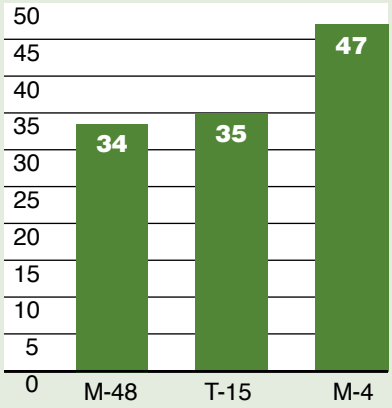
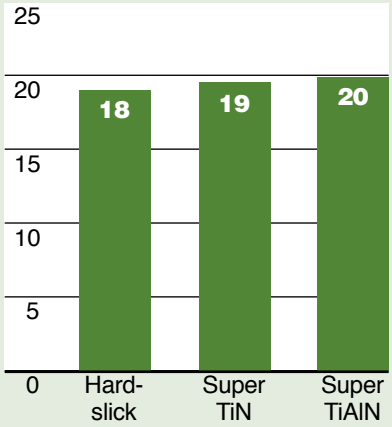
SPADE DRILL SELECTION & APPLICATIONS HSS

Toughness Values



Wear Values



- **WHEN TO USE M-4**
  - Loose or Manual Machines
  - If T-15 Breaks
- **WHEN TO USE T-15**
  - When M-4 Life needs to be Extended
  - If M-48 Breaks
- **WHEN TO USE M-48**
  - Extend Life of T-15

SPEEDS – FEED RECOMMENDATIONS

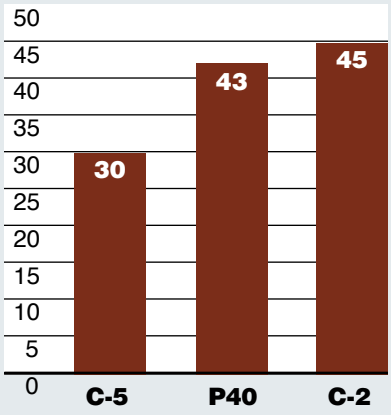
Material	Material Hardness (BHN)	SFM Surface Footage	Feed (IPR) 3/8" to 1/2"	33/64" to 11/16"	45/64" to 15/16"	31/32" to 1-3/8"	1-13/32" to 1-7/8"	1-29/32" to 2-9/16"	2-19/32" to 4-1/2"
	100 - 150	280	.007	.010	.013	.016	.020	.023	.028
Free Machining Steel	150 - 200	260	.007	.010	.013	.016	.020	.023	.028
1118, 1215, 12L14, etc.	200 - 250	240	.007	.010	.013	.016	.020	.023	.028
	125 - 175	240	.006	.009	.012	.015	.019	.023	.027
	175 - 225	225	.005	.008	.010	.014	.018	.021	.024
Low & Medium Carbon Steel	225 - 275	210	.005	.008	.010	.014	.018	.021	.024
1018, 1040, 1140, etc.	275 - 325	195	.004	.007	.009	.012	.016	.019	.022
	125 - 175	210	.006	.008	.010	.014	.017	.019	.022
	175 - 225	195	.005	.008	.010	.014	.017	.019	.022
	225 - 275	180	.005	.007	.010	.014	.017	.019	.022
Alloy Steel	275 - 325	170	.004	.006	.009	.012	.015	.017	.020
4140, 5140, 8640, etc.	325 - 375	155	.003	.006	.009	.012	.015	.017	.020
	225 - 300	110	.005	.007	.009	.010	.014	.017	.020
High Strength Alloy Steel	300 - 350	85	.004	.007	.009	.010	.014	.017	.020
4340, 4330V, 300M, etc.	350 - 400	70	.003	.006	.008	.009	.012	.015	.018
	100 - 150	200	.006	.010	.012	.014.	018	.021	.026
Structural Steel	150 - 250	170	.005	.009	.010	.012	.016	.019	.024
A36, A285, A516, etc.	250 - 350	140	.004	.008	.009	.010	.014	.017	.020
High Temp, Alloy	140 - 220	40	.003	.006	.007	.008	.010	.012	.015
Hastelloy B, Inconel 600, etc.	220 - 310	35	.003	.006	.007	.008	.010	.012	.015
Stainless Steel	135 - 185	105	.006	.008	.009	.011	.014	.016	.020
303, 416, 420, 17-4 PH, etc.	185 - 275	90	.005	.007	.008	.010	.012	.014	.018
Tool Steel	150 - 200	110	.004	.006	.008	.010	.012	.015	.017
H-13, H021, A04, 0-2, S-3, etc.	200 - 250	90	.004	.006	.008	.010	.012	.015	.017
	30	850	.008	.013	.016	.020	.022	.025	.025
Aluminum	180	450	.008	.013	.016	.018	.022	.025	.025
	120 - 150	250	.007	.012	.016	.020	.024	.027	.030
	150 - 200	225	.006	.011	.014	.018	.022	.025	.028
	200 - 220	195	.006	.009	.012	.016	.018	.021	.024
Cast Iron	220 - 260	165	.005	.007	.009	.012	.014	.017	.020
Gray, Ductile, Nodular	260 - 320	135	.004	.006	.007	.009	.012	.014	.016

STANDARD GEOMETRY

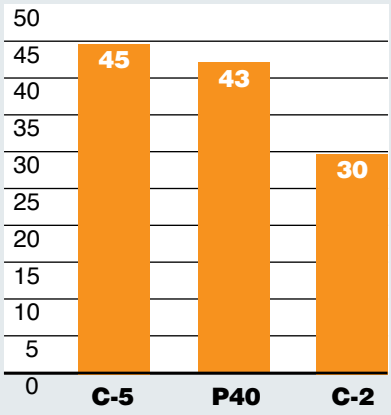
FOR SM POINT ADD 5% TO 10%

SPADE DRILL SELECTION & APPLICATIONS CARBIDE

Toughness Values



Wear Values



If C-5 chips try C-2 at 10% – 20% lower S.F.M. than C-5 rating

Grade	Geometry and Application	Stocked Coatings
P40 & C-5	Steel Cutting	Super TiN TiAlN
C-3	Cast Iron	Super TiN TiAlN
P40 & C-2	Ductile Iron Stainless Steel Aluminum Exotic Alloys	Super TiN TiAlN

Note: Carbide has a lower transverse rupture strength than HSS and is prone to chipping and breakage.

Recutting of chips or lack of rigidity can cause breakage.

Check Coolant Recommendations Chart on Page 15 for flow rates.

SPEEDS – FEED RECOMMENDATIONS

Material	Material Hardness (BHN)	SFM Surface Footage	Feed (IPR) 3/8" to 1/2"	33/64" to 11/16"	45/64" to 15/16"	31/32" to 1-3/8"	1-13/32" to 1-7/8"
	100 - 150	420	.006	.009	.012	.015	.019
Free Machining Steel	150 - 200	360	.006	.008	.011	.013	.017
1118, 1215, 12L14, etc.	200 - 250	340	.005	.008	.010	.012	.015
	125 - 175	340	.005	.008	.010	.014	.017
	175 - 225	310	.005	.007	.009	.012	.016
Medium Carbon Steel	225 - 275	270	.004	.007	.009	.012	.015
1018, 1040, 1140, etc.	275 - 325	230	.004	.006	.008	.010	.014
	125 - 175	325	.005	.008	.010	.013	.016
	175 - 225	300	.005	.007	.009	.012	.015
	225 - 275	270	.004	.007	.009	.012	.015
Alloy Steel	275 - 325	250	.004	.006	.008	.011	.014
4140, 5140, 8640, etc.	325 - 375	220	.003	.005	.007	.010	.013
	225 - 300	200	.005	.007	.009	.010	.014
High Strength Alloy Steel	300 - 350	180	.004	.006	.008	.009	.012
4340, 4330V, 300M, etc.	350 - 400	160	.003	.005	.007	.008	.010
	100 - 150	310	.006	.010	.011	.012	.016
Structural Steel	150 - 250	250	.005	.008	.010	.011	.015
A36, A285, A516, etc.	250 - 350	230	.004	.007	.009	.009	.013
High Temp, Alloy	140 - 220	80	.003	.006	.007	.009	.011
Hastelloy B, Inconel 600, etc.	220 - 310	60	.003	.005	.006	.008	.010
Stainless Steel	135 - 185	210	.006	.008	.009	.011	.013
303, 416, 420, 17-4 PH, etc.	185 - 275	160	.005	.007	.008	.010	.011
Tool Steel	150 - 200	220	.003	.005	.007	.009	.011
H-13, H021, A04, 0-2, S-3, etc.	200 - 250	170	.003	.005	.007	.009	.011
	30	1500	.008	.013	.016	.020	.022
Aluminum	180	1000	.007	.011	.014	.018	.020
	120 - 150	460	.006	.009	.011	.015	.020
	150 - 200	400	.005	.008	.010	.014	.018
	200 - 220	360	.005	.007	.008	.012	.015
Cast Iron	220 - 260	310	.004	.006	.007	.010	.013
Gray, Ductile, Nodular	260 - 320	270	.004	.005	.006	.008	.011

STANDARD GEOMETRY

FOR SM POINT ADD 5% TO 10%

CUTTING CONDITIONS

SUPER COBALT T-15 FLAT BOTTOM SPADE DRILL INSERTS

Material	Material Hardness (Bhn)	Speed (SFM)		Feed			
		TiN	TiAlN	Ø 3/8" ~1/2"	Ø 33/64" ~11/16"	Ø 45/64" ~15/16"	Ø 31/32" ~1*3/8"
Free machining Steel	100 - 150	165	220	0.005	0.007	0.010	0.013
1213, 12L13, 1215	150 - 200	150	215	0.005	0.007	0.010	0.013
12L14, 1118 etc	200 - 250	135	190	0.004	0.007	0.010	0.012
Low Carbon Steel	85 - 125	140	195	0.005	0.007	0.009	0.012
1015, 1020, 1140	125 - 175	135	190	0.005	0.007	0.009	0.012
1025 etc	175 - 225	125	180	0.004	0.006	0.008	0.011
	225 - 275	115	175	0.004	0.006	0.008	0.011
Medium Carbon Steel	125 - 175	135	195	0.004	0.007	0.009	0.011
1035, 1050, 1045	175 - 225	125	180	0.004	0.006	0.007	0.011
1055, 1140 etc	225 - 275	115	165	0.004	0.006	0.007	0.011
	275 - 325	105	150	0.003	0.005	0.007	0.009
Structural Steel	100 - 150	115	165	0.004	0.007	0.009	0.011
A36, A516, A182 etc	150 - 250	100	140	0.004	0.007	0.008	0.009
	250 - 350	80	115	0.003	0.006	0.007	0.008
Cast Iron / S,G Iron	120 - 150	145	215	0.005	0.010	0.014	0.016
A48-76 GR30/GR45	150 - 200	130	190	0.005	0.008	0.011	0.016
A536-72 60-40-18	200 - 220	110	165	0.005	0.008	0.010	0.014
A220-76 GR40010 etc	220 - 260	95	150	0.004	0.006	0.008	0.010
	260 - 320	80	120	0.004	0.005	0.006	0.008
Alloy Steel	125 - 175	125	165	0.005	0.006	0.008	0.011
8620, 4130, 4137	175 - 225	115	150	0.004	0.006	0.008	0.011
4140, 6150 etc	225 - 275	105	145	0.004	0.005	0.007	0.011
	275 - 325	100	140	0.003	0.005	0.007	0.009
	325 - 375	90	120	0.003	0.005	0.007	0.009
Tool Steel	150 - 200	65	90	0.003	0.005	0.006	0.008
H13, H21, A2, S1 etc	200 - 250	45	75	0.003	0.005	0.006	0.008
High Temp. Alloy	140 - 220	20	30	0.003	0.005	0.006	0.008
Hastelloy B,Inconel etc	220 - 310	15	25	0.003	0.004	0.006	0.006
High Strength Alloy	225 - 300	65	90	0.004	0.006	0.007	0.008
9840, 4340, 4330V etc	300 - 350	45	70	0.003	0.006	0.007	0.008
	350 - 400	40	60	0.003	0.005	0.006	0.007
Aluminium	30	520	700	0.007	0.011	0.014	0.017
2014, 6061, 7075 etc	180	255	390	0.007	0.011	0.014	0.016
Stainless Steel	135 - 185	60	90	0.005	0.007	0.008	0.009
310, 316, 410, 330 etc	185 - 275	50	80	0.004	0.006	0.007	0.009

RPM = revolution per minute (rev/min)
SFM = surface feet per minute (ft/min)
DIA = diameter of drill (inch)
IPR = feed rate (in/rev)
IPM = inch per minute penetration rate

*** Formulas :**

SFM = (RPM)· (.262)· (DIA.)

IPM = (RPM)· (IPR)

$$RPM = \frac{(SFM)\cdot(3.82)}{(DIA.)}$$

The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points. Speed and feed reductions (20% reduction in speed and 10% reduction in feed) are recommended.