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Operating Parameters: Bit Load for Geotechnical Core Bits

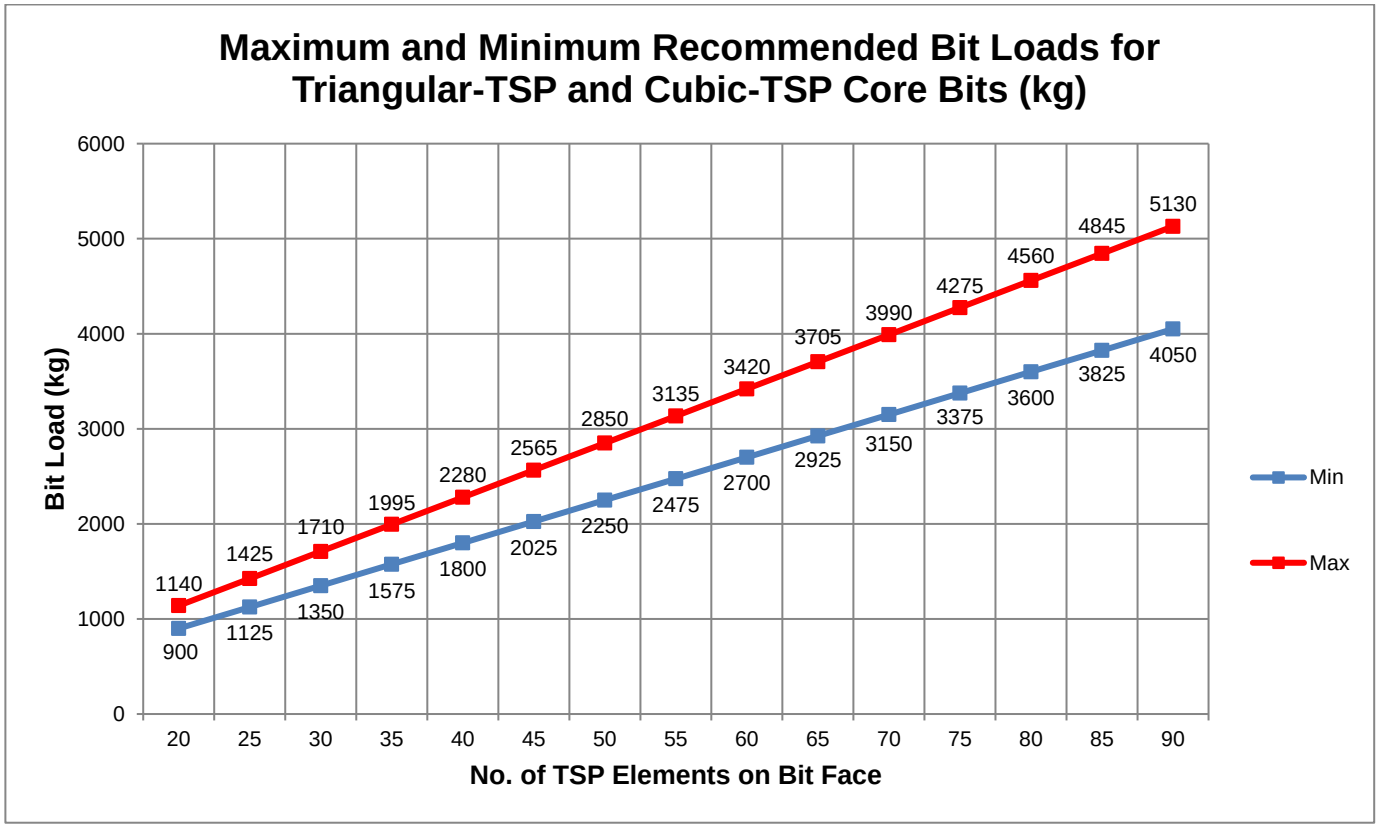
The types of geotechnical core bits that are discussed in this technical data sheet include:

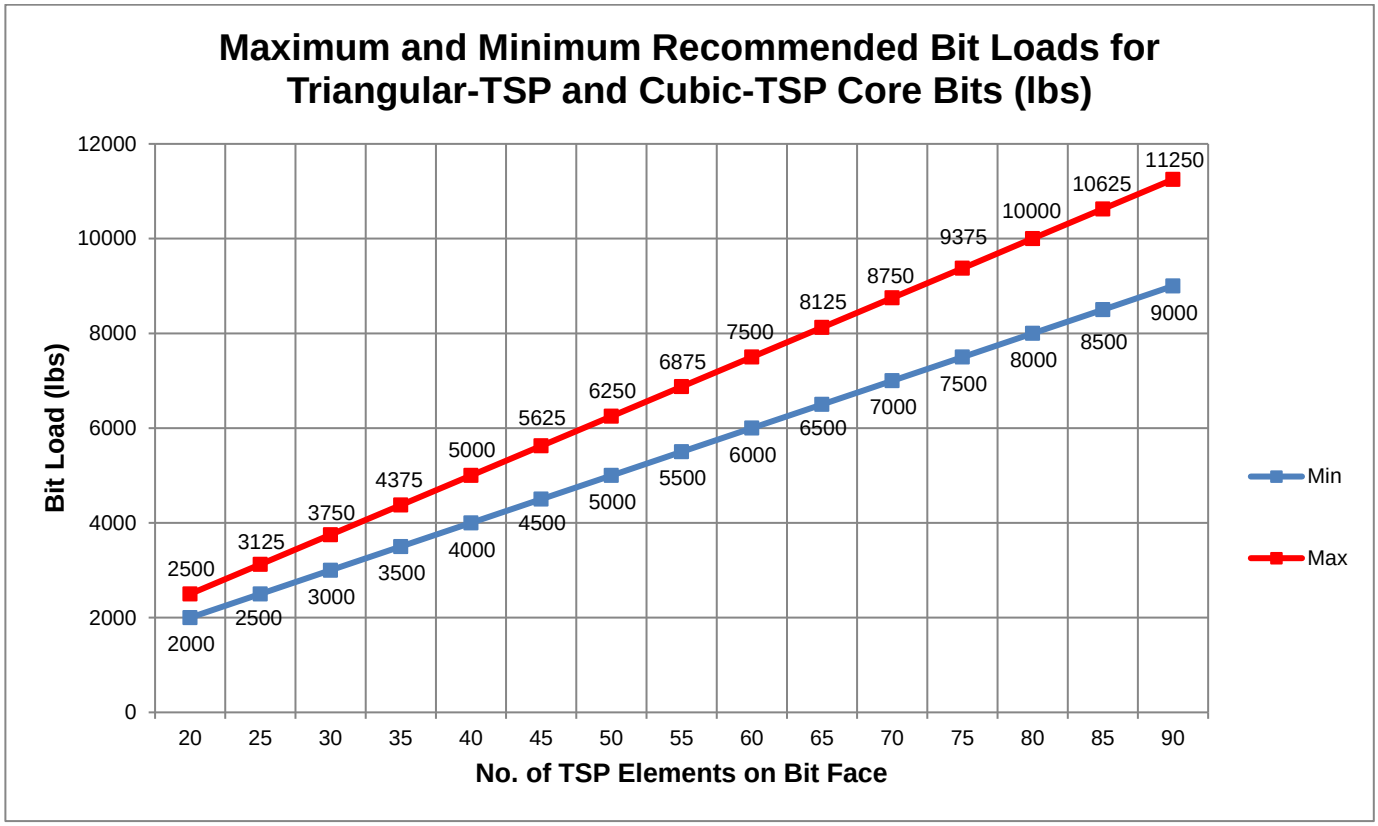
- TSP – Thermally stable polycrystalline diamond (synthetic),
- PDC – Polycrystalline diamond compact (synthetic) – also known as “Pax-set”,
- Saw tooth tungsten-carbide,
- “Carbide-chip” tungsten-carbide.

Bit load requirements for TSP-set and PDC-set bits

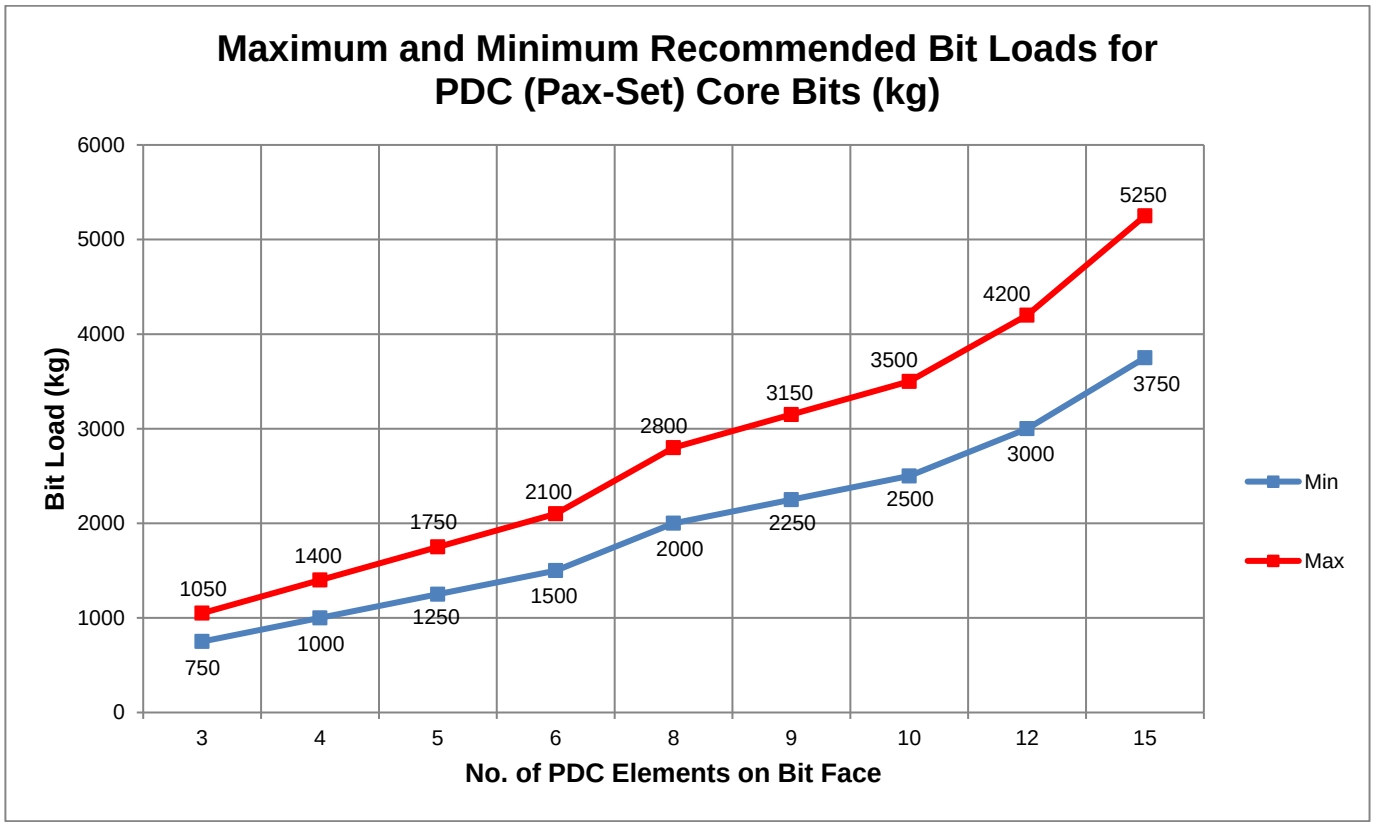
The bits in this group are set with large synthetic diamond cutting elements that require the use of relatively high, sustained bit loads. When applied in appropriate formations, they often provide rates of penetration that are considerably higher than surface-set diamond bits.

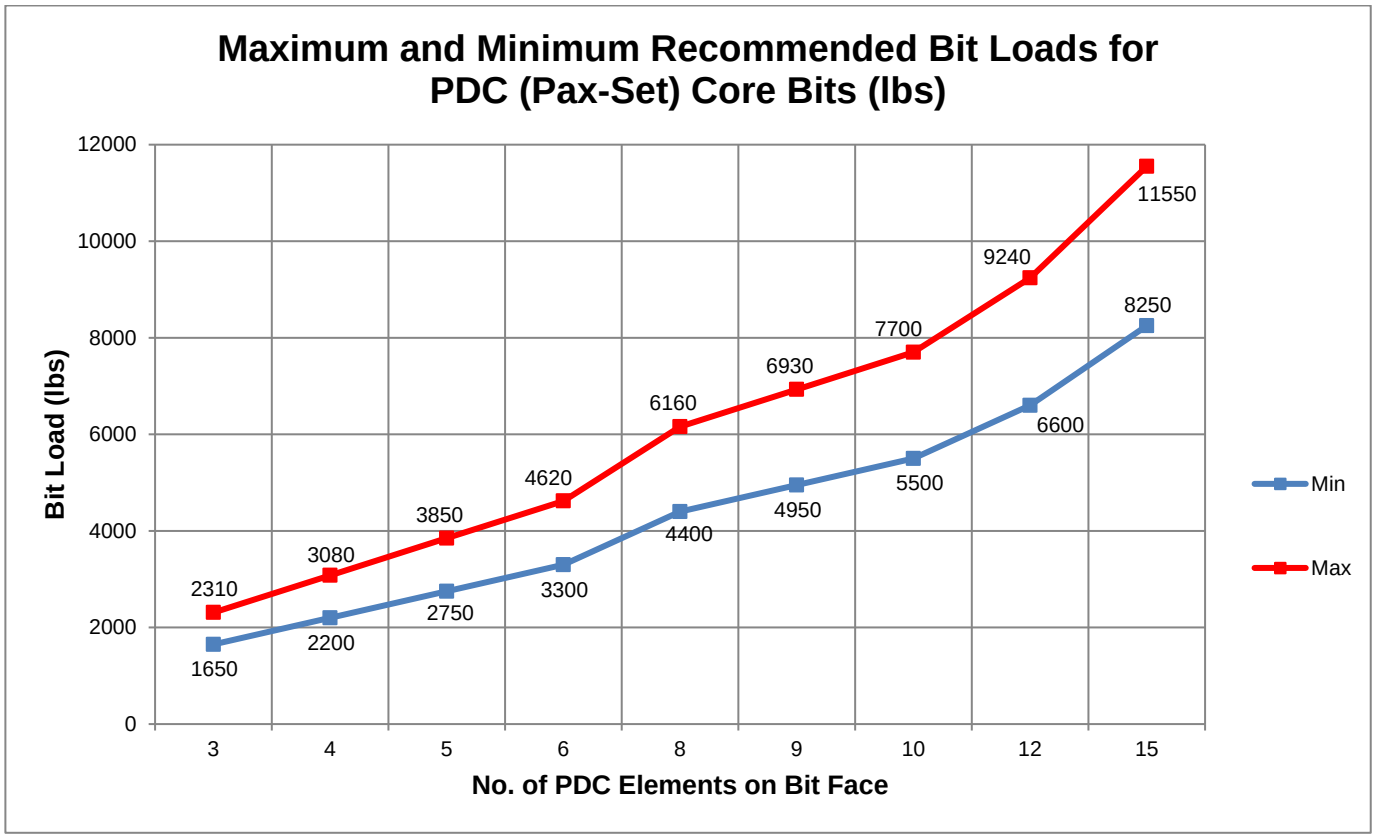
Higher bits loads are necessary to maintain the sharpness of the individual TSP or PDC cutters, particularly in formations of medium hardness. Insufficient bit loads will cause the cutter elements to become glazed and polished. As a result, the bit’s penetration rate will be reduced to virtually zero. However, applied bit loads should not be so high as to exceed the manufacturer’s recommended maximum load rating for the core barrel and drill string in use.
For Triangular-TSP or Cubic-TSP core bits, the recommended bit load is approximately 100 to 125 lbs force (45 kg to 57 kg) per TSP element mounted on the bit face.





For PDC (Pax-set) core bits, the recommended bit load is approximately 550 to 770 lbs force (250 kg to 350 kg) per PDC element mounted on the bit face.





Bit load requirements for “saw-tooth” type tungsten-carbide core bits

Bit load is a function of the total length of the tungsten-carbide cutters that are mounted on the face of the bit. Each of these tungsten-carbide cutters possesses a single cutting edge. The maximum bit load is determined by finding the sum of the linear length of cutting edge on all of the cutters on the bit face and multiplying that sum by a constant of load per unit length of cutting edge.

The formula that is used to calculate the maximum bit load (F) for any “saw-tooth” type tungsten-carbide core bit is given as:

$$F = \left(4.5\,\frac{kg}{mm}\right) n \left(\frac{D-d}{2}\right)$$

Where:
F = The calculated maximum bit load expressed in kilograms.
D = The outside set diameter of the bit crown expressed in millimetres.
d = The inside set diameter of the bit crown expressed in millimetres.
n = The number of tungsten-carbide cutting blades mounted on the bit face.

Bit load requirements for “carbide-chip” type tungsten-carbide core bits

In the case of carbide-chip core bits, bit load is a function of the bit face bearing area. That is, the actual contact area of the bit face with the formation being drilled. The maximum recommended bit load per bit face bearing area is 0.35 kg/mm^2 (500 lbs/inch^2).

The formula that is used to calculate the maximum bit load (F) for any “saw-tooth” type tungsten-carbide core bit is given as:

$$F = \left(0.35\,\frac{kg}{mm^2}\right)\left[\frac{\pi(D^2 - d^2)}{4} - nw\left(\frac{D-d}{2}\right)\right]$$

Where:
F **=** The calculated maximum bit load expressed in kilograms.
D **=** The outside set diameter of the bit crown expressed in millimetres.
d **=** The inside set diameter of the bit crown expressed in millimetres.
n **=** The number of full waterway canals across the bit face kerf.
w **=** The typical width of the waterway canals expressed in millimetres.

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The technical application data in this document is intended as a basic guideline for the selection of the appropriate tools for your job. As drilling conditions and the capabilities of drilling equipment vary considerably from site to site, it is impossible to define absolute parameters for the application of our drilling tools. Some experimentation on the part of the end user may be required as parameters outside of those recommended in Dimatec's product literature may be applicable. Every effort has been made to ensure the accuracy of the data contained in this document. Dimatec Inc. cannot accept any liability due to errors or omissions in the data that we provide. Dimatec Inc. is constantly working to improve our products and therefore reserve the right to make changes to materials, specifications, prices and technical data without prior notice.

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