



The Formation Characteristics				Bit Selection & Matrix Choices													
Hardness	Rock Group	Typical Rock Types	Characteristics	Bit Matrix													
				1	3	5	6	7	8	9	10	11	12	14	15		
Soft	1 & 3	Limestone Sandstone Shales Conglomerates	Soft to Medium Soft Very Abrasive Coarse Grained Mixed rocks	Grey	SB	SER 5											
Soft Medium	4	Peridotite Serpentine Andesite Weathered Granite Dolomite	Medium Soft Abrasive Medium to Coarse Grained Competent to Fractured				HL6	7C 7DD 7SA 7MD	8A.4								
Medium	5	Gabbro Diabase Pegmatite Schist Basalt	Medium Hard Moderately Abrasive Medium to Coarse Grained Competent to Fractured					7AA HA7	8C	8AA	HA9 9G 9AA	9F	HA10				
Medium Hard	6	Silicified Volcanics Norite Quartz Pegmatite Granite	Hard Moderately Abrasive Fine to Medium Grained Competent to Fractured								9H 9DD	10c	KS 9-	11A	HL12		
Hard	7	Quartzite Gneiss Granite Dorite Andesite	Hard to VeryHard Non-Abrasive Fine Grained Competent									10E.4	11-13	12-14	HL14		
Very Hard	8	Glassy Quartz Taconite Rhyolite Porphyry	Extremely Hard Non-Abrasive Fine Grained													14-15	
Ultra Hard	8+	Jasperite Chert Ironstone	ULTRA Hard Very Fine Grained Competent														HL15

Bit Face Profiles: Standard Profiles: Standard; Wide Standard; Face Discharge; Sandbit (Internal Flush); Turbo; Wide Turbo
 Customised profiles available to customer specifications and flushing requirements on request

Standard Impregnation Heights: (Diamond containing depth of matrix) BWL Y=12,16; NWL Y=12,16,18; HWL Y=12,15; PWL Y=10,12

HUD Signature Versatile Matrix designated by a Circle

Bit Selection Guide - Important Driller Guidelines

Selection Criteria for HUD Impregnated Bits

- 1) Abrasiveness of rock types being drilled.
- 2) Condition of the rock being drilled – e.g. Solid, broken or variable.
- 3) Machine type – e.g. hydraulic feed, screw feed or top drive.
- 4) Power / Torque available – A Rule-of-thumb is High Power/Torque = Tougher matrix. Low Power / Torque = Softer matrix.
- 5) Weight-on-bit:- High weight = Tough matrix / Low weight = Soft matrix.
- 6) RPM – Note High RPM generally requires a softer matrix type, where as low RPM's require a tougher matrix.
- 7) NOTE: Within each bit group HUD can tailor make products to suit specific drilling requirements!

NB that within every rock group there can be several variances and that the rock types given are only a guideline and depending on the conditions. Bit recommendations may need to differ to those specified above (Refer to points 1 & 2). It is recommended that when starting a drill contract, that one matrix either side of the selected bit is carried in case of changes in the formation being drilled. If only one type of bit is available one can obtain satisfactory results by varying the drilling parameters – eg: RPM; weight-on-bit; flushing.

Drilling Hints

- 1) Do not start rotation with the bit on the bottom of the hole. Always start flushing, then rotation and then feed slowly until the bit starts to take weight on the bottom of the hole. Gradually increase the RPM and the weight-on-bit until an acceptable rate of penetration has been achieved. Do not over-feed as this will lead to excessive wear and early failure. Under-feeding can lead to the diamonds polishing and excessive weight having to be applied.
- 2) BEWARE VIBRATION. Vibration destroys the diamonds and hence the bit!!
- 3) Ensure that there is adequate flushing to lubricate the bit/rod string and effectively flush the cuttings from the hole. NOTE: variations in flush pump pressure indicate leaking or cracked rods. IMMEDIATELY cease drilling and check the rod string.
- 4) At the end of the feed stroke always allow the rod string to rotate long enough to reduce the compression on the rod string.

Reading Your Bit

- 1) The ideal bit face wear should be reasonably flat with well developed comet trails behind the diamonds and a low degree of diamond “pull-out”.
- 2) CONCAVE wear indicates over-feeding or too soft a matrix. In this case: either reduce the weight-on-bit; or increase the RPM; or change to a harder matrix.
- 3) CONVEX wear indicates under-feeding or too hard a matrix. In this case: either increase weight-on-bit; or reduce the RPM; or change to a softer matrix
- 4) Sheared or broken diamond indicates excessive “VIBRATION”. Check rod lubricant and adjust RPM until vibration disappears.
- 5) Highly exposed diamonds indicate that a tougher / harder matrix should be used or alternatively a higher RPM can be used.

A Rule-of-thumb is that "the higher the RPM - the harder the matrix reacts, and, the lower the RPM - the softer the matrix reacts.

In-Hole Bit Sharpening

This can be carried out in different ways:

- 1) Reduce the flushing volume to retain cuttings at the bit face for a longer period.
- 2) Reduce RPM whilst maintaining weight-on-bit until penetration rate increases.
- 3) Increase weight-on-bit whilst maintaining RPM.

NOTE:- ALL THE ABOVE MUST BE CARRIED OUT BY COMPETENT DRILLERS TO AVOID DAMAGING THE BIT OR BURNING IN!!