



*It's not a solution until it works for you*



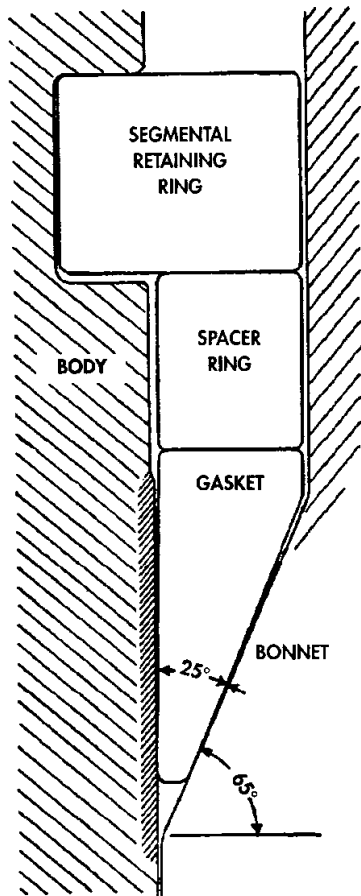
# ***GRAPHITE PRESSURE SEALS FOR VALVE BONNETS***



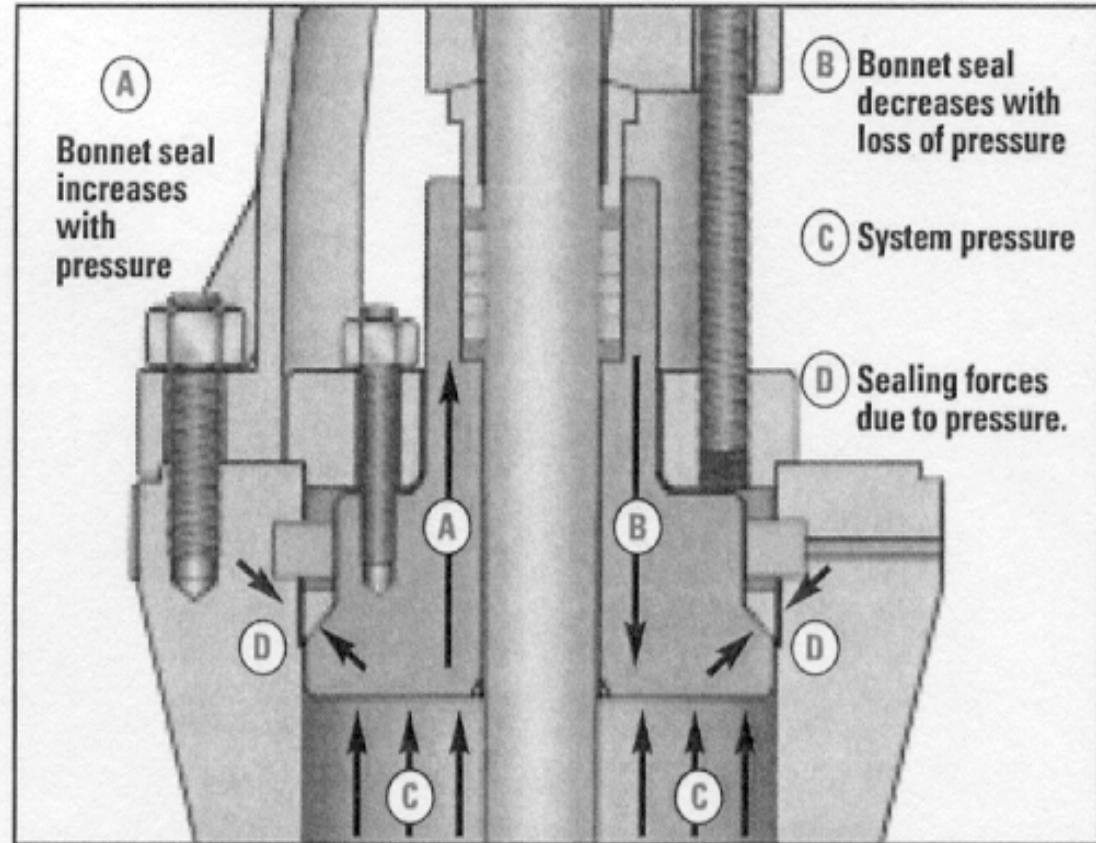
## ***IMPROVED PERFORMANCE, REDUCED COST***

140 Parker Court, Chardon, OH 44024 Tel: 440-285-5835 Email: [egc@egc-ent.com](mailto:egc@egc-ent.com) website: [www.egc-ent.com](http://www.egc-ent.com)

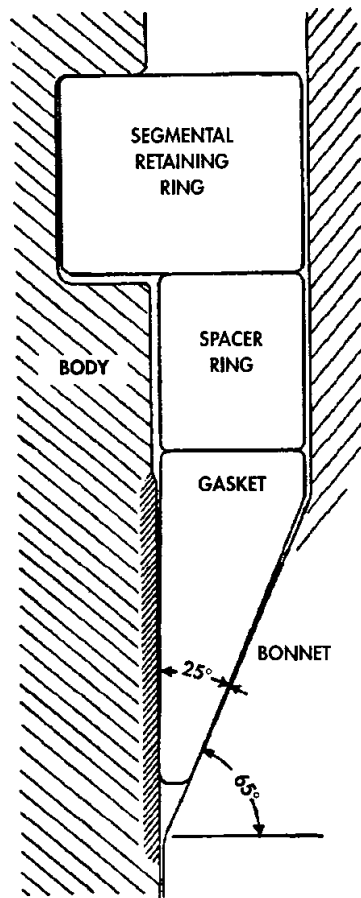
# Typical Metal Pressure Seal Bonnet



## STANDARD DESIGN



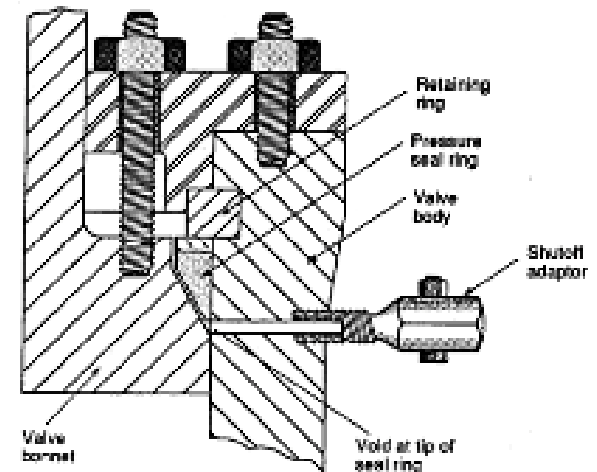
# Sealing Requirements for Metal Pressure Rings



- Extremely high unit load to seal
- Bonnet bolting alone does not create this load
- Reliance on system pressure to create initial seal
- Expensive hard-face inlay to protect valve body wall
- All sealing surfaces must be pristine & tight tolerance
  - Surface finish 32 RMS min
  - No foreign material on surfaces
  - Cavity diameters & roundness .002" - .005" tolerance range, angle within  $\frac{1}{2}^\circ$
- Oversize metal seal required to fit oversize machined body cavity

# ***Metal Pressure Seal Known Issues***

- Leaks at start-up may result from:
  - Low system pressure / load on seal
  - Imperfect sealing surfaces
    - Debris / foreign material
    - Rough or marred surface finishes
    - Out of round body
    - Steam cut
    - Improper seal sizing
  - Thermal expansion – Seal < Valve Body
    - Expensive leak-sealing repair injection may be necessary to keep plant online



# *Metal Pressure Seal Known Issues*

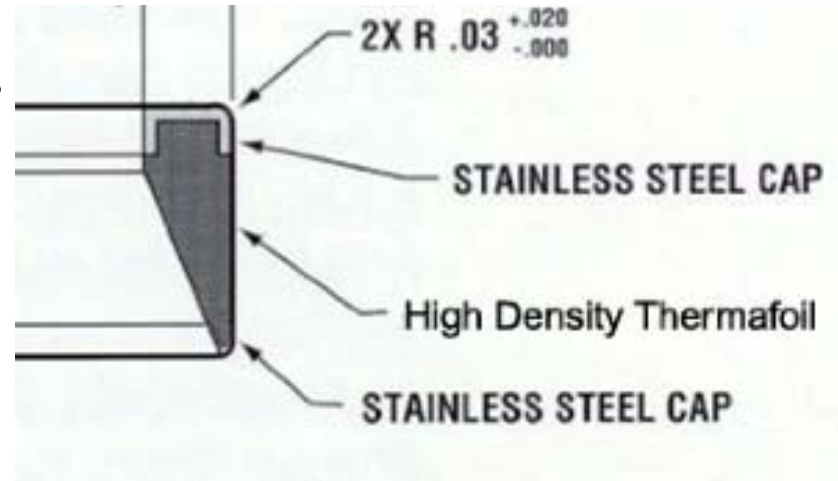


- Galling / Welding of seal to body
  - Seal must be torch-cut out for removal causing valve damage & further repair
  - Increases valve disassembly time
  - Caused by extreme load forces acting on seal toe
  - High temps & thermal cycling



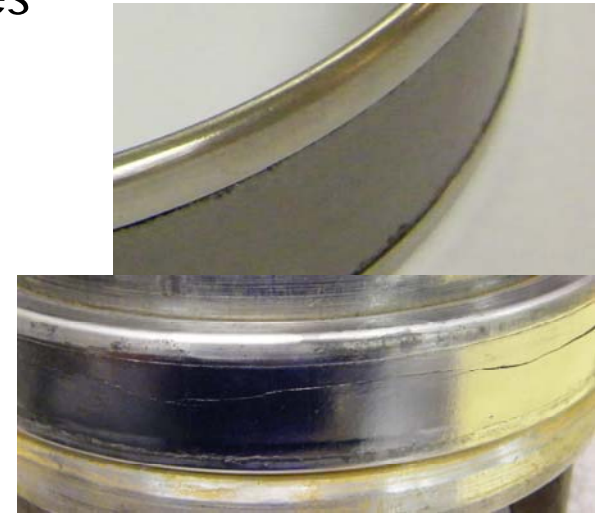
# *Thermafoil Graphite Pressure Seals*

- Conventional Pressure Seal
  - Die Formed High-Density Thermafoil
  - .030" min Stainless Steel Caps
  - 3-4 Week Lead Time
  - Tooling Cost for new sizes
- VSG™
  - High-Density Thermafoil Graphite
  - .030" min Stainless Steel Caps
  - 48-Hour Max Lead Time (FastTrac)
  - \$0 Zero Tooling Cost



# *The Benefits of Thermafoil Graphite*

- Low load to seal
  - In most cases, bonnet bolt load achieves minimum load to seal
  - Seal fully intact at system start-up
- Reduce valve disassembly time
  - Quick removal of used seal
  - Graphite does not weld or gall to mating components
- Reduce valve repair time
- Seals on imperfect surfaces – Less machining
- Forgiving to broad cavity tolerances – Tested to .060" oversize cavity & .060" out of round body conditions
- Seals over steam cuts – Tested to .030" x .080" across entire sealing surface





## ***Tested & Proven***

### **U.S. Naval Nuclear Valve Qualification Test**

- Passed standard pressure, thermal & shock testing
- Passed failure mode testing including:
  - Condition 1 – Oversize body cavity
    - Body machined .060" oversize
  - Condition 2 – Out of round body cavity
    - Cavity machined .060" out of round
  - Condition 3 – Surface imperfections (steam cut)
    - .030" x .080" groove machined across entire sealing face
  - Zero leakage recorded through all events
  - EGC the only approved supplier to U.S. Navy



## *Tested & Proven*

### Nuclear Steam Valve Accelerated Life Test

- Completed at U.S. largest nuclear power station
- 25-Year accelerated life cycle test of graphite pressure seal
- Fixture consisted of bonnet from 15", 900 # class check valve (16" x 14")
- 5 seals tested under cyclic pressure & temperature conditions to 200 total hours each (25 cycles @ 8 hrs)
- Test environment: 2,250 psig saturated steam, temp cycled from ambient to 700°F
- Zero leakage recorded through all events



## EGCpressure-seal

**Designed as a resilient graphite valve bonnet gasket, the EGCpressure-seal** requires significantly lower load than its metal counterpart, while providing you far superior sealing. Constructed of high-density Thermafoil® flexible graphite and heavy gage stainless steel top and bottom caps, EGCpressure-seals provide rugged performance in this extreme environment. The steel caps offer strength, extrusion resistance and graphite containment while the Thermafoil core easily conforms to irregular sealing surfaces. In fact, due to its resilience the graphite acts as a high-temperature spring to continually maintain seal to cavity contact that is crucial during thermal and pressure cycles. You'll find EGC's robust design not only outperforms plated metal rings, but also affords greater durability than other graphite pressure seals on the market. Some designs have thin metal foil caps, or no caps at all greatly increasing the potential for seal extrusion, leakage and failure. At the extreme operating pressures and load forces acting on the sealing element, it is critical the pressure seals are properly contained.

### Benefits

**Lower Total Operating Cost** — EGCpressure-seals not only cost less than silver-plated metal rings, they will reduce your valve operating and maintenance costs in a number of ways.

**Trouble-free seal removal** — Compared to removal of metal pressure seals, you'll save literally hundreds of man-hours during change-out. Simply loosen the nuts on the bonnet studs and push the bonnet away. In most cases the weight of the bonnet will break the joint, and the seal and mating valve components are easily disassembled.

**No need to machine or resurface valve sealing surfaces** — EGCpressure-seals install quickly as the Thermafoil flexible graphite easily conforms to irregular surfaces and will even tolerate out-of-round valve components.

**Reduced inventory** — No need to stock oversize metal seals to fit remachined valves. EGCpressure-seals sized to the original OEM cavity dimensions are designed to accommodate the full range of cavity machining allowed by the OEM valve manufacturer.

**Proven Performance Advantages** — EGCpressure-seals require significantly lower loads to seal and are much more resilient than their all-metal counterparts.

**Thermal Compensation** — Flexible graphite's coefficient of thermal expansion actually causes it to shrink slightly as temperature rises. EGC has developed a proprietary method that reverses this effect and allows the pressure seal to expand at the same rate as the surrounding valve components, thus insuring seal contact is maintained.

**U.S. Naval Approved** — EGC's is the only graphite pressure seal tested and approved by the U.S. Navy for use in Standard Navy Control Valve designs aboard nuclear-propulsion vessels.

**Tested and Proven** — A major Southwestern U.S. nuclear power station has performed extensive life-cycle testing on EGCpressure-seals. Their accelerated 30-year life test subjected seals to numerous potential failure modes and cyclic temperature and pressure conditions. Since the test inception in 1993, and during in-plant use of EGCpressure-seals, they report hundreds of man hours have been saved during outages with zero seal-related failures and zero leakage recorded.

[www.egc-ent.com](http://www.egc-ent.com)

SEALING | HEATING | FASTENING | THERMAL TRANSFER

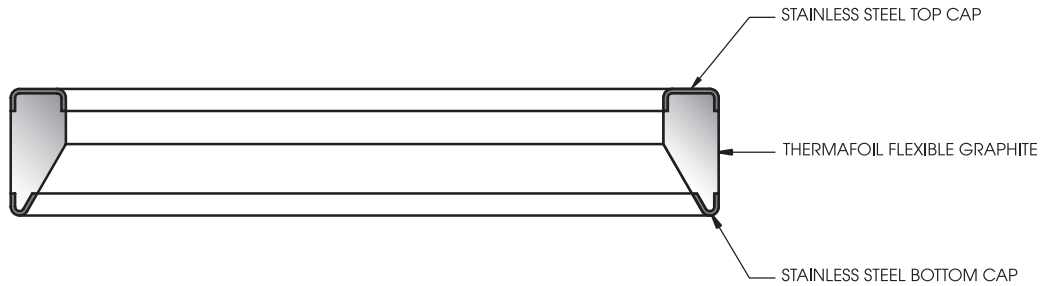


Innovative. ingenious. industrious.

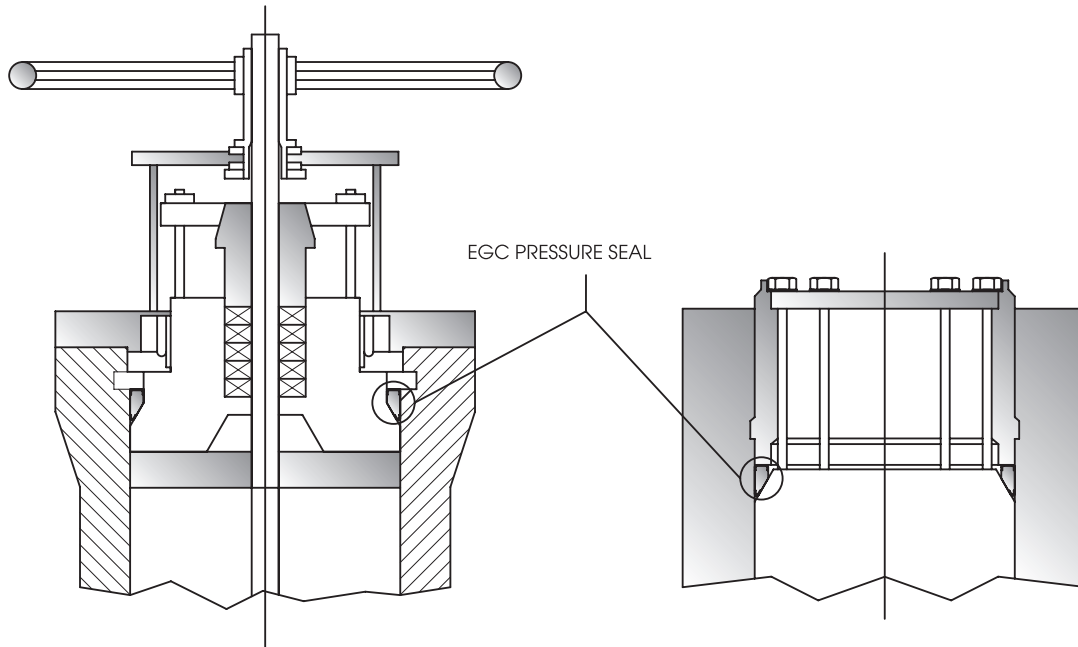
# EGCpressure-seal

## EGCpressure-seal

The EGCpressure-seal with double stainless steel anti-extrusion caps.



The EGCpressure-seal has been tested and approved by several OEM control valve manufacturers, aftermarket customers and the U.S. Navy. It is also in use at several nuclear and fossil-fuel power generation facilities throughout the U.S.



 *Innovative. ingenious. industrious.*

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Toll-Free 1-800 EGC-0211 | Toll-Free Fax 1-800 EGC-3363 | [www.egc-ent.com](http://www.egc-ent.com)

 Certified to ISO 9001:2000 including design and AS9100B:2004

## ***VSG Graphite Pressure Seal***

*Available through EGC's exclusive **FastTrac™ Program***

EGC Enterprises, the industry leader in providing High Performance Graphite Pressure Seals for critical high pressure valves, announces *VSG FastTrac*. EGC has addressed the needs of our customers again by developing a pressure seal with no tooling charge and a reduced lead time. EGC's VSG Graphite Pressure Seal offers:

- **ZERO tooling \$**
- **48 hour max lead time through FastTrac program.**
- **Leak-Free, Exceptional Reliability**



The result . . . a Thermafoil flexible graphite seal with stainless steel top and toe caps that performs at the same leak free levels as the high-density pressure seals EGC has been producing for nearly 20 years.

The next time you have pressure seal requirements, you can rest assured that EGC's VSG Graphite Pressure Seal will meet your performance and budgetary needs in a timely manner. For more information please contact the EGC sales team at 800-342-0211 or [egc@egc-ent.com](mailto:egc@egc-ent.com).



\*VSG Graphite Pressure Seal is available through FastTrac program for seals up through 23" OD.



## ***EGC FastTrac QuickShip Program***

For over 30 years EGC has been an industry leader in the design and manufacturing of high temperature fluid seals. Through extensive work with power generation, refining, and petrochemical facilities along with valve repair firms we have recognized the need for a rapid production process that allows for immediate shipment of sealing products for your critical applications. The EGC FastTrac QuickShip Program provides.

- 48 hour max lead time
- Many products available through FastTrac program have no tooling charge.
- Reliable, high quality engineered products that are synonymous with EGC Enterprises.

EGC's FastTrac QuickShip Program enables our customers to receive reliable sealing products in an expedited time frame that will reduce downtime and maintain your outage schedule. For more information please contact the EGC sales team at 800-342-0211 or [egc@egc-ent.com](mailto:egc@egc-ent.com).



# Thermafoil<sup>®</sup> Graphite Pressure Seal Data Sheet

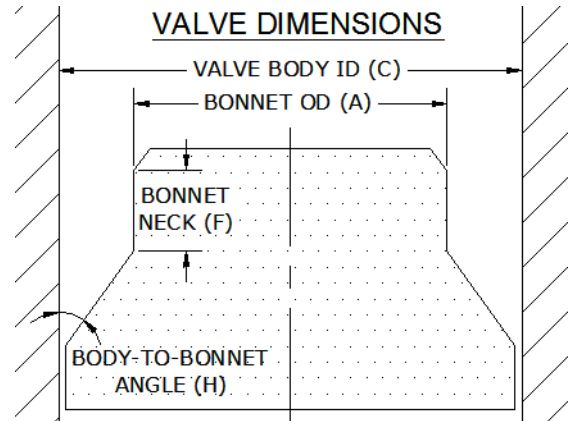
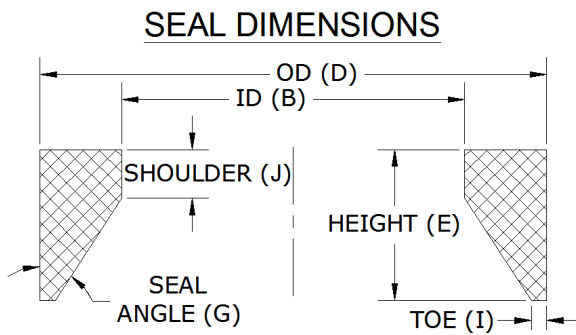
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**The following information is necessary to accurately quote and design your graphite replacement pressure seal. Please answer all of the questions below.**

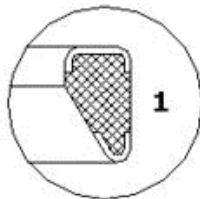
Company: \_\_\_\_\_ Contact Name: \_\_\_\_\_

Phone: \_\_\_\_\_ Email: \_\_\_\_\_

Name of valve manufacturer?: \_\_\_\_\_ Qty. of Seals Required? \_\_\_\_\_



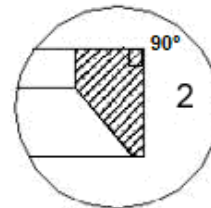
**Please select your seal style from the sketches shown below and provide the "Required Data". Accurate dimensions are required to ensure proper fit & function of the seal.**



Graphite Seal (Typical Style)

**Required Data:**

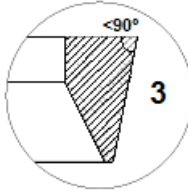
- 1) A) Bonnet OD: \_\_\_\_\_ inches
- OR B) Seal ID: \_\_\_\_\_ inches
- 2) D) Seal OD: \_\_\_\_\_ inches
- OR C) Valve Body ID: \_\_\_\_\_ inches
- 3) E) Seal Height: \_\_\_\_\_ inches
- 4) G) Seal Angle: \_\_\_\_\_ Degrees
- OR H) Body-to-Bonnet Angle \_\_\_\_\_ Degrees
- 5) I) Toe Width: \_\_\_\_\_ inches
- 6) Were these dimensions taken from a used or new seal? USED NEW
- 7) What is the valve pressure class? \_\_\_\_\_



Metal Seal (Typical Style)

**Required Data:**

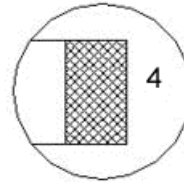
- 1) A) Bonnet OD: \_\_\_\_\_ inches
- 2) D) Seal OD: \_\_\_\_\_ inches
- OR C) Valve Body ID: \_\_\_\_\_ inches
- 3) E) Seal Height: \_\_\_\_\_ inches
- 4) F) Bonnet Neck Height: \_\_\_\_\_ inches
- 5) G) Seal Angle: \_\_\_\_\_ Degrees
- OR H) Body-to-Bonnet Angle: \_\_\_\_\_ Degrees
- OR J) Shoulder: \_\_\_\_\_ inches
- 6) I) Toe Width: \_\_\_\_\_ inches
- 7) What is the valve pressure class? \_\_\_\_\_



Metal Seal (Powell Style)

**Required Data:**

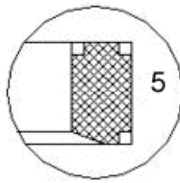
- 1) A) Bonnet OD: \_\_\_\_\_ inches
- 2) D) Seal OD: \_\_\_\_\_ inches
- 3) E) Seal Height: \_\_\_\_\_ inches
- 4) F) Bonnet Neck Height: \_\_\_\_\_ inches
- 5) G) Seal Angle: \_\_\_\_\_ Degrees
- OR H) Body-to-Bonnet Angle: \_\_\_\_\_ Degrees
- 6) I) Toe Width: \_\_\_\_\_ inches
- 7) J) Shoulder: \_\_\_\_\_ inches
- 8) Seal OD at Toe: \_\_\_\_\_ inches
- 9) What is the valve pressure class? \_\_\_\_\_



Graphite Seal (Rectangular Non-Capped Style)

**Required Data:**

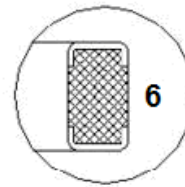
- 1) A) Bonnet OD: \_\_\_\_\_ inches
- OR B) Seal ID: \_\_\_\_\_ inches
- 2) D) Seal OD: \_\_\_\_\_ inches
- OR C) Valve Body ID: \_\_\_\_\_ inches
- 3) E) Seal Height: \_\_\_\_\_ inches
- 4) Were these dimensions taken from a used or new seal? USED NEW
- 5) What is the valve pressure class? \_\_\_\_\_



Graphite Seal (Rockwell/Edwards Style)

**Required Data:**

- 1) A) Bonnet OD: \_\_\_\_\_ inches
- OR B) Seal ID: \_\_\_\_\_ inches
- 2) D) Seal OD: \_\_\_\_\_ inches
- OR C) Valve Body ID: \_\_\_\_\_ inches
- 3) E) Seal Height: \_\_\_\_\_ inches
- 4) Were these dimensions taken from a used or new seal? USED NEW
- 5) What is the valve pressure class? \_\_\_\_\_
- 6) Corner Ring Cross-section: \_\_\_\_\_ inches



Graphite Seal (Rectangular Capped Style)

**Required Data:**

- 1) A) Bonnet OD: \_\_\_\_\_ inches
- OR B) Seal ID: \_\_\_\_\_ inches
- 2) D) Seal OD: \_\_\_\_\_ inches
- OR C) Valve Body ID: \_\_\_\_\_ inches
- 3) E) Seal Height: \_\_\_\_\_ inches
- 4) Were these dimensions taken from a used or new seal? USED NEW
- 5) What is the valve pressure class? \_\_\_\_\_