | 20-30 | 25A45T |
| Potash, Dry Muriate | 70 | 70B37 |
| Potash, Mine Run Muriate | 75 | 75D37 |
| Potassium Carbonate | 51 | 51B36 |
| Potassium Chloride, Pellets | 120-130 | 125C25TU |
| Potassium Nitrate - 1/2" | 76 | 76C16NT |
| Potassium Nitrate - 1/8" | 80 | 80B26NT |
| Potassium Sulfate | 42-48 | 45B46X |
| Potato, Flour | 48 | 48A35MNP |
| Pumice, -1/8" | 42-48 | 45B46 |
| Pyrite, Pellets | 120-130 | 125C26 |

See page 38 for material code explanation.

Drives Engineering Information

Table VI - Material Characteristics

| Drives | Loose Bulk Density | Material Code |
|--------------------------------------|--------------------|---------------|
| Material Description | Lb./Cu. Ft. | |
| Quartz - 1/2" | 80-90 | 85C27 |
| Quartz - 100 Mesh | 70-80 | 75A27 |
| Rice, Bran | 20 | 20B35NY |
| Rice, Grits | 42-45 | 44B35P |
| Rice, Hulled | 45-49 | 47C25P |
| Rice, Hulls | 20-21 | 21B35NY |
| Rice, Polished | 30 | 30C15P |
| Rice, Rough | 32-36 | 34C35N |
| Rosin - 1/2" | 65-68 | 67C45Q |
| Rubber, Pelleted | 50-55 | 53D45 |
| Rubber, Reclaimed, Ground | 23-50 | 37C45 |
| Rye | 42-48 | 45B15N |
| Rye, Bran | 15-20 | 18B35Y |
| Rye, Feed | 33 | 33B35N |
| Rye, Meal | 35-40 | 38B35 |
| Rye, Middlings | 42 | 42B35 |
| Rye, Shorts | 32-33 | 33C35 |
| Safflower, Cake | 50 | 50D26 |
| Safflower, Meal | 50 | 50B35 |
| Safflower, seed | 45 | 45B15N |
| Saffron (See Safflower) | | |
| Sal Ammoniac (See Ammonium Chloride) | | |
| Salicylic Acid | 29 | 29B37U |
| Salt Cake, Dry, Coarse | 85 | 85B36TU |
| Salt Cake, Dry, Pulverized | 65-85 | 75B36TU |
| Salt, Dry, Coarse | 45-60 | 53C36TU |
| Salt, Dry, Fine | 70-80 | 75B36TU |
| Saltpeter (See Potassium Nitrate) | | |
| Sand, Dry Bank, Damp | 110-130 | 120B47 |
| Sand, Dry Bank, Dry | 90-110 | 100B37 |
| Sand, Foundry, Shake Out | 90-100 | 95D37Z |
| Sand, Silica, Dry | 90-100 | 95B27 |
| Sand, Silica, Resin Coated | 104 | 104B27 |
| Sand, Zircon, Resin Coated | 115 | 115A27 |
| Sawdust, Dry | 10-13 | 12B45UX |
| Sea-Coal | 65 | 65B36 |
| Sesame seed | 27-41 | 34B26 |
| Shale, Crushed | 85-90 | 88C36 |
| Shellac, Powdered or Granulated | 31 | 31B35P |
| Silica, Flour | 80 | 80A46 |
| Silica, Gel, 1/2" to 3" | 45 | 45D37QU |
| Silicon Dioxide (See Quartz) | | |

| Drives | Loose Bulk Density | Material Code |
|---|--------------------|---------------|
| Material Description | Lb./Cu. Ft. | |
| Slag, Blast Furnace, Crushed | 130-180 | 155D37Y |
| Slag, Furnace, Granular, Dry | 60-65 | 63C37 |
| Slate, Crushed - 1/2" | 80-90 | 85C36 |
| Slate, Ground - 1/8" | 82-85 | 84B36 |
| Sludge, Sewage, Dry | 40-50 | 45E46TW |
| Sludge, Sewage, Dry, Ground | 45-55 | 50B46T |
| Soap, Beads or Granules | 15-35 | 25B35Q |
| Soap, Chips | 15-25 | 20C35Q |
| Soap, Detergent | 15-50 | 33B35Q |
| Soap, Flakes | 5-15 | 10B35QXY |
| Soap, Powder | 20-25 | 23B25X |
| Soapstone, Talc, Fine | 40-50 | 45A45XY |
| Soda Ash, Heavy | 55-65 | 60B36 |
| Soda Ash, Light | 20-35 | 28A36Y |
| Sodium Aluminate, Ground | 72 | 72B36 |
| Sodium Aluminum Fluoride (See Kryolite) | | |
| Sodium Aluminum Sulphate | 75 | 75A36 |
| Sodium Bentonite (See Bentonite) | | |
| Sodium Bicarbonate (See Baking Soda) | | |
| Sodium Borate (See Borax) | | |
| Sodium Carbonate (See Soda Ash) | | |
| Sodium Chloride (See Salt) | | |
| Sodium Hydrate (See Caustic Soda) | | |
| Sodium Hydroxide (See Caustic Soda) | | |
| Sodium Nitrate | 70-80 | 75D25NS |
| Sodium Phosphate | 50-60 | 55B35 |
| Sodium Sulfate (See Salt, Cake) | | |
| Sodium Sulfite | 96 | 96B46X |
| Sorghum seed (See Kafir or Milo) | | |
| Soybean Dust | 25-35 | 30A35MN |
| Soybean, Cake | 40-43 | 42D35W |
| Soybean, Cracked | 30-40 | 35C36NW |
| Soybean, Flakes, Raw | 15-35 | 25 C35Y |
| Soybean, Flour | 25-35 | 30A35MN |
| Soybean, Meal, Cold | 35-45 | 40B35 |
| Soybean, Meal, Hot | 40 | 40B35T |
| Soybean, Whole | 45-50 | 48C26NW |
| Starch | 25-50 | 38A15MN |
| Steel Turnings, Crushed | 100-150 | 125D46VV |

| Drives | Loose Bulk Density | Material Code |
|---------------------------------|--------------------|---------------|
| Material Description | Lb./Cu. Ft. | |
| Sugar Beet, Pulp, Dry | 12-15 | 14C26N |
| Sugar Beet, Pulp, Wet | 25-45 | 35C35XN |
| Sugar, Powdered | 50-60 | 55A35PXN |
| Sugar, Raw | 55-65 | 60B35PXN |
| Sugar, Refined, Granulated, Dry | 50-55 | 53B35PUN |
| Sugar, Refined, Granulated, Wet | 55-65 | 60C35X |
| Sulphur, Crushed, - 1/2" | 50-60 | 55C35N |
| Sulphur, Lumps - 3" | 80-85 | 83D35N |
| Sulphur, Powdered | 50-60 | 55A35MN |
| Sunflower seed | 19-38 | 29C15 |
| Talcum -1/2" | 80-90 | 85C36 |
| Talcum, Powder | 50-60 | 55A36M |
| Tanbark, Ground | 55 | 55B45 |
| Timothy seed | 36 | 36B35NY |
| Tobacco, Scraps | 15-25 | 20D45Y |
| Tobacco, Snuff | 30 | 30B45MQ |
| Tricalcium Phosphate | 40-50 | 45A45 |
| Triple Super Phosphate | 50-55 | 53B36RS |
| Trisodium Phosphate | 60 | 60C36 |
| Trisodium Phosphate, Granular | 60 | 60B36 |
| Trisodium Phosphate, Pulverized | 50 | 50A36 |
| Tung Nuts | 25-30 | 28D15 |
| Tung Nuts, Meat, Crushed | 28 | 28D25W |
| Urea Prills, Coated | 43-46 | 45B25 |
| Vermiculite, Expanded | 16 | 16C35Y |
| Vermiculite, Ore | 80 | 80D36 |
| Vetch | 48 | 48B16N |
| Walnut Shells, Crushed | 35-45 | 40B36 |
| Wheat | 45-48 | 47C25N |
| Wheat, Cracked | 40-45 | 43B25N |
| Wheat, Germ | 18-28 | 23B25 |
| White Lead, Dry | 75-100 | 88A36MR |
| Wood, Chips, Screened | 10-30 | 20D45VY |
| Wood, Flour | 16-36 | 26B35N |
| Wood, Shavings | 8-16 | 12E45VY |
| Zinc Oxide, Heavy | 30-35 | 33A45X |
| Zinc Oxide, Light | 10-15 | 13A45XY |
| Zinc, Concentrate, Residue | 75-80 | 78B37 |

See page 38 for material code explanation.

Engineering Conversions

BUSHELs – bu
x 1.2445 = Cubic feet (ft³)

CENTIMETRES – cm
x 0.3937 = inches (in)

CENTIMETRES PER SECOND – cm/s
x 1.9685 = Feet per minute (ft/min)
x 0.03291 = Feet per second (ft/s)
x 0.03600 = Kilometres per hour (km/h)
x 0.6000 = Metres per minute (m/min)
x 0.02237 = Miles per hour (mph)

CUBIC CENTIMETRES – cm³
x 3.5315 x 10⁻⁵ = Cubic feet (ft³)
x 6.1024 x 10⁻² = Cubic inches (in³)
x 1.308 x 10⁻⁶ = Cubic yards (yd³)
x 2.642 x 10⁻⁴ = U.S. gallons (U.S. gal)
x 1.000 x 10⁻³ = Litres (l)

CUBIC FEET – ft³
x 0.02832 = Cubic metres (m³)
x 2.832 x 10⁴ = Cubic centimetres (cm³)
x 1728 = Cubic inches (in³)
x 0.03704 = Cubic yards (yd³)
x 7.481 = U.S. gallons (U.S. gal)
x 6.229 = Imperial gallons (imp gal)
x 28.32 = Litres (l)

CUBIC INCHES – in³
x 1.6387 x 10⁻⁵ = Cubic metres (m³)
x 16.387 = Cubic centimetres (cm³)
x 0.016387 = Litres (l)
x 5.787 x 10⁻⁴ = Cubic feet (ft³)
x 2.143 x 10⁻⁵ = Cubic yards (yd³)
x 4.329 x 10⁻³ = U.S. gallons (U.S. gal)
x 3.605 x 10⁻³ = Imperial gallons (imp gal)

CUBIC METRES – m³
x 1000 = Litres (l)
x 35.315 = Cubic feet (ft³)
x 61.024 x 10³ = Cubic inches (in³)
x 1.3080 = Cubic yards (yd³)
x 264.2 = U.S. gallons (U.S. gal)

CUBIC YARDS – yd³
x 0.7646 = Cubic metres (m³)
x 764.6 = Litres (l)
x 7.646 x 10⁵ = Cubic centimetres (cm³)
x 27 = Cubic feet (ft³)
x 46.656 = Cubic inches (in³)
x 201.97 = U.S. gallons (U.S. gal)

DEGREES, ANGULAR (°)
x 0.017453 = Radians (rad)
x 60 = Minutes (′)
x 3600 = Seconds (″)
x 1.111 = Grade (gon)

DEGREES PER SECOND, ANGULAR (°/s)
x 0.017453 = Radians per second (rad/s)
x 0.16667 = Revolutions per minute (r/min)
x 2.7778 x 10⁻³ = Revolutions per second (r/s)

FEET – ft
x 0.3048 = Metres (m)
x 30.480 = Centimetres (cm)
x 12 = Inches (in)
x 0.3333 = Yards (yd)

FEET PER MINUTE – ft/min
x 0.5080 = Centimetres per second (cm/s)
x 0.01829 = Kilometres per hour (km/h)
x 0.3048 = Metres per minute (m/min)
x 0.016667 = Feet per second (ft/s)
x 0.01136 = Miles per hour (mph)

FOOT-POUNDS-FORCE – ft . lbf
x 1.356 = Joules (J)
x 1.285 x 10⁻³ = British thermal units (Btu)
x 3.239 x 10⁻⁴ = Kilocalories (kcal)
x 0.13825 = Kilogram-force-metres (kgf.m)
x 5.050 x 10⁻⁷ = Horsepower-hours (hp.h)
x 3.766 x 10⁻⁷ = Kilowatt-hours (kW.h)

GALLONS, U.S. – U.S. gal
x 3.7854 = Cubic centimetres (cm³)
x 3.7854 = Litres (l)
x 3.7854 x 10⁻³ = Cubic metres (m³)
x 231 = Cubic inches (in³)
x 0.13368 = Cubic feet (ft³)
x 4.951 x 10⁻³ = Cubic yards (yd³)

GRAMS – g
x 15.432 = Grains (gr)
x 0.035274 = Ounces (oz) av.
x 0.032151 = Ounces (oz) troy
x 2.2046 x 10⁻³ = Pounds (lb)

GRAMS-FORCE – gf
x 9.807 x 10⁻³ = Newtons (N)

HORSEPOWER – hp
x 745.7 = Watts (W)
x 0.7457 = Kilowatts (kW)
x 1.0139 = Horsepower (metric)

INCHES – in
x 2.540 = Centimetres (cm)
x 25.4 = Millimetres (ml)

KILOGRAMS – kg
x 2.2046 = Pounds (lb)
x 1.102 x 10⁻³ = Tons (ton) short

KILOGRAMS-FORCE – kgf
x 9.807 = Newtons (N)
x 2.205 = Pounds-force (lbf)

KILOWATTS – kW
x 1.3410 = Horsepower (hp)

LITRES – l
x 1000 = Cubic centimetres (cm³)
x 0.035315 = Cubic feet (ft³)
x 61.024 = Cubic inches (in³)
x 1.308 x 10⁻³ = Cubic yards (yd³)
x 0.2642 = U.S. gallons (U.S. gal)

METRES – m
x 3.281 = Feet (ft)
x 39.37 = Inches (in)
x 1.0936 = Yards (yd)

METRES PER MINUTE – m/min
x 1.6667 = Centimetres per second (cm/s)
x 3.281 = Feet per minute (ft/min)
x 0.05468 = Feet per second (ft/s)
x 0.03728 = Miles per hour (mph)

MICROMETRES – formerly m/cron
x 10⁻⁶ = Metres (m)

MILES – mi
x 1.6093 x 10³ = Metres (m)
x 1.6093 = Kilometres (km)
x 5280 = Feet (ft)
x 1760 = Yards (yd)

MILES PER HOUR – mph
x 44.70 = Centimetres per second (cm/s)
x 1.6093 = Kilometres per hour (km/h)
x 26.82 = Metres per minute (m/min)
x 88 = Feet per minute (ft/min)
x 1.4667 = Feet per second (ft/s)

MILES PER MINUTE – mi/min
x 1.6093 = Kilometres per minute (km/min)
x 2682 = Centimetres per second (cm/s)
x 88 = Feet per second (ft/s)
x 60 = Miles per hour (mph)

MINUTES, ANGULAR – (′)
x 2.909 x 10⁻⁴ = Radians (rad)

NEWTONS – N
x 0.10197 = Kilograms-force (kgf)
x 0.2248 = Pounds-force (lbf)

POUNDS-FORCE – lbf av.
x 4.448 = Newton (N)
x 0.4536 = Kilograms-force (kgf)

POUNDS – lb av.
x 453.6 = Grams (g)

RADIANS – rad
x 57.30 = Degrees (°) angular

TONS-MASS – tonm long
x 1016 = Kilograms (kg)
x 2240 = Pounds (lb) av.
x 1.1200 = Tons (ton) short

TONS- ton short
x 907.2 = Kilograms (kg)
x 0.9072 = Metric tons (t)
x 2000 = Pounds (lb) av.
x 0.8929 = Tons (ton) long