CME Diamond Bits

Core Bits ..............................................................................................................................................................6.02
Impregnated Diamond Bits ........................................................................................................................................6.04
Surface Set Diamond Bits ........................................................................................................................................6.11
Tungsten Carbide Bits ................................................................................................................................................6.17
Polycrystalline Diamond Compact Bits ..................................................................................................................6.19
Casing & Rod Shoes ..................................................................................................................................................6.20
Reamer Shells ..........................................................................................................................................................6.22
Bit & Shoe Set Dimensions .....................................................................................................................................6.25
Use & Care of Diamond Bits ....................................................................................................................................6.26
MOH’S SCALE OF HARDNESS

This scale characterizes the scratch resistance of various minerals through the ability of a harder material to scratch a softer material.

<table>
<thead>
<tr>
<th>Hardness</th>
<th>Mineral</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>Diamond</td>
</tr>
<tr>
<td>9</td>
<td>Corundum</td>
</tr>
<tr>
<td>8</td>
<td>Topaz</td>
</tr>
<tr>
<td>7</td>
<td>Quartz</td>
</tr>
<tr>
<td>6</td>
<td>Feldspar</td>
</tr>
<tr>
<td>5</td>
<td>Apatite</td>
</tr>
<tr>
<td>4</td>
<td>Fluorite</td>
</tr>
<tr>
<td>3</td>
<td>Calcite</td>
</tr>
<tr>
<td>2</td>
<td>Gypsum</td>
</tr>
<tr>
<td>1</td>
<td>Talc</td>
</tr>
</tbody>
</table>

Mohs Hardness Scale

Note: On the Moh’s scale, a pencil “lead” (graphite) has a hardness of 1; a fingernail, 2.5; copper penny, about 3.5; a knife blade, 5.5; window glass, 5.5; and a steel file, 6.5. Using these ordinary materials of known hardness can be a simple way to approximate the position of the mineral scale.
BIT SELECTION CHART vs. MOH’S HARDNESS SCALE

Carbide Tooth
Carbide Chip
PDC / Geoset
Surface Set
Impregnated

Central Mine Equipment Company
4215 Rider Trail North • Earth City, MO 63045 • Ph: 314.291.7700 • 800.325.8827 • Fax: 314.291.4880
E-mail: info@cmeco.com • Website: www.cmeco.com
The impregnated diamond bit is for cutting medium to ultra-hard formations. They utilize various powdered metals mixed with synthetic diamond grits and are reinforced with carbide and diamond. This allows the bit to drill all types of formations. The impregnated diamond bit can be matched to the job ranging from broken and highly abrasive to fine-grained, consolidated and ultra-hard rock. The bit resharpen as it drills, renewing the cutting edges. New diamond layers are exposed as the matrix wears away. Several water-way designs are available for different types of formations and conditions. The impregnated bit is not designed to drill through overburden.
Selecting an impregnated diamond bit.
Where to get started.

What is the competency of the formation?
If it is fractured or broken a lower series # bit is recommended due to the abrasiveness of the rock. For a competent formation a higher series # bit is suggested where a softer matrix is utilized for proper diamond exposure and matrix erosion.

What is the torque output of the drill rig?
If a machine has low torque output then a higher series # bit ought to be used because of the higher RPM output. A lower series # bit may perform better with a high torque machine that optimizes the available RPM’s.

What is the hardness of the rock?
(see Moh’s scale of Hardness)
When drilling in soft rock a lower series # bit is more resistant to the abrasive conditions which extends bit life and increases penetration rates. A higher series # bit is more productive in hard rock conditions where the softer matrix wears exposing new diamonds to the rock formation.

Once these criteria have been evaluated and the bit has been selected and used, record the footage, wear pattern and penetration rates.

Continue to use bit if successful or re-evaluate your selection for a different bit.

Adjustments?
If penetration rate is slow try a higher series # bit.
If the bit life is short try a lower series # bit.
# Diamond Bits

## BITS - IMPREGNATED SELECTION GUIDE

<table>
<thead>
<tr>
<th>Series 2</th>
<th>Series 2-6</th>
<th>Series 6</th>
<th>Series 7</th>
<th>Series 8</th>
<th>Series 10</th>
</tr>
</thead>
<tbody>
<tr>
<td>SILTSTONE</td>
<td>SHALE</td>
<td>SHALE</td>
<td>QUARTZ</td>
<td>CHERT</td>
<td></td>
</tr>
<tr>
<td>SCHIST</td>
<td>LIMESTONE</td>
<td>GNEISS</td>
<td>RHYOLITE</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>CHERT</td>
<td>QUARTZ</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fractured or Broken</td>
<td>Coarse Abrasive</td>
<td>Competent Non-Abrasive</td>
<td>Fine Medium Hard</td>
<td>Ultra Hard Non-Abrasive</td>
<td>Fine Grain Ultra Hard</td>
</tr>
</tbody>
</table>
# BITS - IMPREGNATED

<table>
<thead>
<tr>
<th>Waterway Configurations</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image_url" alt="Standard Waterways, longest life" /></td>
</tr>
<tr>
<td>Standard Waterways, longest life</td>
</tr>
<tr>
<td><img src="image_url" alt="Hydra Waterways, faster penetration, reduced down pressure required" /></td>
</tr>
<tr>
<td>Hydra Waterways, faster penetration, reduced down pressure required</td>
</tr>
<tr>
<td><img src="image_url" alt="Tapered Waterways, helps push cuttings to the OD and reduces pressure across bit face" /></td>
</tr>
<tr>
<td>Tapered Waterways, helps push cuttings to the OD and reduces pressure across bit face</td>
</tr>
<tr>
<td><img src="image_url" alt="Face Discharge Waterways, has the benefit of reducing fluid pressure to the ID and redirects it to the face of the bit (reduces core wash)" /></td>
</tr>
<tr>
<td>Face Discharge Waterways, has the benefit of reducing fluid pressure to the ID and redirects it to the face of the bit (reduces core wash)</td>
</tr>
</tbody>
</table>
# BITs - Impregnated

## Operating Recommendations

We recommend flexible guidelines for running impregnated diamond bits that take into account the many operating variables such as; fluid flow, rpm and weight-on-bit. This approach, in combination with formation characteristics, maximizes bit life and penetration rate.

### Drilling Fluid

Formation characteristics and penetration rate will dictate proper fluid make-up and flow. With an increase in penetration rate, fluid flow should be increased to properly clean the bit. The cuttings generated by an impregnated bit abrade the metal matrix around the diamonds, which plays an important role in keeping the bit sharp. Conversely, if the cuttings are washed away too quickly, the metal matrix will not wear away fast enough to properly expose new diamond surfaces, and the bit will polish, reducing performance.

### Rotation Speed

In general, impregnated diamond bits should be run at higher rotational speeds (rpm) than are similar size surface set diamond bits. Maximum bit performance is achieved by running the impregnated bit as fast as conditions allow, without vibration caused by high rotation speed.

### Weight-On-Bit

Optimum weight-on-bit, combined with proper rotation speed, fluid flow and penetration rate provides for a balanced system. The least possible weight-on-bit that maintains efficient penetration rates should be used. Applying insufficient weight results in polishing the diamonds, while too much weight, over a prolonged period, may damage the bit. When the bit fails to penetrate after adjusting weight-on-bit, rpm, or fluid flow, a different bit should be selected which is designed for drilling harder rock.

### Operating Observations

- Stable, smooth, vibration free rotation optimizes bit cutting efficiency. Reaming shells and stabilized core barrel outer tubes should provide improved bit performance.
- Experience indicates that optimum rotation speeds for impregnated bits in wireline applications should be 400 rpms or greater for N sized bits.
- While bit lubrication with a polymer or water soluble oil mixture is helpful, high fluid viscosity can create a cushion between the bit and formation, resulting in poor performance.
## BITS - IMPREGNATED

<table>
<thead>
<tr>
<th>Size</th>
<th>Series 2</th>
<th>Series 6</th>
<th>Series 7</th>
<th>Series 8</th>
<th>Series 10</th>
</tr>
</thead>
<tbody>
<tr>
<td>N W/L</td>
<td>C36500</td>
<td>C36501</td>
<td>C3668</td>
<td>C36502</td>
<td>C36730</td>
</tr>
<tr>
<td>N W/L2</td>
<td>C36508</td>
<td>C36509</td>
<td>C3667</td>
<td>C36510</td>
<td>C36670</td>
</tr>
<tr>
<td>N W/L3</td>
<td>C36624</td>
<td>C36625</td>
<td>-</td>
<td>C36626</td>
<td>C36671</td>
</tr>
<tr>
<td>NWD - 4</td>
<td>C36516</td>
<td>C36517</td>
<td>-</td>
<td>C36518</td>
<td>-</td>
</tr>
<tr>
<td>NXB - NWC3</td>
<td>C36524</td>
<td>C36525</td>
<td>-</td>
<td>C36526</td>
<td>-</td>
</tr>
<tr>
<td>H W/L</td>
<td>C36595</td>
<td>C36596</td>
<td>-</td>
<td>C36597</td>
<td>-</td>
</tr>
<tr>
<td>H W/L3</td>
<td>C36545</td>
<td>C36610</td>
<td>-</td>
<td>C36611</td>
<td>C36656</td>
</tr>
<tr>
<td>P W/L</td>
<td>C36700</td>
<td>C36701</td>
<td>-</td>
<td>C36702</td>
<td>-</td>
</tr>
<tr>
<td>P W/L3</td>
<td>C36717</td>
<td>C36718</td>
<td>-</td>
<td>C36719</td>
<td>-</td>
</tr>
</tbody>
</table>

### NOTE:
All bits set to Reamer Shell Gage (RSG) unless noted.

The bits listed above have proven to be successful in the majority of applications and are normally kept in stock for immediate shipment.
## Diamond Bits

### BITS - IMPREGNATED “ULTRA”

<table>
<thead>
<tr>
<th>Size</th>
<th>Series 6</th>
<th>Series 8</th>
<th>Series 10</th>
</tr>
</thead>
<tbody>
<tr>
<td>N W/L</td>
<td>C36587</td>
<td>C36588</td>
<td>C36639</td>
</tr>
<tr>
<td>N W/L2</td>
<td>C36589</td>
<td>C36590</td>
<td>C36640</td>
</tr>
<tr>
<td>NWD - 4</td>
<td>C36591</td>
<td>C36592</td>
<td>C36641</td>
</tr>
<tr>
<td>NXB - NWC3</td>
<td>C36593</td>
<td>C36594</td>
<td>C36642</td>
</tr>
<tr>
<td>H W/L</td>
<td>C36643</td>
<td>C36644</td>
<td>C36645</td>
</tr>
</tbody>
</table>

### BITS - IMPREGNATED “HYDRA”

<table>
<thead>
<tr>
<th>Size</th>
<th>Series 6</th>
<th>Series 8</th>
<th>Series 10</th>
</tr>
</thead>
<tbody>
<tr>
<td>N W/L</td>
<td>C36571</td>
<td>C36572</td>
<td>-</td>
</tr>
<tr>
<td>N W/L2</td>
<td>C36555</td>
<td>C36556</td>
<td>-</td>
</tr>
<tr>
<td>NWD - 4</td>
<td>C36573</td>
<td>C36574</td>
<td>-</td>
</tr>
<tr>
<td>NXB - NWC3</td>
<td>C36575</td>
<td>C36576</td>
<td>-</td>
</tr>
<tr>
<td>H W/L</td>
<td>C36602</td>
<td>C36603</td>
<td>-</td>
</tr>
<tr>
<td>H W/L3</td>
<td>C36616</td>
<td>C36617</td>
<td>-</td>
</tr>
<tr>
<td>P W/L</td>
<td>C36708</td>
<td>C36709</td>
<td>-</td>
</tr>
<tr>
<td>P W/L3</td>
<td>C36724</td>
<td>C36725</td>
<td>-</td>
</tr>
</tbody>
</table>

**NOTE:** All bits set to Reamer Shell Gage (RSG) unless noted.
The bits listed above have proven to be successful in the majority of applications and are normally kept in stock for immediate shipment.

---

Central Mine Equipment Company  
4215 Rider Trail North  •  Earth City, MO 63045  •  Ph: 314.291.7700  •  800.325.8827  •  Fax: 314.291.4880  
E-mail: info@cmeeco.com  •  Website: www.cmeeco.com
CME Surface Set Diamond Bits

The surface set diamond bit is for coring soft to medium hard formations where impregnated diamond bits are less effective. They are set with a single layer of natural diamonds in a tungsten carbide matrix with diamond and carbide reinforcements. They are recommended for relatively soft, unconsolidated formations and harder formations where the RPM’s and bit loads required for impregnated bits are not available. The surface set bit is not ideal for ultra-hard formations and are not recommended.

The choice of a Surface Set Bit will be dictated by the rock type. The diamond size, crown design and matrix hardness used will be determined by the hardness of the formation. The friability of the core will determine the type of fluid passages. The surface set bit provides a greater exposure of diamonds than the impregnated bit and therefore faster penetration in soft formations.

Surface Set Bits are available in 8spc, 15spc, 25spc, 40spc, & 40/60spc-step diamond sizes. (SPC=stones per carat). Other diamond sizes are available upon request.
## BITS - SURFACE SET SELECTION GUIDE

<table>
<thead>
<tr>
<th>Fractured or Broken</th>
<th>Coarse Abrasive</th>
<th>Competent Non-Abrasive</th>
<th>Fine Medium Hard</th>
<th>Ultra Hard Non-Abrasive</th>
<th>Fine Grain Ultra Hard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Siltstone</td>
<td>Shale</td>
<td>Shale</td>
<td>Quartz</td>
<td>Chert</td>
<td>Quartz</td>
</tr>
<tr>
<td>Fractured or Broken</td>
<td>Coarse Abrasive</td>
<td>Competent Non-Abrasive</td>
<td>Fine Medium Hard</td>
<td>Ultra Hard Non-Abrasive</td>
<td>Fine Grain Ultra Hard</td>
</tr>
<tr>
<td>Schist</td>
<td>Limestone</td>
<td>Gneiss</td>
<td>Quartz</td>
<td>Chert</td>
<td>Quartz</td>
</tr>
<tr>
<td>Fractured or Broken</td>
<td>Coarse Abrasive</td>
<td>Competent Non-Abrasive</td>
<td>Fine Medium Hard</td>
<td>Ultra Hard Non-Abrasive</td>
<td>Fine Grain Ultra Hard</td>
</tr>
<tr>
<td>Weathered Granite</td>
<td>Sandstone</td>
<td>Chert</td>
<td>Fine Grained Sandstone</td>
<td>Jasper</td>
<td>Schist</td>
</tr>
<tr>
<td>Fractured or Broken</td>
<td>Coarse Abrasive</td>
<td>Competent Non-Abrasive</td>
<td>Fine Medium Hard</td>
<td>Ultra Hard Non-Abrasive</td>
<td>Fine Grain Ultra Hard</td>
</tr>
<tr>
<td>Quartz</td>
<td>Chert</td>
<td>Quartz</td>
<td>Ultra Hard Non-Abrasive</td>
<td>Jasper</td>
<td>Schist</td>
</tr>
<tr>
<td>Fractured or Broken</td>
<td>Coarse Abrasive</td>
<td>Competent Non-Abrasive</td>
<td>Fine Medium Hard</td>
<td>Ultra Hard Non-Abrasive</td>
<td>Fine Grain Ultra Hard</td>
</tr>
<tr>
<td>Chert</td>
<td>Quartz</td>
<td>Ultra Hard Non-Abrasive</td>
<td>Fine Grain Ultra Hard</td>
<td>Quartz</td>
<td>Chert</td>
</tr>
</tbody>
</table>

**Central Mine Equipment Company**

4215 Rider Trail North • Earth City, MO 63045 • Ph: 314.291.7700 • 800.325.8827 • Fax: 314.291.4880
E-mail: info@cmeco.com • Website: www.cmeco.com
CME SR 8

The 8 stone per carat bit applies the advantage of diamond cutting power to drilling in exceptionally soft, friable formations.

Using natural diamonds and extra hard matrix, extended bit life is achieved in formations that tend to abrade the matrix.

CME MR 15

Designed for coring in badly fractured, soft to moderately hard formations, this bit utilizes a hard matrix and a pilot crown design which stabilizes the cutting face and minimizes hole deviation and vibration. The 15 stone per carat bit with natural diamonds uses a controlled diamond exposure for increased drilling efficiency.

CME MR 25

This bit configuration is designed for coring fractured, medium to hard formations. A hard matrix and natural diamonds, extend bit life and resists abrasion. The modified pilot crown is designed for stability and permits diamonds to be set over a comparatively regular surface to increase load per stone. This coupled with controlled diamond exposure optimizes cutting efficiency.

Reinforced waterways contribute OD and ID strength, minimizing matrix and waterway erosion while providing flushing and cooling of a predetermined diamond pad area.
## Diamond Bits

### BITS - SURFACE SET

<table>
<thead>
<tr>
<th>CME HR 40</th>
</tr>
</thead>
<tbody>
<tr>
<td>This bit provides excellent performance in coring medium-hard to hard broken formations. The diamonds are set in a hard matrix, balancing the need for cutting power with abrasive resistance and ductility. The semi-round crown provides a reduced area over which diamonds can be set. The resulting smaller crown area in contact with the formation improves cutting efficiency and increases penetration. Optimum unit loading of the diamonds keeps them cutting in hard rock.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CME HR 40-60 STEP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hard solid formations are drilling territory for this design which is set with a size blend of natural diamonds. By using a medium concentration of diamonds, cutting efficiency and penetration are optimized allowing maximum loading of the diamonds to keep them cutting. The tapered step crown design of this bit provides good stability and fast penetration. Free cutting is enhanced by this design, facilitating constant mechanical fracturing and chipping of the formation.</td>
</tr>
</tbody>
</table>
## BITS - SURFACE SET

<table>
<thead>
<tr>
<th>Bit Profiles</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>#2 A CROWN</td>
<td>#4 W CROWN</td>
<td>#5 FLAT W CROWN</td>
</tr>
<tr>
<td>#8 MODIFIED PILOT</td>
<td>#9 WIDE PILOT</td>
<td>#10 NARROW PILOT</td>
</tr>
<tr>
<td>#11 WIDE STEP</td>
<td>#12 NARROW STEP</td>
<td>#13 TAPERED CROWN</td>
</tr>
<tr>
<td># OF STEPS OPTIONAL</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**NOTE:** Other crown types for special applications are available upon request.
## BITS - SURFACE SET

<table>
<thead>
<tr>
<th>Size</th>
<th>SR 8</th>
<th>MR 15</th>
<th>MR 25</th>
<th>HR 40</th>
<th>HR 60/40 STEP</th>
</tr>
</thead>
<tbody>
<tr>
<td>N W/L</td>
<td>C36504</td>
<td>C36505</td>
<td>C36506</td>
<td>C36507</td>
<td>C36547</td>
</tr>
<tr>
<td>N W/L2</td>
<td>C36655</td>
<td>C36513</td>
<td>C36514</td>
<td>C36515</td>
<td>C36546</td>
</tr>
<tr>
<td>N W/L3</td>
<td>C36631</td>
<td>C36627</td>
<td>C36628</td>
<td>C36629</td>
<td>C36630</td>
</tr>
<tr>
<td>NWD4</td>
<td>C36520</td>
<td>C36521</td>
<td>C36522</td>
<td>C36523</td>
<td>C36548</td>
</tr>
<tr>
<td>NXB</td>
<td>C36528</td>
<td>C36529</td>
<td>C36530</td>
<td>C36531</td>
<td>C36549</td>
</tr>
<tr>
<td>H W/L</td>
<td>C36608</td>
<td>C36598</td>
<td>C36599</td>
<td>C36600</td>
<td>C36601</td>
</tr>
<tr>
<td>H W/L3</td>
<td>C36621</td>
<td>C36612</td>
<td>C36613</td>
<td>C36614</td>
<td>C36615</td>
</tr>
<tr>
<td>P W/L</td>
<td>C36713</td>
<td>C36703</td>
<td>C36704</td>
<td>C36705</td>
<td>C36707</td>
</tr>
<tr>
<td>P W/L3</td>
<td>C36729</td>
<td>C36720</td>
<td>C36721</td>
<td>C36722</td>
<td>C36723</td>
</tr>
</tbody>
</table>

**NOTE:** All bits set to Reamer Shell Gage (RSG) unless noted. Other set sizes available upon request.

The bits listed above have proven to be successful in the majority of applications and are normally kept in stock for immediate shipment.
<table>
<thead>
<tr>
<th>BITS - TUNGSTEN CARBIDE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbide Tooth</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

The Carbide Tooth core bit is designed to cut soft formations with very small gravel, sticky shales or clay. The tooth bit is provided in 2 styles, Full Sawtooth or Staggered Tooth. Tungsten carbide inserts are selectively placed in the carbide matrix. Waterways are designed for optimum discharge of fluid and aid in controlling matrix abrasion to maximize cutting efficiency and penetration. The carbide bits will not drill hard formations and are constructed with single layer cutting elements. The bit is also available with face discharge ports to reduce washing of the core.

The Tuff-Kut core bit is for general drilling in soft formations such as clay, sand, gypsum or soft shale. The matrix is comprised of tungsten carbide chips suspended in the metal alloy. This bit is similar to an impregnated diamond bit in that the crown is composed of several layers of cutting media. As the bit wears new layers of randomly set carbide chips are exposed. The Tuff-Kut bit is also used to clean steel fragments from existing drill holes.

An oversized bit gage is highly recommended (but not mandatory) for these bits. Oversized bits will not permit passage thru the corresponding casing. (i.e. N size bit thru NW casing)
### BITS - TUNGSTEN CARBIDE

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>N W/L</td>
<td>C36577</td>
<td>C36581</td>
<td>C36560</td>
<td>C36564</td>
<td>C36568</td>
<td>-</td>
</tr>
<tr>
<td>N W/L2</td>
<td>C36578</td>
<td>C36582</td>
<td>C36561</td>
<td>C36565</td>
<td>C36557</td>
<td>-</td>
</tr>
<tr>
<td>N W/L3</td>
<td>C36634</td>
<td>C36635</td>
<td>C36632</td>
<td>C36633</td>
<td>C36636</td>
<td>C36637</td>
</tr>
<tr>
<td>NWD - 4</td>
<td>C36579</td>
<td>C36583</td>
<td>C36562</td>
<td>C36566</td>
<td>C36569</td>
<td>-</td>
</tr>
<tr>
<td>NXB</td>
<td>C36580</td>
<td>C36584</td>
<td>C36563</td>
<td>C36567</td>
<td>C36570</td>
<td>-</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>H W/L</td>
<td>C36605</td>
<td>-</td>
<td>C36604</td>
<td>-</td>
<td>C36606</td>
<td>-</td>
</tr>
<tr>
<td>H W/L3</td>
<td>C36619</td>
<td>-</td>
<td>C36618</td>
<td>-</td>
<td>C36620</td>
<td>-</td>
</tr>
<tr>
<td>P W/L</td>
<td>-</td>
<td>C36711</td>
<td>-</td>
<td>C36710</td>
<td>-</td>
<td>C36712</td>
</tr>
<tr>
<td>P W/L3</td>
<td>-</td>
<td>C36727</td>
<td>-</td>
<td>C36726</td>
<td>-</td>
<td>C36728</td>
</tr>
</tbody>
</table>

**NOTE:** All bits set to Reamer Shell Gage (RSG) unless noted. Other set sizes available upon request.

The bits listed above have proven to be successful in the majority of applications and are normally kept in stock for immediate shipment.
## BITS - PDC (Polycrystalline Diamond Compact)

<table>
<thead>
<tr>
<th>PDC</th>
<th>Geo Set</th>
</tr>
</thead>
</table>

PDC bits are for coring formations too soft and/or sticky for large stone diamond bits such as clay, shale, or sandstone to abrasive, broken siltstone or limestone. Disc shaped cutters consist of a layer of polycrystalline diamonds on a tungsten carbide base. The bit is set with 9 mm or 13 mm diameter cutters. Gage is maintained by natural diamond and hard facing. Waterways are designed for efficient cuttings removal. Oversized gage is highly recommended for these bits. PDC bits are primarily run on drills with high torque and low RPM output.

Geo Set bits are triangular shaped polycrystalline diamond cutters. These bits are designed for high performance in soft abrasive to medium hard formation. The crown design with its intermediate waterways allows for high volume cuttings removal and fast penetration.

Footnote: Attributes of these bits are fast penetration and long life.
# CASING and ROD SHOES

<table>
<thead>
<tr>
<th></th>
<th>Impregnated</th>
<th>Carbide Tooth</th>
<th>Tuff-Kut</th>
</tr>
</thead>
</table>

Casing or wireline rod shoes are used to seat casing or wireline rod into the rock to maintain fluid control during core or rotary drilling applications.

Shoes are designed in several configurations which include: Diamond Impregnated (Standard or Heavy Duty), Surface Set, Carbide Tooth and Tuff-Kut.
# CASING SHOES

<table>
<thead>
<tr>
<th>Size</th>
<th>IMPREGNATED</th>
<th>IMPREGNATED HD</th>
<th>ADVANCER IMPG HD</th>
<th>SAWTOOTH</th>
<th>TUFF-KUT</th>
</tr>
</thead>
<tbody>
<tr>
<td>NW</td>
<td>C36542 3.615”</td>
<td>C36552 3.615”</td>
<td>C36646 3.75”</td>
<td>C36731 3.75”</td>
<td>220500 3.75”</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>C36585 3.75”</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>HW</td>
<td>C36543 4.625”</td>
<td>C36553 4.625”</td>
<td>C36647 4.75”</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>HWT</td>
<td>C36551 4.625”</td>
<td>C36554 4.625”</td>
<td>C36648 4.75”</td>
<td></td>
<td>C36659 4.75”</td>
</tr>
</tbody>
</table>

# WIRELINE ROD SHOES

<table>
<thead>
<tr>
<th>Size</th>
<th>IMPREGNATED</th>
<th>IMPREGNATED HD</th>
<th>25/35 SPC SURFACE SET</th>
<th>TUFF-KUT</th>
</tr>
</thead>
<tbody>
<tr>
<td>H W/L</td>
<td>C36651 3.615”</td>
<td>C36652 3.615”</td>
<td>C36653 3.615”</td>
<td>C36660 3.75”</td>
</tr>
</tbody>
</table>

---

**NOTE:** Other sizes available upon request.

The shoes listed above are normally kept in stock for immediate shipment.

Advancer Impregnated HD is required for the casing advancer system.
REAMER SHELL

<table>
<thead>
<tr>
<th>Standard</th>
<th>Heavy Duty</th>
</tr>
</thead>
</table>

Reamer shells connect the core bit to a core barrel. The outside surface of the reamer shell can be inset with diamonds or hard facing to maintain the gage of the hole as the O.D. of the core bit wears. The proper hole gage is critical. If the hole gage is reduced, the cuttings may not be flushed from the face of the bit. This can result in core grinding. In extreme cases, the core barrel may become difficult or even impossible to remove from the hole. Reamer shells are available in a standard or a heavy duty design.

Note: Oversized, blank, and hardfaced reamer shells are also available.
## REAMER SHELLS

<table>
<thead>
<tr>
<th>Size</th>
<th>DIAMOND</th>
<th>HARD FACED</th>
</tr>
</thead>
<tbody>
<tr>
<td>N W/L</td>
<td>C36532</td>
<td>C36539</td>
</tr>
<tr>
<td>NXB</td>
<td>C36534</td>
<td>C36541</td>
</tr>
<tr>
<td>NWD-4</td>
<td>C36533</td>
<td>C36540</td>
</tr>
<tr>
<td>H W/L</td>
<td>C36544</td>
<td>C36607</td>
</tr>
<tr>
<td>P W/L</td>
<td>C36716</td>
<td>C36715</td>
</tr>
</tbody>
</table>

NOTE: Oversized shells are available upon request.
The Reamer Shells listed above are normally kept in stock for immediate shipment.
## CROSSOVER REAMER SHELLS

<table>
<thead>
<tr>
<th>Size</th>
<th>DIAMOND</th>
<th>HARDFACED</th>
</tr>
</thead>
<tbody>
<tr>
<td>N W/L - NXB</td>
<td>C36536</td>
<td>C36538</td>
</tr>
<tr>
<td>NXB - N W/L</td>
<td>C36535</td>
<td>C36537</td>
</tr>
</tbody>
</table>

NOTE: Cross Over Shells (X-O) permit the use of a bit on one design core barrel to be used on another (i.e. NXB bit on a N W/L barrel)

Oversized shells are available upon request.
The Reamer Shells listed above are normally kept in stock for immediate shipment.
### BIT SET DIMENSIONS

<table>
<thead>
<tr>
<th>CORE BARREL</th>
<th>BIT DIMENSIONS</th>
<th>CORE BARREL</th>
<th>BIT DIMENSIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size</td>
<td>O.D. RSG</td>
<td>I.D.</td>
<td>Size</td>
</tr>
<tr>
<td>EWG, EWM*</td>
<td>1.485</td>
<td>.845</td>
<td>HWD-4</td>
</tr>
<tr>
<td>AWG, AWM*</td>
<td>1.890</td>
<td>1.185</td>
<td>HXB, HWC-3</td>
</tr>
<tr>
<td>A W/L, AV</td>
<td>1.890</td>
<td>1.062</td>
<td>H W/L</td>
</tr>
<tr>
<td>BWG, BWM*</td>
<td>2.360</td>
<td>1.655</td>
<td>H W/L3</td>
</tr>
<tr>
<td>BWD-4</td>
<td>2.360</td>
<td>1.615</td>
<td>P W/L</td>
</tr>
<tr>
<td>BXB, BWC-3</td>
<td>2.360</td>
<td>1.432</td>
<td>P W/L3</td>
</tr>
<tr>
<td>B W/L, BV</td>
<td>2.360</td>
<td>1.432</td>
<td>2.75 X 3.875*</td>
</tr>
<tr>
<td>NWG, NWM*</td>
<td>2.980</td>
<td>2.060</td>
<td>4 X 5.125</td>
</tr>
<tr>
<td>NWD-3, NWD-4</td>
<td>2.980</td>
<td>1.875</td>
<td>4 X 5.5*</td>
</tr>
<tr>
<td>NXB, NWC-3</td>
<td>2.980</td>
<td>1.875</td>
<td>4 X 5.75</td>
</tr>
<tr>
<td>N W/L, NV</td>
<td>2.980</td>
<td>1.995</td>
<td>6 X 7.125</td>
</tr>
<tr>
<td>N W/L2</td>
<td>2.980</td>
<td>1.995</td>
<td>6 X 7.75*</td>
</tr>
<tr>
<td>NXE</td>
<td>2.980</td>
<td>1.995</td>
<td>6.5 X 7.875</td>
</tr>
<tr>
<td>NW/L3</td>
<td>2.980</td>
<td>1.775</td>
<td></td>
</tr>
<tr>
<td>HWG*</td>
<td>3.907</td>
<td>3.000</td>
<td></td>
</tr>
</tbody>
</table>

### SHOE SET DIMENSIONS

<table>
<thead>
<tr>
<th>CASING</th>
<th>SHOE DIMENSIONS</th>
<th>CASING</th>
<th>SHOE DIMENSIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size</td>
<td>O.D.</td>
<td>I.D.</td>
<td>Size</td>
</tr>
<tr>
<td>RW*</td>
<td>1.485</td>
<td>1.185</td>
<td>HW/HWT*</td>
</tr>
<tr>
<td>EW*</td>
<td>1.875</td>
<td>1.495</td>
<td>PW*</td>
</tr>
<tr>
<td>AW*</td>
<td>2.345</td>
<td>1.900</td>
<td>SW*</td>
</tr>
<tr>
<td>BW*</td>
<td>2.965</td>
<td>2.370</td>
<td>UW*</td>
</tr>
<tr>
<td>NW*</td>
<td>3.615</td>
<td>2.992</td>
<td>ZW*</td>
</tr>
</tbody>
</table>

**NOTE:** * Conforms to DCDMA standards. All dimensions are in inches.
<table>
<thead>
<tr>
<th>WHAT TO DO</th>
<th>WHY IT IS DONE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Be sure wrenches never contact the diamonds in bits and shells.</td>
<td>1. Broken stones will result. Diamonds will not stand this kind of abuse.</td>
</tr>
<tr>
<td>2. Use full circle grip inner &amp; outer tube wrenches.</td>
<td>2. Avoid damaging or egg-shaping the tubular connections of the core barrel assembly.</td>
</tr>
<tr>
<td>3. Start a hole with a used bit whenever possible in slow feed at moderate RPM's.</td>
<td>3. The sharp points on a new bit may be broken on a rough rock surface.</td>
</tr>
<tr>
<td>4. Start water circulating before putting a bit on bottom.</td>
<td>4. To remove the cuttings which have settled in the bottom of the hole.</td>
</tr>
<tr>
<td>5. Start a new bit in an existing core hole 4-6 inches from bottom and drill it down.</td>
<td>5. The used bit it replaced may have been slightly under gage.</td>
</tr>
<tr>
<td>6. Run a new bit in slow feed and at moderate RPM for the first few inches.</td>
<td>6. To give the diamonds time to seat themselves in the rock.</td>
</tr>
<tr>
<td>7. Tighten all drill rod joints and wick when necessary, before lowering into the hole.</td>
<td>7. Wash water may escape through joints and the bit will burn in the sludge at bottom.</td>
</tr>
<tr>
<td>8. Grease core barrels and rods.</td>
<td>8. To prevent vibration and its hammering effect, which results in broken diamonds.</td>
</tr>
<tr>
<td>9. Avoid grinding core.</td>
<td>9. Grinding core rapidly destroys both bit and shell.</td>
</tr>
<tr>
<td>10. Remove lost core.</td>
<td>10. Running over loose core is very destructive to the bit.</td>
</tr>
<tr>
<td>11. Avoid dry blocking.</td>
<td>11. The heat generated in dry blocking can render a bit useless.</td>
</tr>
<tr>
<td>13. Never start bits turning under pressure.</td>
<td>13. This will damage the cutting points on the diamonds.</td>
</tr>
<tr>
<td>14. Make sure that fluid is circulating through the bit, before starting to drill.</td>
<td>14. Remember that time is required, particularly on deeper holes, for circulation to reach the bit.</td>
</tr>
<tr>
<td>15. When necessary to improve circulation in sticky ground, never raise the bit more than half an inch off bottom.</td>
<td>15. Short lengths of core may fall in the hole and damage the bit.</td>
</tr>
<tr>
<td>16. Maintain safe storage for bits and shells. They should be removed from the barrel, well oiled, and packed in a separate box.</td>
<td>16. Protects bits and shells from damage.</td>
</tr>
</tbody>
</table>