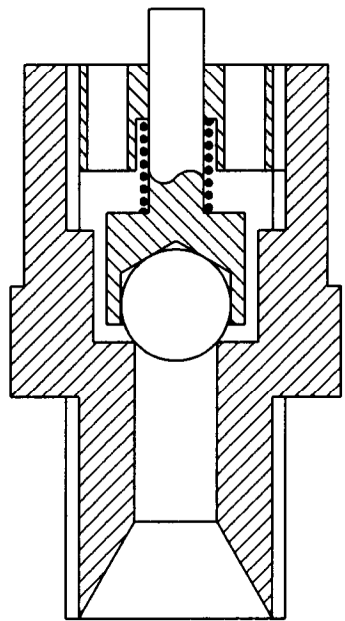
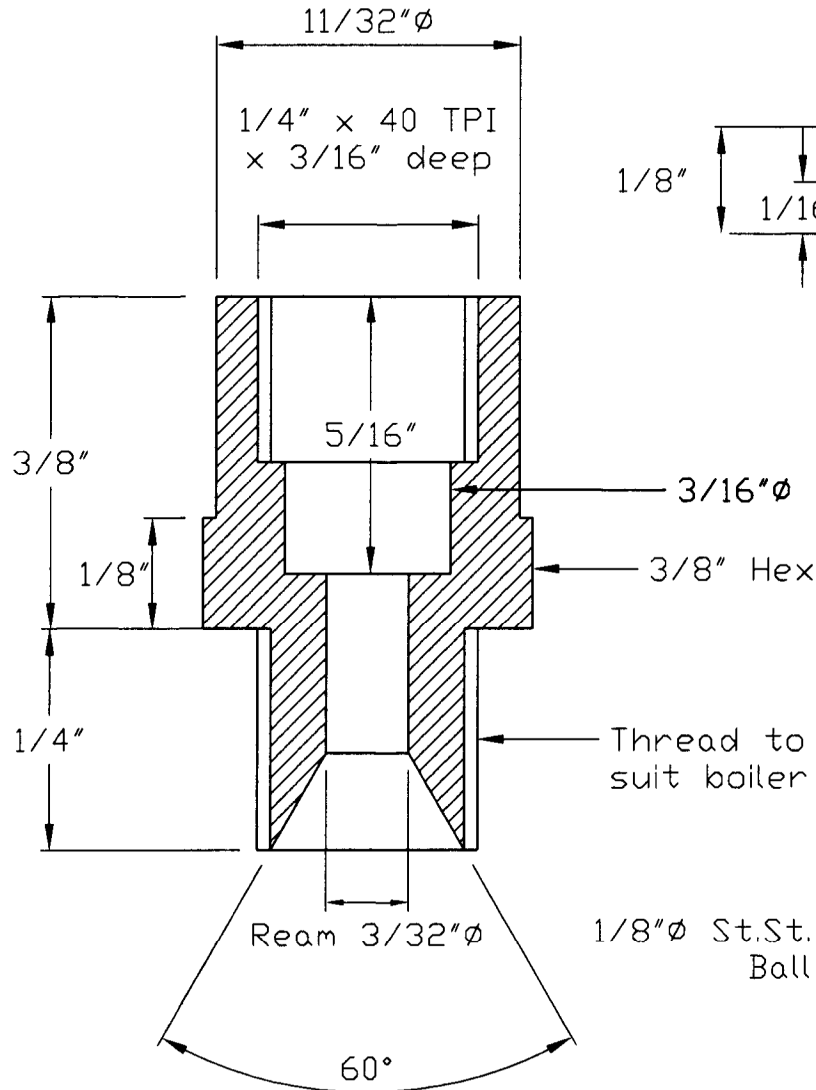


# GAUGE 1 SAFETY VALVE

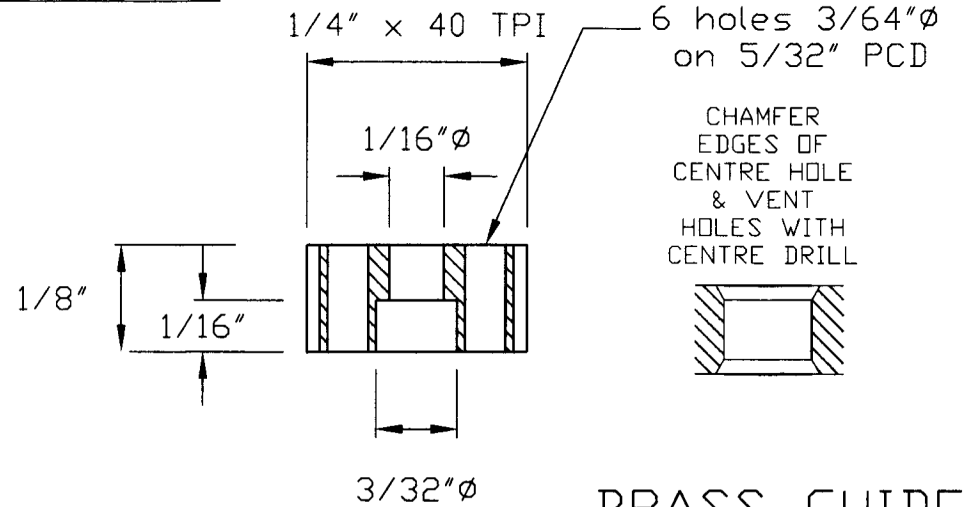
BRONZE or  
G/M BODY



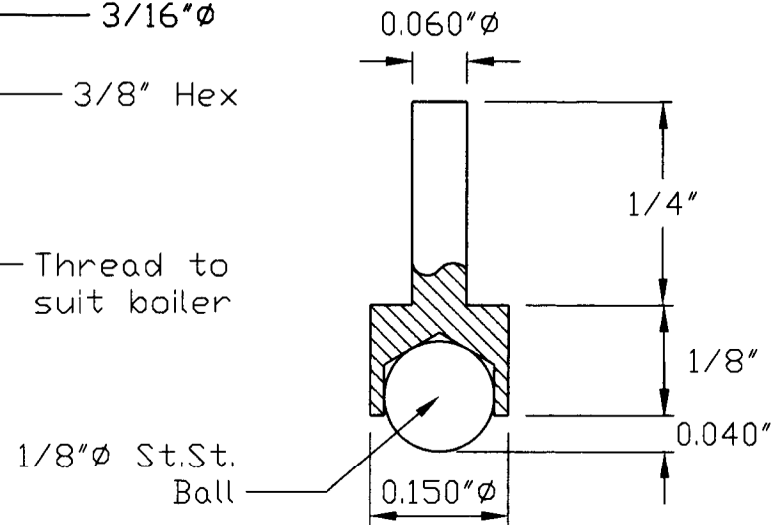
SPRING "LEE"  
C1-010B-2-SS



$1/4" \times 40 \text{ TPI}$  6 holes  $3/64" \phi$   
on  $5/32" \text{ PCD}$



BRASS GUIDE  
& ADJUSTER



## SAFETY VALVE DESIGN

### I/ SIMPLE or MILD POP

SIMPLE type valves can be made to work quite well, if well designed but they are limited in their steam handling capacity.

Even when well designed the accumulation will rise rapidly as steam flow increases. As a consequence they often have to be set to lift well below the nominal working pressure to prevent the pressure from rising above the allowable 10%, on high performance boilers.

### Spring selection

For the SIMPLE type valve the spring "rate" is very important and I would recommend that it should be approx.  $1/32$  x the seat dia. i.e. for a  $5/32$ " bore valve the "rate" should be 5 lb./in., and for a  $3/16$ " bore seat 6 lb./in. etc. The "solid" load (the force required to make the spring coilbound) should be approx. 1.5 x the working force (that required to balance the steam pressure at the nominal working pressure).

**NEVER** use a spring cut from a long length. It is very important that the spring is close wound at its ends and ground square. Out of square ends or cut springs with "pig tail" ends will bias the ball to one side of its seat when the valve lifts, and make re-seating difficult. Out of squareness of the spring will also tilt the guide spindle to one side of the adjuster hole and create unnecessary friction, which will also impair the re-seating process.

For the MILD POP design I select a spring having a rate of approx. 2 to 2.5 x the rate of a SIMPLE design i.e. approx 80 x the seat dia. This is possible due to the extra lifting force provided by the action of the exhaust steam impinging on the shroud around the ball. The stiffer spring also enables the MILD POP design to be made shorter than the SIMPLE design and more in keeping with some of the modern prototypes.

### Adjuster cap & Vent holes

The SIMPLE type valve cannot tolerate a back pressure build up within the valve body and to prevent this it requires a vent area of approx. 1.5 x the seat area. To achieve this I normally drill 6 vent holes  $1/2$  the dia. of the valve seat.

For the MILD POP the vent area can be reduced to approx. that of the valve seat, (again due to the added lift provided by the exhaust steam impinging on the shroud).

This enables the dia. of the valve body to be reduced slightly, which is some times desirable.






### Re-seating problems

One of the most common problems with safety valves is that they are often very reluctant to re-seat after lifting. My experiments suggest that the most likely causes (as discussed earlier), are either an un squarely ground spring, inadequate clearance between the guide spindle and adjuster, sharp edges (no chamfer) in the adjuster guide hole, or a rough surface on the guide spindle.

It is advisable to smooth out the turning marks on the guide spindle by polishing it along its length with fine emery axially.

The above problems apply to both the SIMPLE design and the MILD POP

# SAFETY VALVE SPRING DETAILS

VALVE SEAT DIAMETER & Drng No.	VALVE STYLE Short/Tall	SUITABLE for LOCO TYPE	'LEE' SPRING Part No	PRICE per SPRING
 1/8" Mild Pop SV # 1	TALL	MOLLY-TICH etc.	LC-016A-3-SS	£1-40p
5/32" Mild Pop SV # 2	TALL	LARGE 3-1/2" SMALL 5"	LCM-055B-4-SS	£1-40p
 5/32" Mild Pop SV # 2A	SHORT (1/2" Tall) 100 lb/sq.in	ditto	LC-021AB-4-SS	£1-40p
5/32" Mild Pop SV # 2B	SHORT (7/16" Tall) 90 lb/sq.in	HEILAN LASSIE	LC-018AB-2-SS	£1-40p
3/16" Mild Pop SV # 3	TALL	SIMPLEX MAID of KENT etc.	LC-026C-3-SS	£1-50p
3/16" Mild Pop SV # 3A	SHORT (1/2" Tall)	Other 5" G. LOCO'S	LCM-060B-5-SS	£1-50p
7/32" Mild Pop SV # 4	TALL	ditto	LC-029C-3-SS	£1-50p
7/32" Mild Pop SV # 4A	SHORT (5/8" Tall)	ditto	LC-029C-3-SS	£1-50p
 1/4" Mild Pop SV # 5	TALL	LARGE 5" G. & SMALL 7-1/4" LOCO'S	LCM-080D-5-SS	£1-50p
1/4" Mild Pop SV # 5A	SHORT (13/16" Tall)	LARGE 5" G. & SMALL 7-1/4" LOCO'S	LCM-080D-5-SS	£1-50p
 1/4" Mild Pop SV # 5B	Twin RAMSBOTTOM Type	LARGE 5" G. & SMALL 7-1/4" LOCO'S	LC-040C-15-SS	£2-00p
5/16" Mild Pop SV # 6	TALL	STANDARD G. 7-1/4" LOCO'S	LC-042E-8-SS	£1-60p
 5/16" Mild Pop SV # 6A	AMERICAN STYLE	STANDARD G. 7-1/4" LOCO'S	LC-042E-8-SS	£1-60p
3/8" Mild Pop SV # 7	TALL	NARROW G. 7-1/4" LOCO'S (HUNSLET)	LC-055G-5-SS	£1-75p

THE ABOVE PRICES ARE EQUIVALENT TO THE MANUFACTURERS PRICES  
FOR QUANTITIES OF 1-3 off

I BUY IN MEDIUM QUANTITIES  
THIS SAVES THE CUSTOMER FROM PAYING THE 'LEE' £20 Min. ORDER CHARGE  
PLEASE ADD 50p per ORDER TO COVER POSTAGE & PACKING

SAFETY VALVE DRAWINGS are 25p EACH

GORDON SMITH, 52 DOVERIDGE ROAD, BURTON-on-TRENT DE15 9GD 01283 546176

GORDON@doveridgerd.freemove.co.uk

10/5/2003

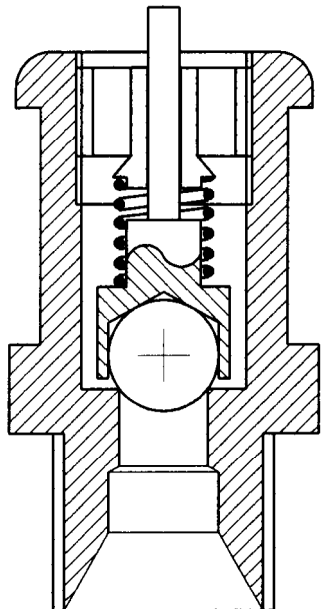
# 1/4" MILD POP Safety Valve

Nominal Working Pressure  
90 to 100 lb/sq.in

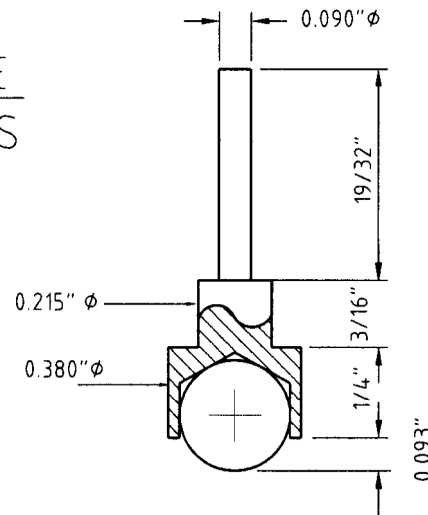
## BODY

7/8" A/F HEX. BRONZE

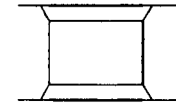
Ball  $\phi$  5/16"



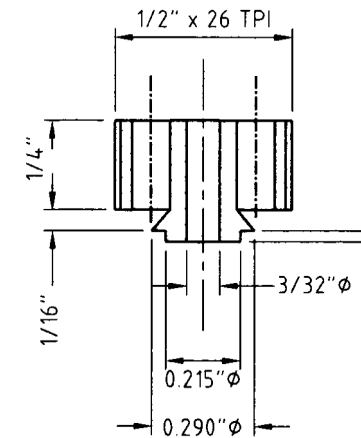
## GUIDE BRASS



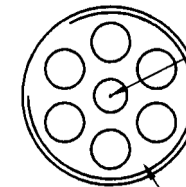
CHAMFER EDGES OF  
CENTRE HOLE &  
VENT HOLES WITH  
CENTRE DRILL



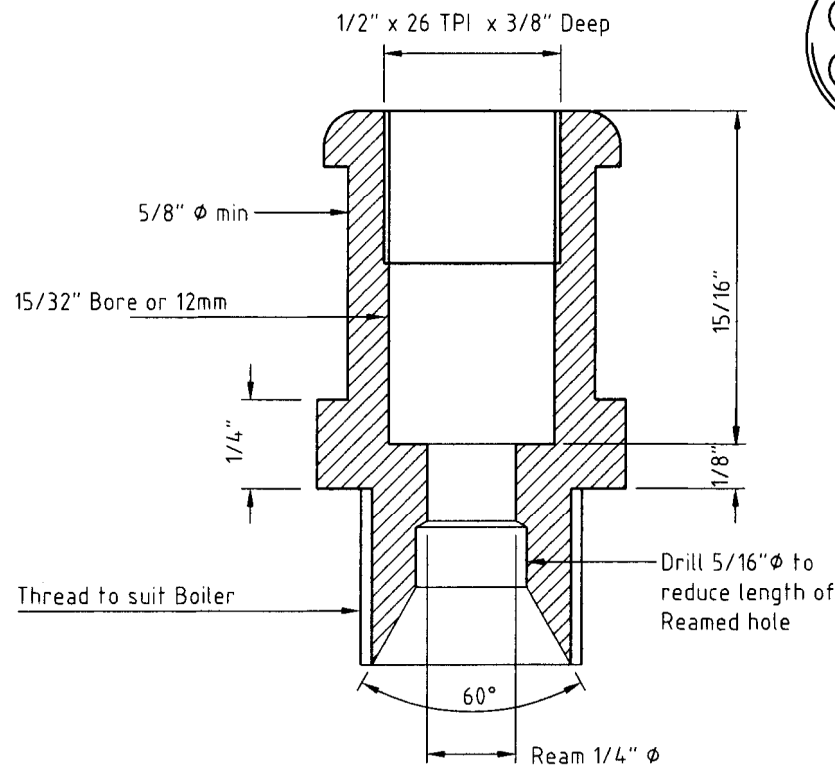
## ADJUSTER BRASS



Centre Hole 3/32"  $\phi$



6 Holes 7/64"  $\phi$  on 0.300" P.C.D.



NOTE! Shroud dia. could be increased to 0.395"  $\phi$  Max. if necessary, to increase the capacity

Spring "LEE" LCM-080D-5- SS

Modified 24/6/2003

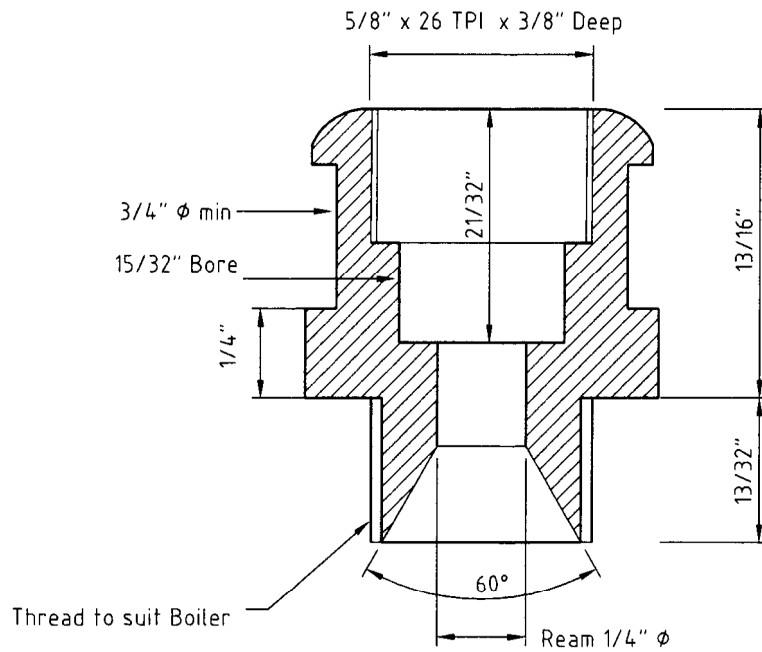
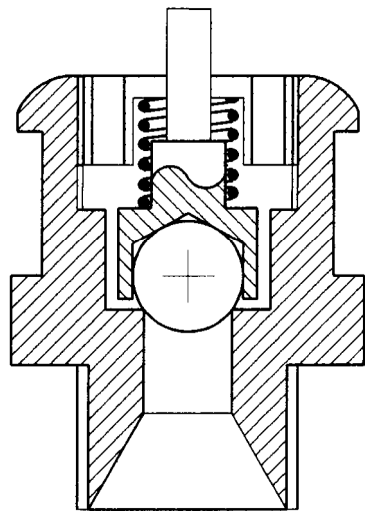
SV # 5

# 1/4" MILD POP - SHORT VERSION

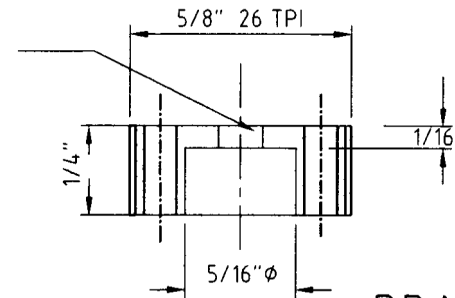
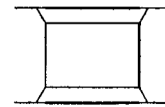
## BODY

1" A/F HEX. BRONZE

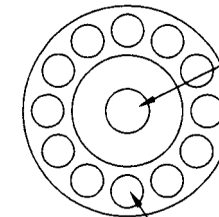
Ball  $\phi$  5/16"



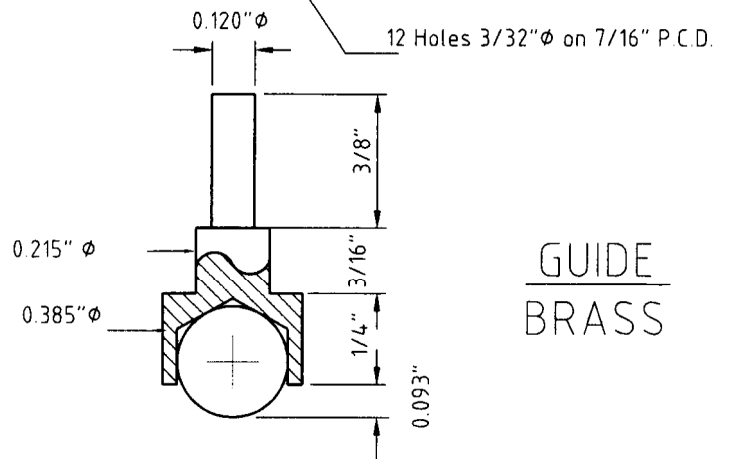
CHAMFER EDGES OF  
CENTRE HOLE &  
VENT HOLES WITH  
CENTRE DRILL



## BRASS ADJUSTER



Centre Hole 1/8"  $\phi$



## GUIDE BRASS

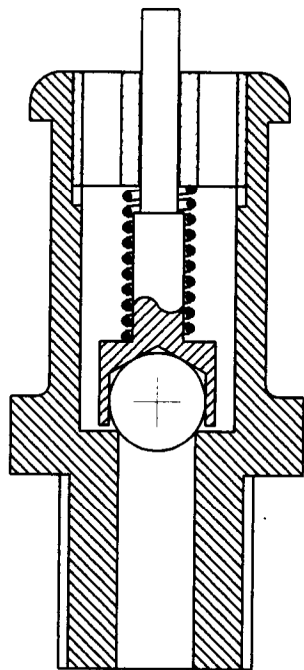
Spring "LEE" LCM-080D-5- SS

Modified 22/6/2003

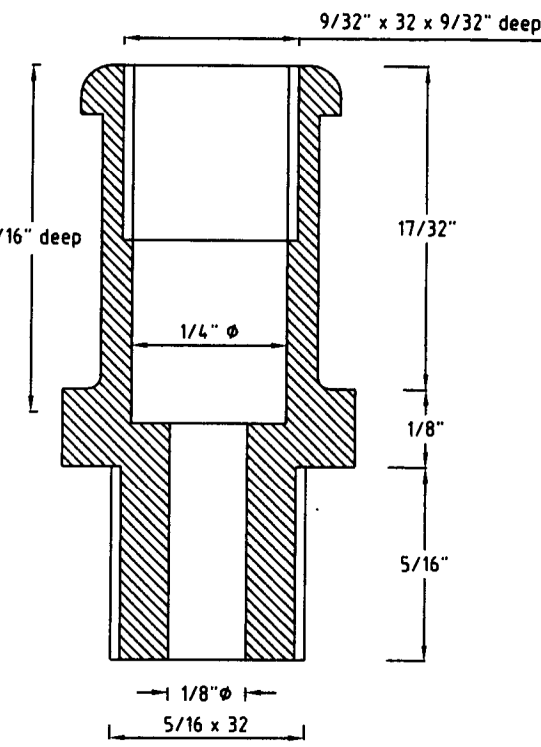
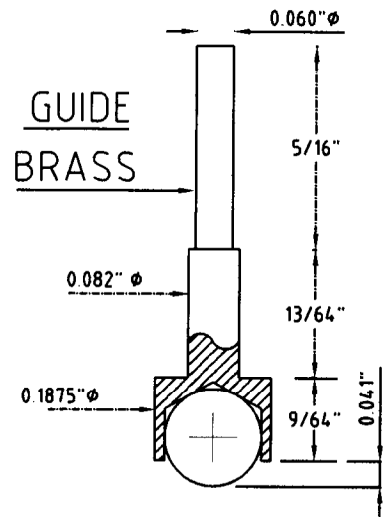
SV # 5A

# 1/8" MILD POP Safety Valve ( 1 piece body )

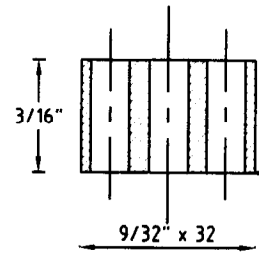
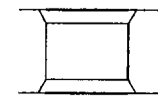
BODY 1/2" Hex  
BRONZE



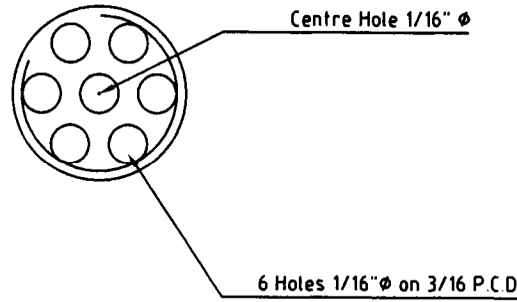
Profile Body to suit  
Engine Type



CHAMFER EDGES OF  
CENTRE HOLE &  
VENT HOLES WITH  
CENTRE DRILL



ADJUSTER  
BRASS



Ball  $\phi$  5/32"  
Spring "LEE" LC-016A-3 SS

3/6/00

SV # 1

# 3/8" MILD POP S/VALVE (1 PIECE BODY)

Nominal Working Pressure 100 Lb/in<sup>2</sup>

## SPRING

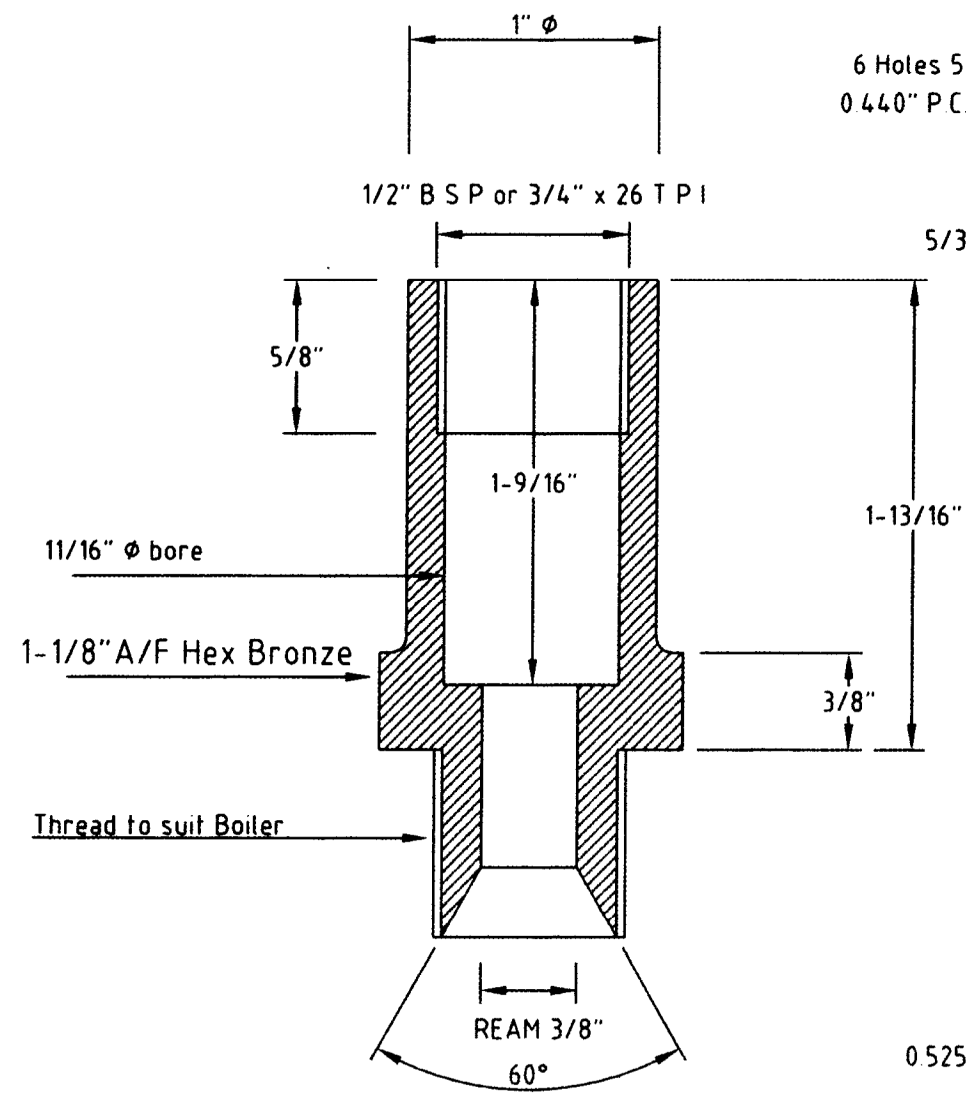
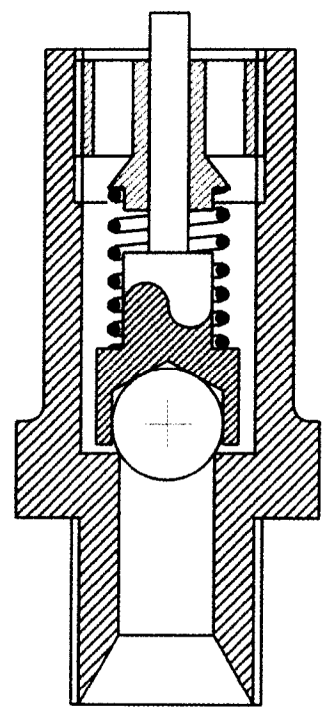
"LEE" LC-055G-5-SS

Free Length = 1"

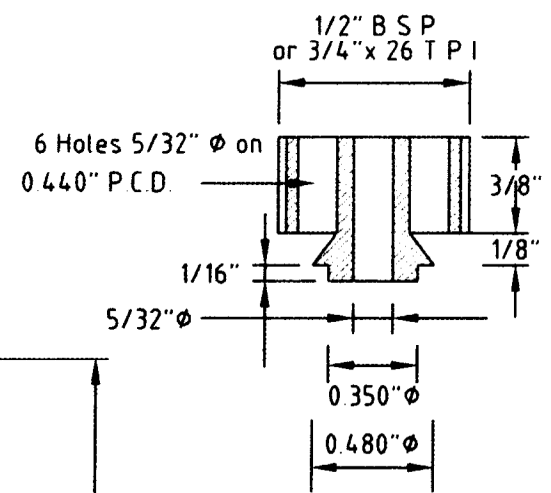
Working Length = 0.623" @ 11Lb

Solid Length = 0.400" @ 16.7 Lb

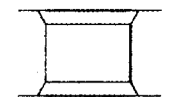
Rate = 29.2 Lb/in



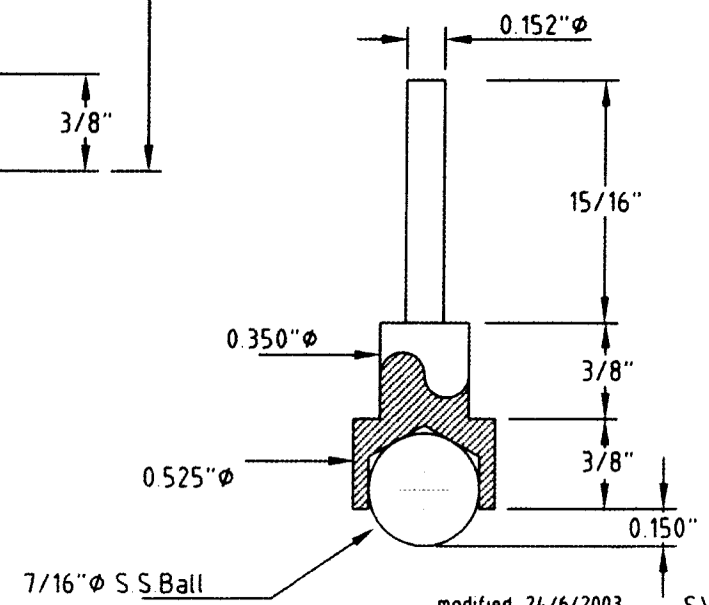
## BRASS ADJUSTER



CHAMFER EDGES OF  
CENTRE HOLE &  
VENT HOLES WITH  
CENTRE DRILL



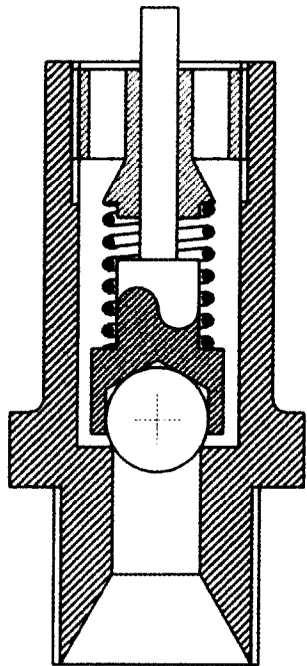
## BRASS GUIDE



modified 24/6/2003 SV #7

# 3/16" MILD POP SAFETY VALVE (1 Piece)

Nominal Working Pressure 100 Lb/in<sup>2</sup>



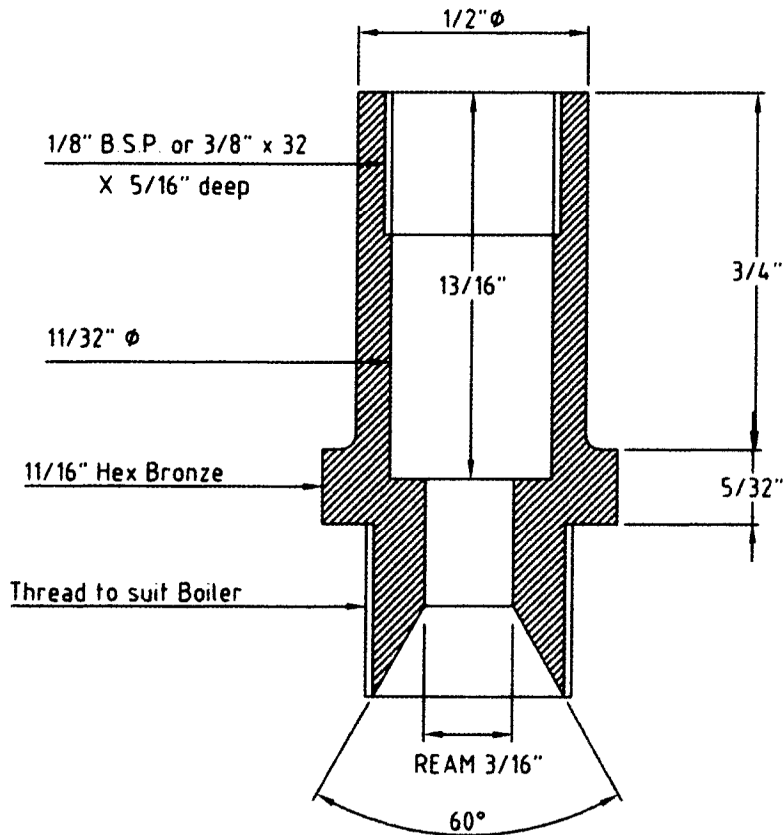
## SPRING

"LEE" LC-026C-3-SS

Spring Rate 14.2 Lb/in

Load @ Solid 4.4 Lb

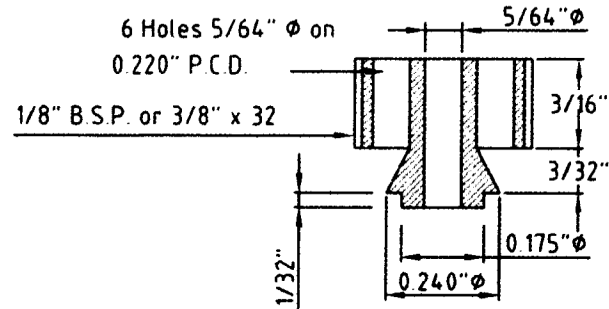
Working Length approx. 0.306" @ 100 Lb/sq in



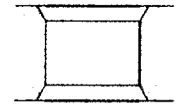
## NOTE!

THE VALVE BORE of 11/32" and  
THE SHROUD dia 0.280 to 0.285  
MUST NOT be altered

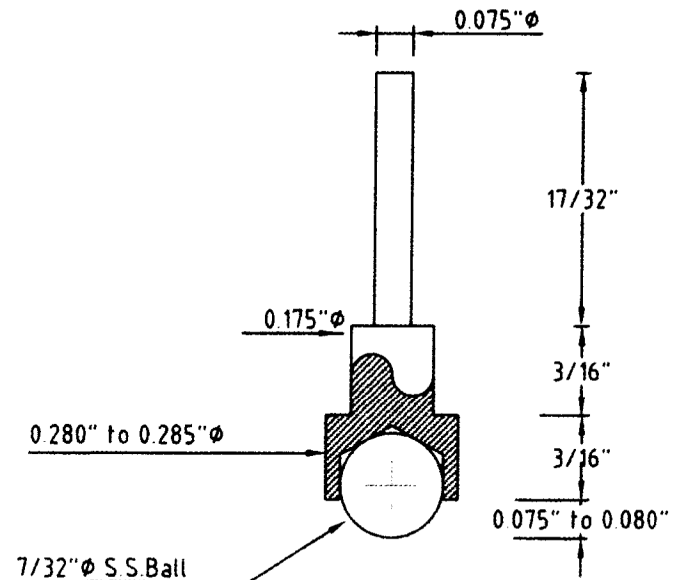
## BRASS ADJUSTER



CHAMFER EDGES OF  
CENTRE HOLE &  
VENT HOLES WITH  
CENTRE DRILL



## BRASS GUIDE



3-16 MILD POP-No-C-Bore  
Modified 24/6/2003



# 3/16" MILD POP x 1/2" TALL

( 1 Piece )

## SPRING

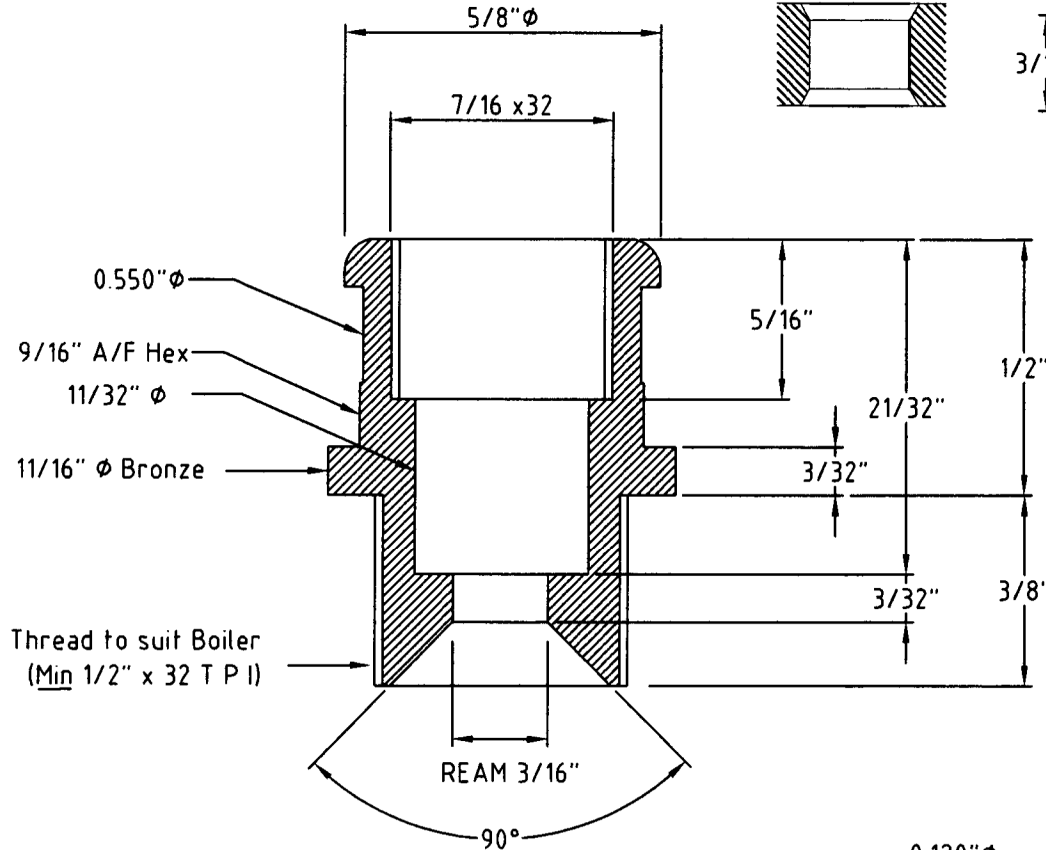
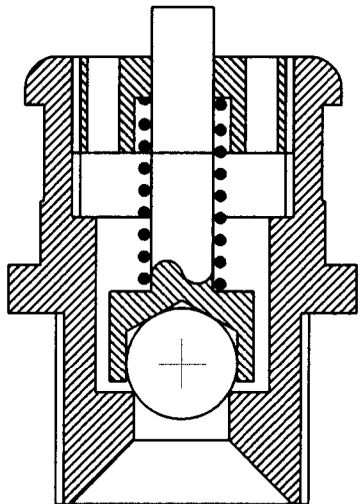
"LEE" LCM-060B-6-SS

O/D 0.181"x0.024" Wire  $\phi$

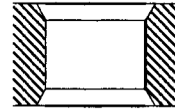
Free Length 0.551"

Rate 14.3 lb/in

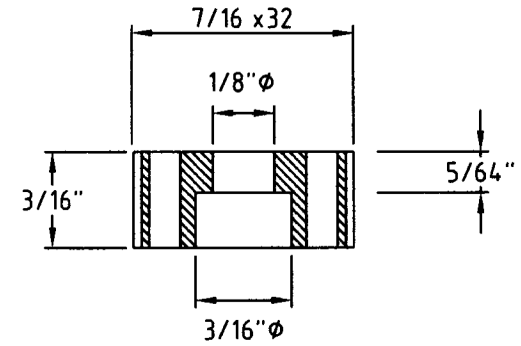
W/ Length @90lb/sq.in 0.375"



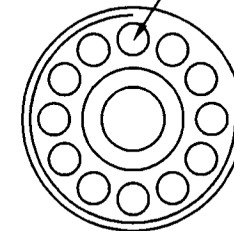
CHAMFER EDGES OF  
CENTRE HOLE &  
VENT HOLES WITH  
CENTRE DRILL



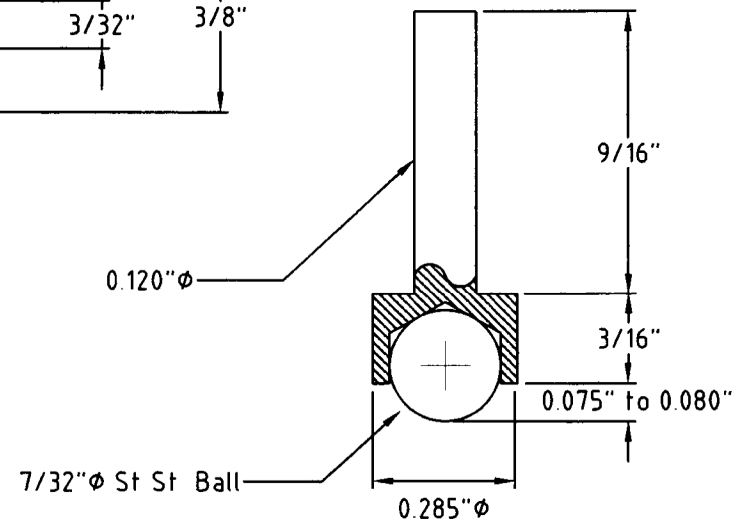
## BRASS ADJUSTER



12 HOLES 1/16"  $\phi$   
on 5/16" P C D



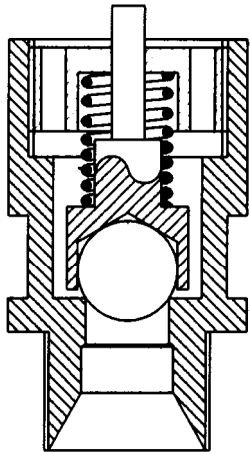
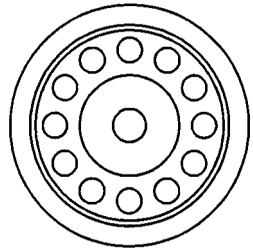
## BRASS GUIDE



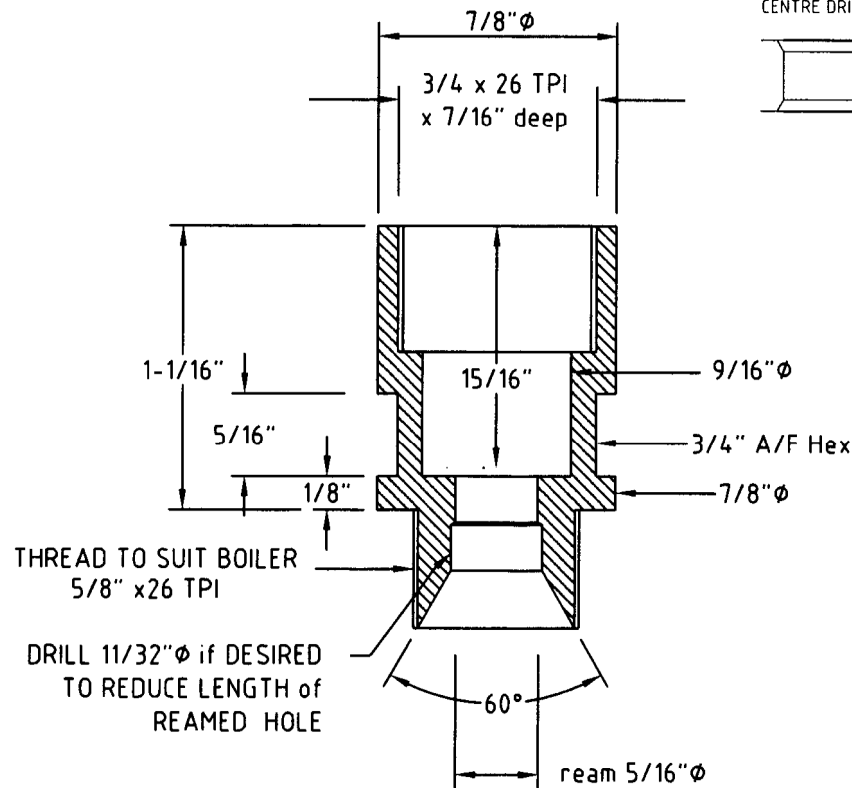
Modified 24/6/2003

SV # 3A

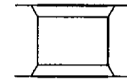
# 5/16" MILD POP ( Tim Rickard )



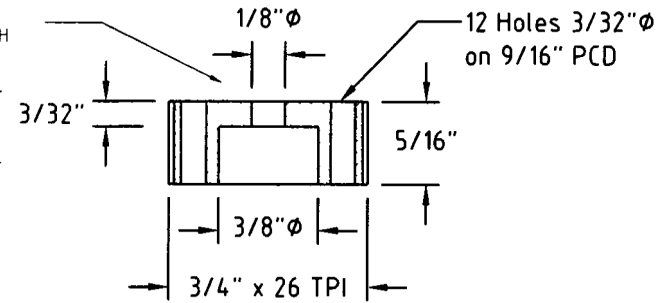
BODY  
7/8"  $\phi$  BRONZE



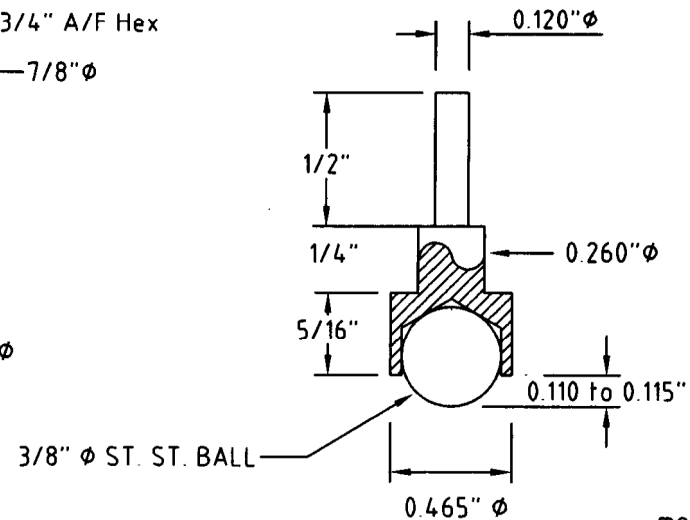
CHAMFER EDGES OF  
CENTRE HOLE &  
VENT HOLES WITH  
CENTRE DRILL



ADJUSTER  
BRASS



BRASS GUIDE



SPRING LEE LC-042E-8- SS

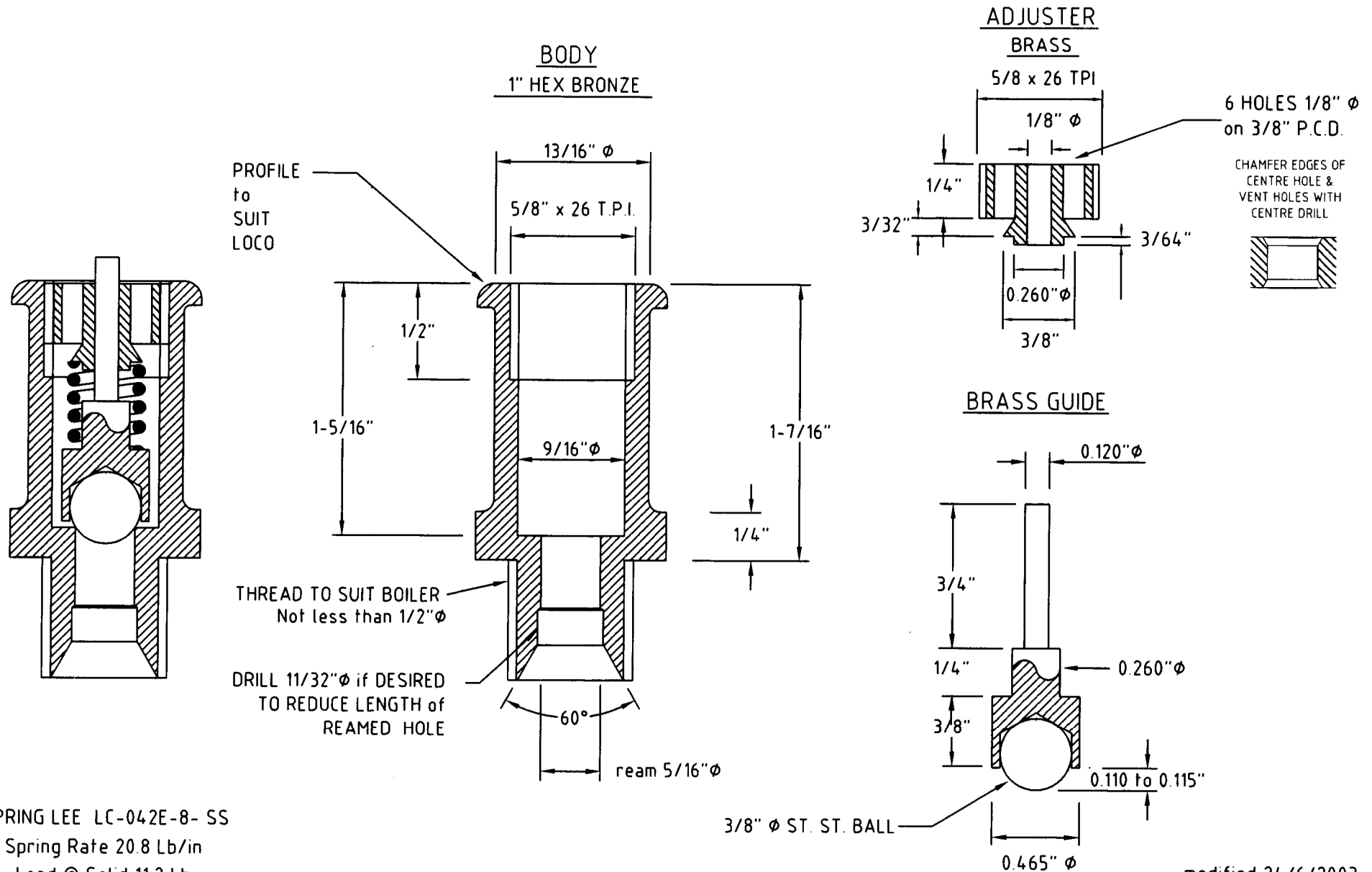
Spring Rate 20.8 Lb/in

Load @ Solid 11.2 Lb

Working Length approx. 0.500" @ 100 Lb/sq in

modified 24/6/2003

# 5/16" MILD POP SAFETY VALVE



SPRING LEE LC-042E-8- SS

Spring Rate 20.8 Lb/in

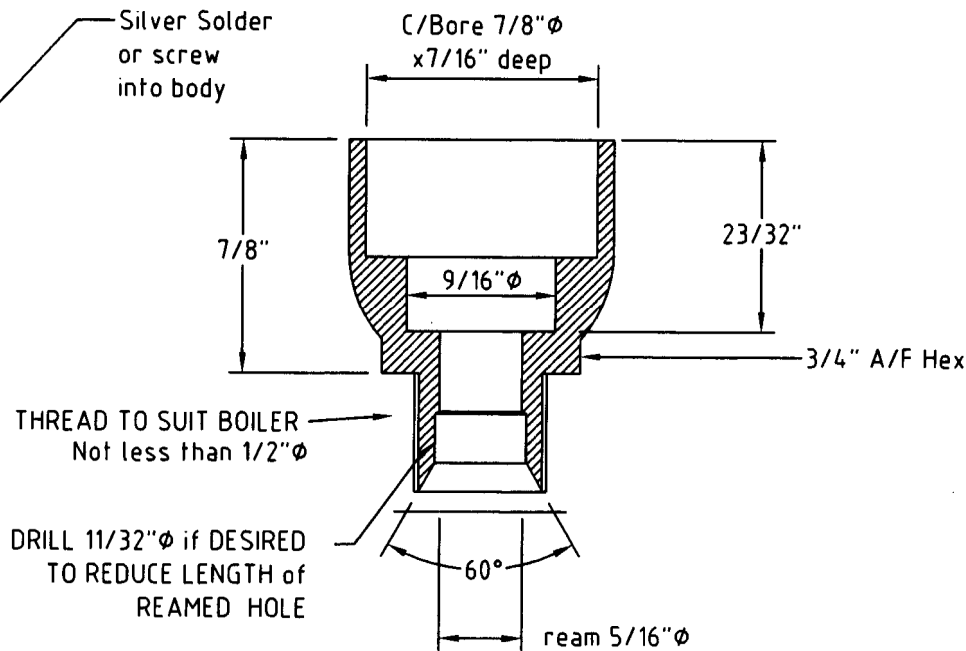
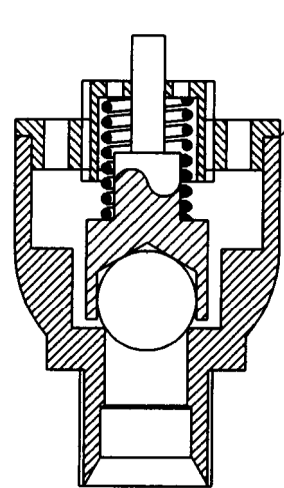
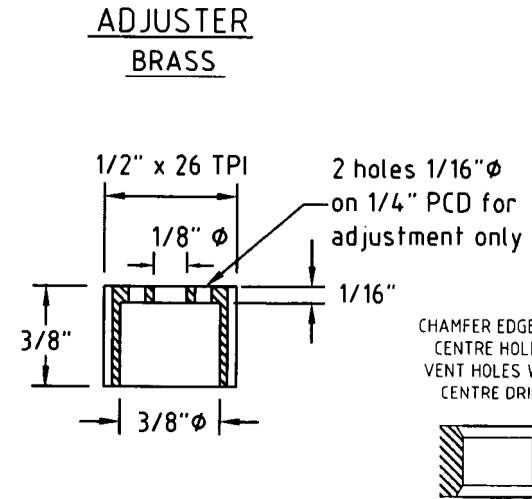
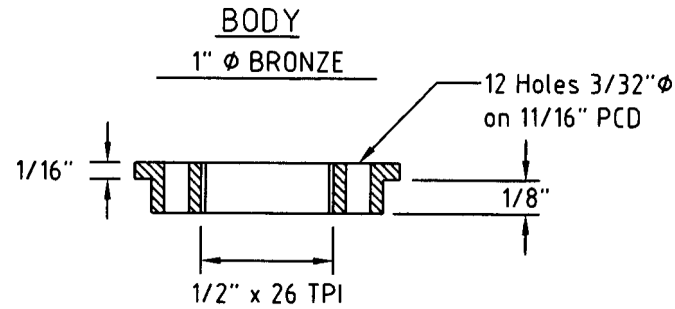
Load @ Solid 11.2 Lb

Working Length approx. 0.500" @ 100 Lb/sq in

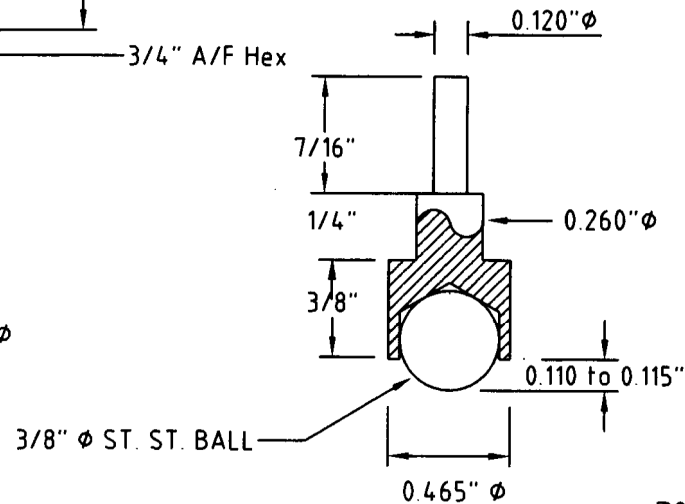
modified 24/6/2003

SV # 6

# 5/16" MILD POP AMERICAN STYLE



## BRASS GUIDE



SPRING LEE LC-042E-8- SS

Spring Rate 20.8 Lb/in

Load @ Solid 11.2 Lb

Working Length approx. 0.500" @ 100 Lb/sq in

modified 24/6/2003

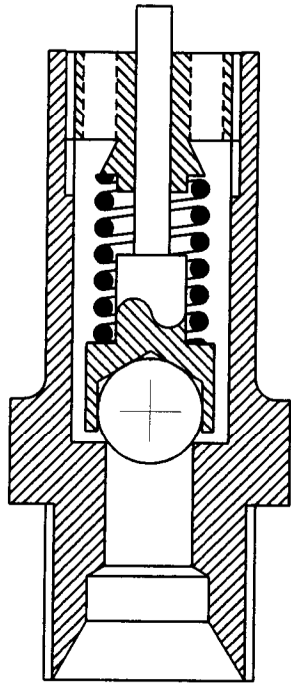
SV # 6A

# 5/32" MILD POP SAFETY VALVE ( 1 PIECE BODY )

## BODY

1/2" HEX BRONZE or G/M

3/16"  
BALL



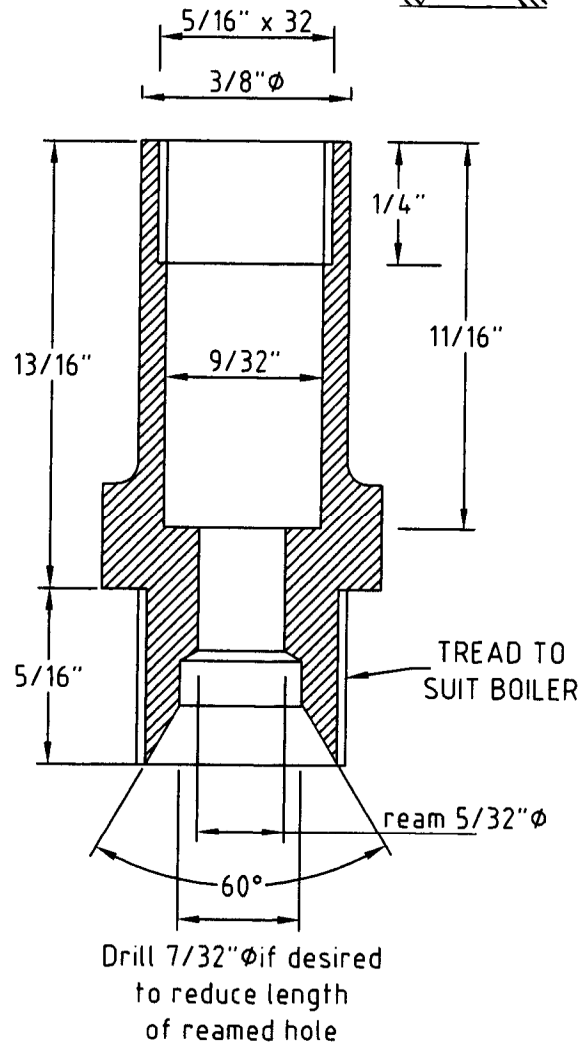
SPRING LEE LCM-055B-4 SS

Spring Rate 12.2 Lb/in

Load @ Solid 3.3 Lb

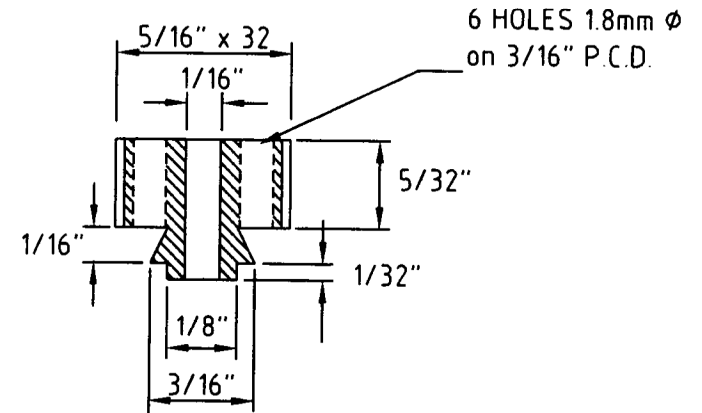
Working Length approx. 0.275" @ 100 Lb/sq in

CHAMFER EDGES OF  
CENTRE HOLE &  
VENT HOLES WITH  
CENTRE DRILL

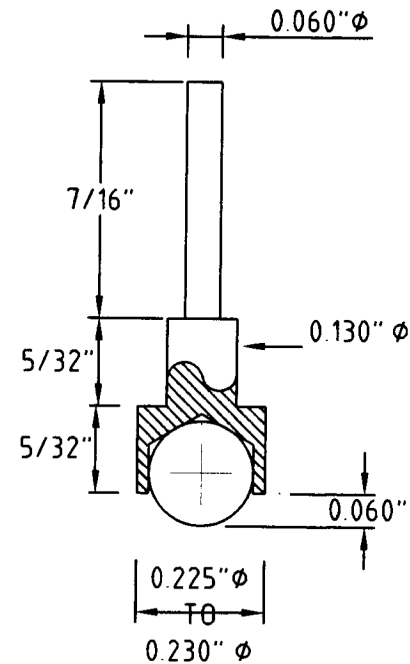


## ADJUSTER

5/16"  $\phi$  BRASS



## BRASS GUIDE



modified 24/6/2003

GORDON SMITH

SV # 2

# 5/32" MILD POP SAFETY VALVE ( ULTRA SHORT 100lb/sq.in)

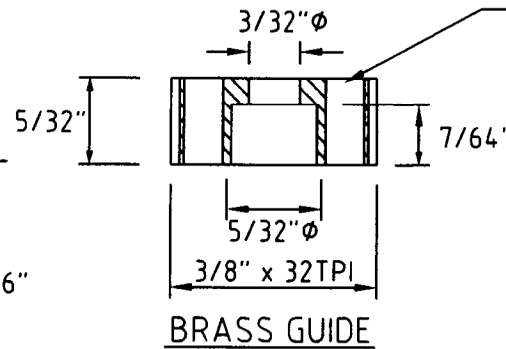
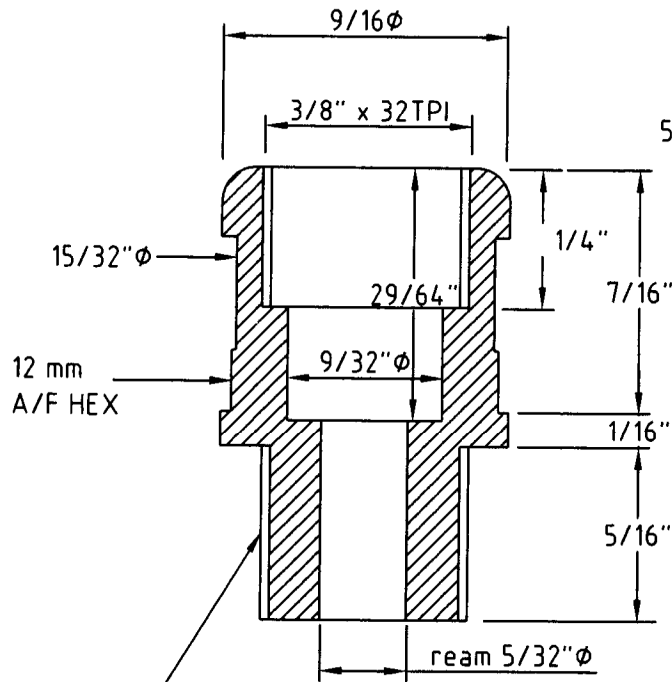
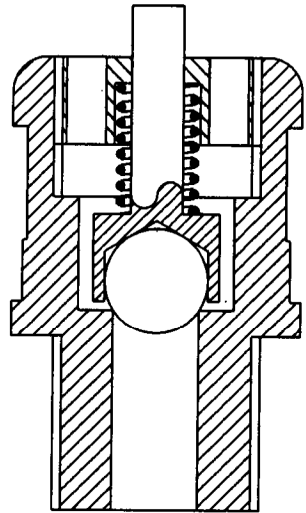
HEIGHT 1/2"

BODY  
PH.BRONZE

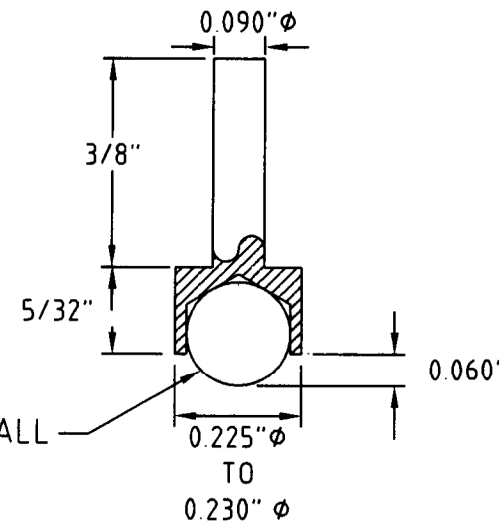
ADJUSTER  
3/8" Ø BRASS

6 HOLES 1.8mm Ø  
on 1/4" P.C.D.

CHAMFER EDGES OF  
CENTRE HOLE &  
VENT HOLES WITH  
CENTRE DRILL



BRASS GUIDE



TO SUIT BOILER

3/16" Ø BALL

SPRING LEE LC-021AB-4 SS

Spring Rate 15.0 Lb/in

Load @ Solid 3.5 Lb

Working Length approx. 0.300" @ 100 Lb/sq in

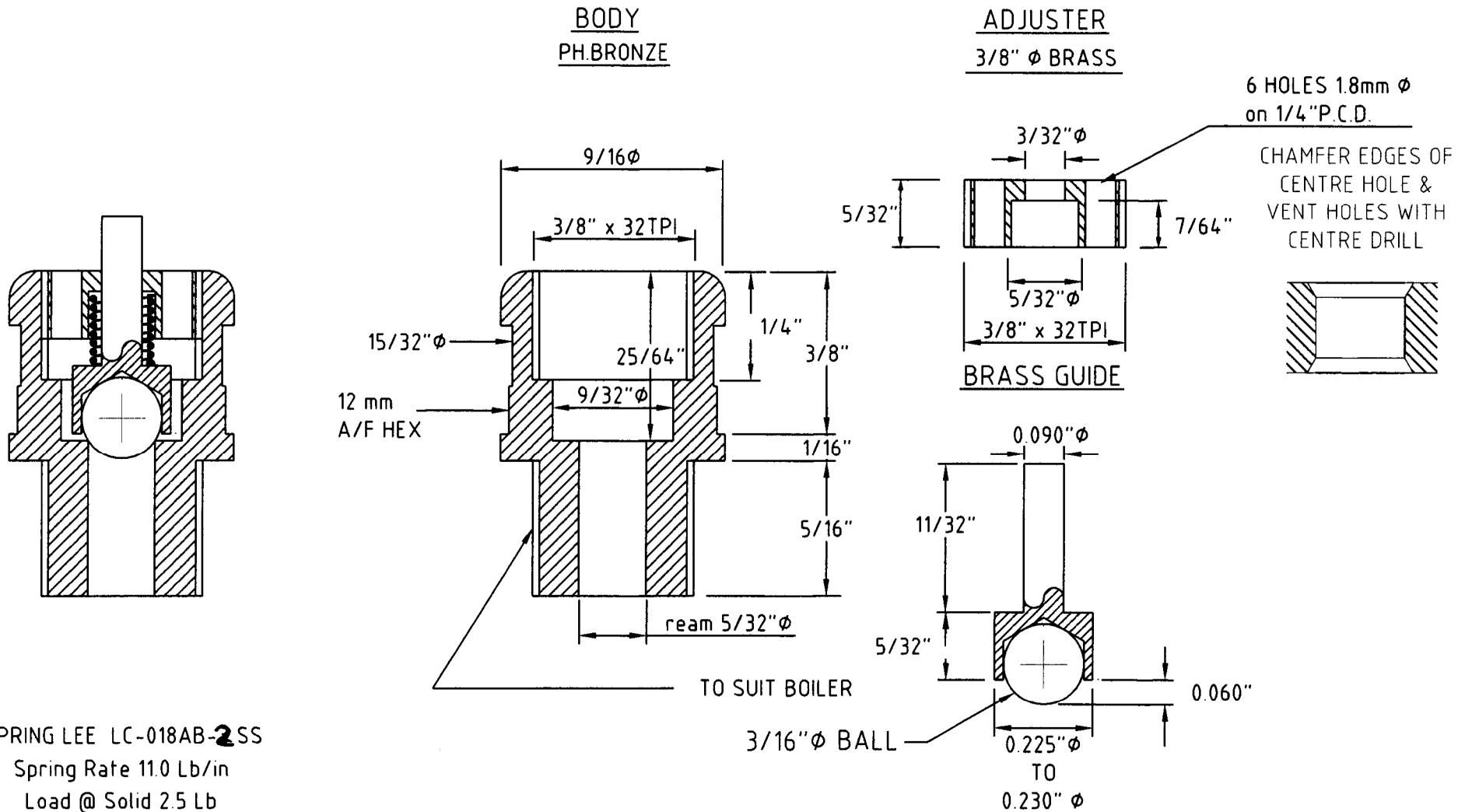
modified 24/6/2003

GORDON SMITH

SV # 2A

# 5/32" MILD POP SAFETY VALVE ( ULTRA SHORT 80-90lb/sq.in)

HEIGHT 7/16"



SPRING LEE LC-018AB-2SS

Spring Rate 11.0 Lb/in

Load @ Solid 2.5 Lb

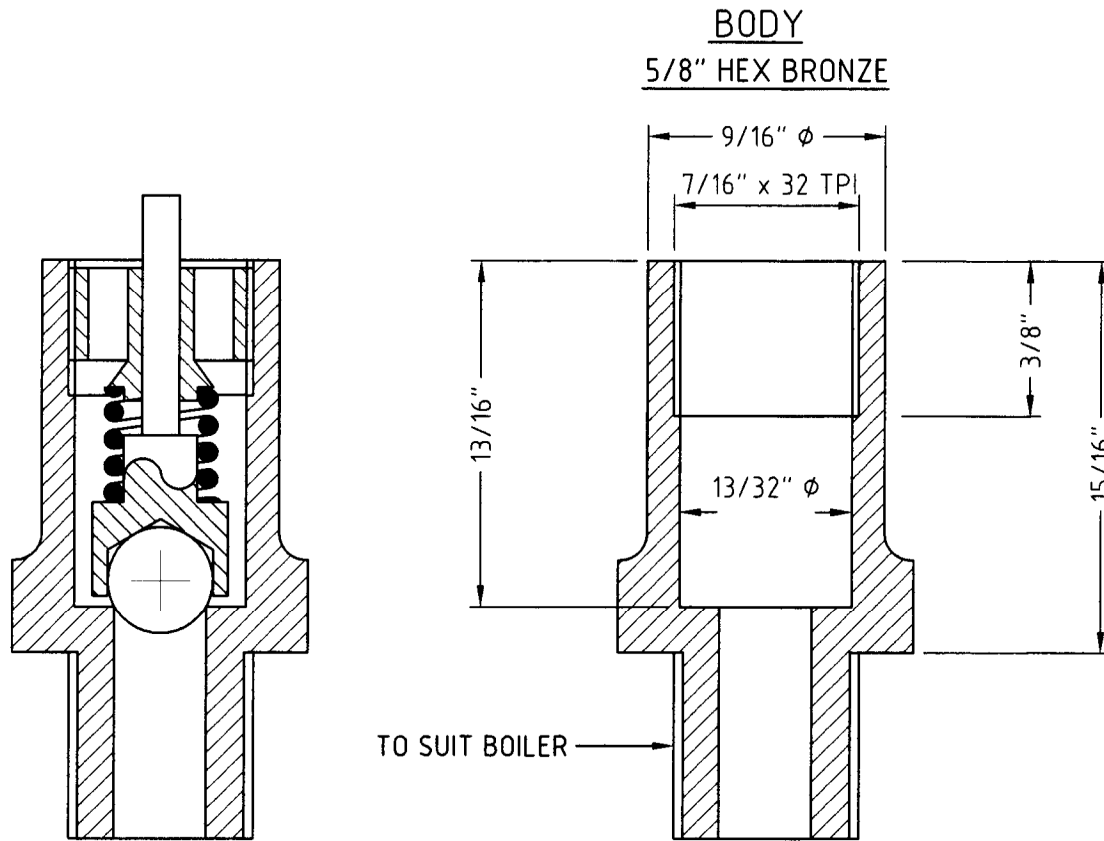
Working Length approx. 0.210" @ 90 Lb/sq in

modified 24/6/2003

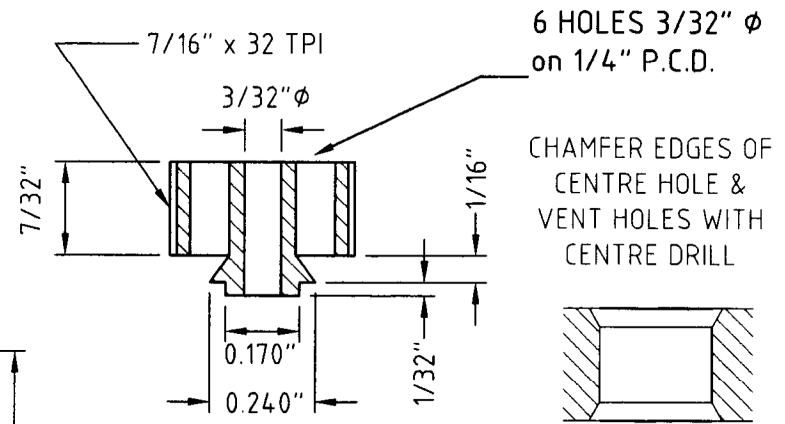
GORDON SMITH

SV # 2B

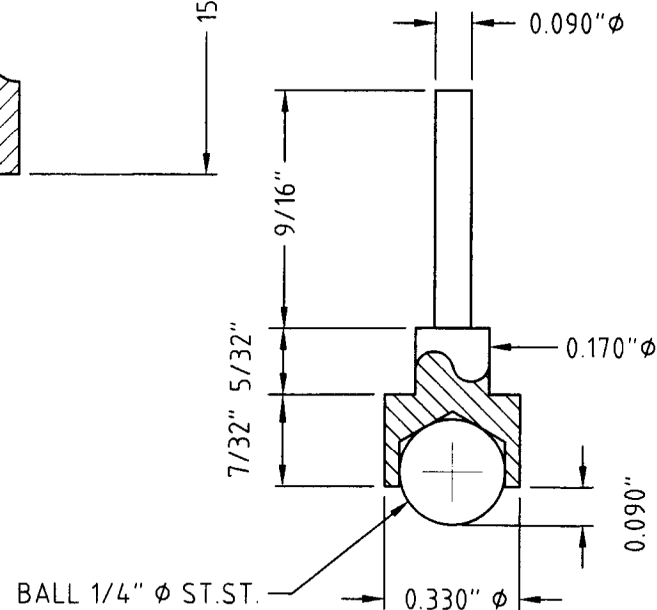
# 7/32" MILD POP SAFETY VALVE ( 1 PIECE BODY )



## ADJUSTER 7/16" $\phi$ BRASS



## BRASS GUIDE



SPRING LEE LC-029C-3- SS

Spring Rate 19.7 Lb/in

Load @ Solid 5.8 Lb

Theoretical Working Length 0.300" @ 100 Lb/sq in

(Actual approx. 0.260")

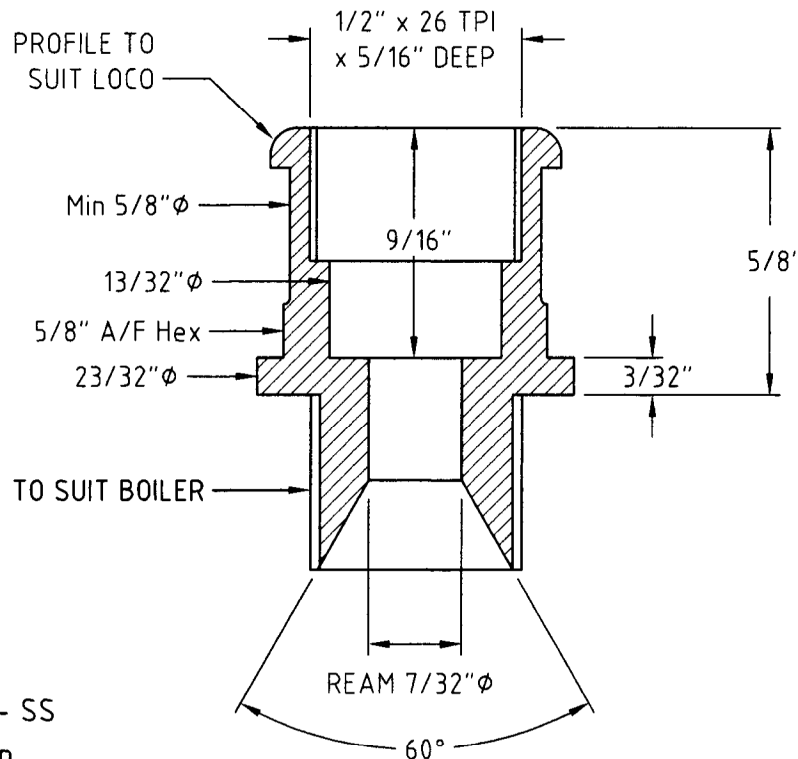
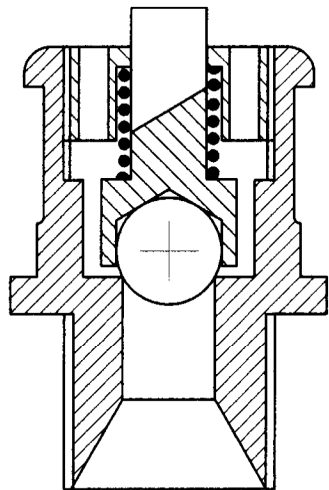
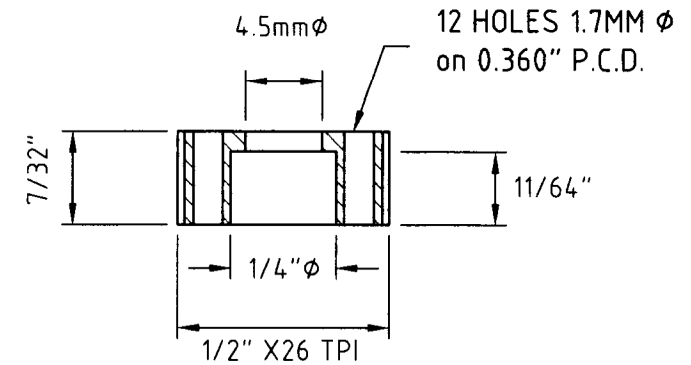
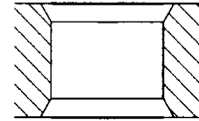


7/32" MILD POP ( SHORT 1 PIECE BODY ) 5/8" Tall

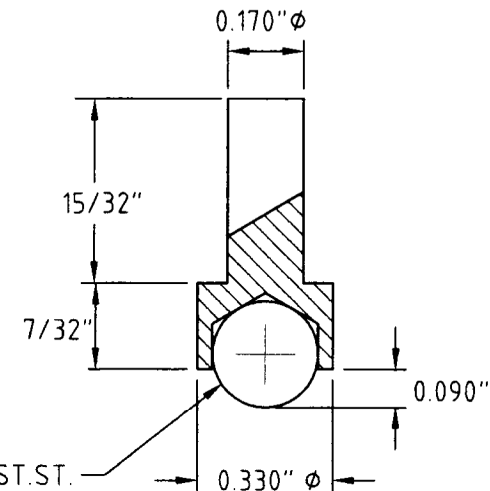
ADJUSTER 1/2"  $\phi$  BRASS

BODY  
3/4"  $\phi$  BRONZE

CHAMFER EDGES OF  
CENTRE HOLE &  
VENT HOLES WITH  
CENTRE DRILL



BRASS GUIDE



SPRING LEE LC-029C-3- SS

Spring Rate 19.7 Lb/in

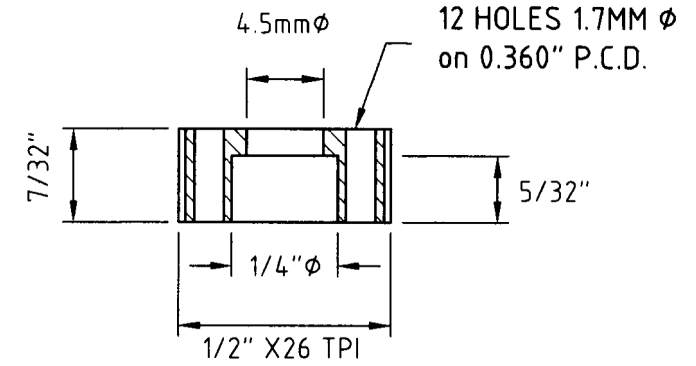
Load @ Solid 5.8 Lb

Theoretical Working Length 0.300" @ 100 Lb/sq in

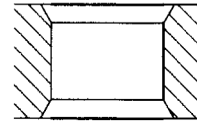
(Actual approx. 0.260")

7/32" MILD POP (ULTRA SHORT) x 7/16" Tall

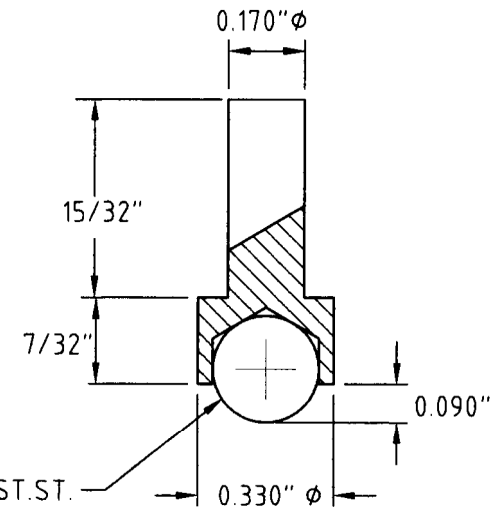
ADJUSTER 1/2"  $\phi$  BRASS



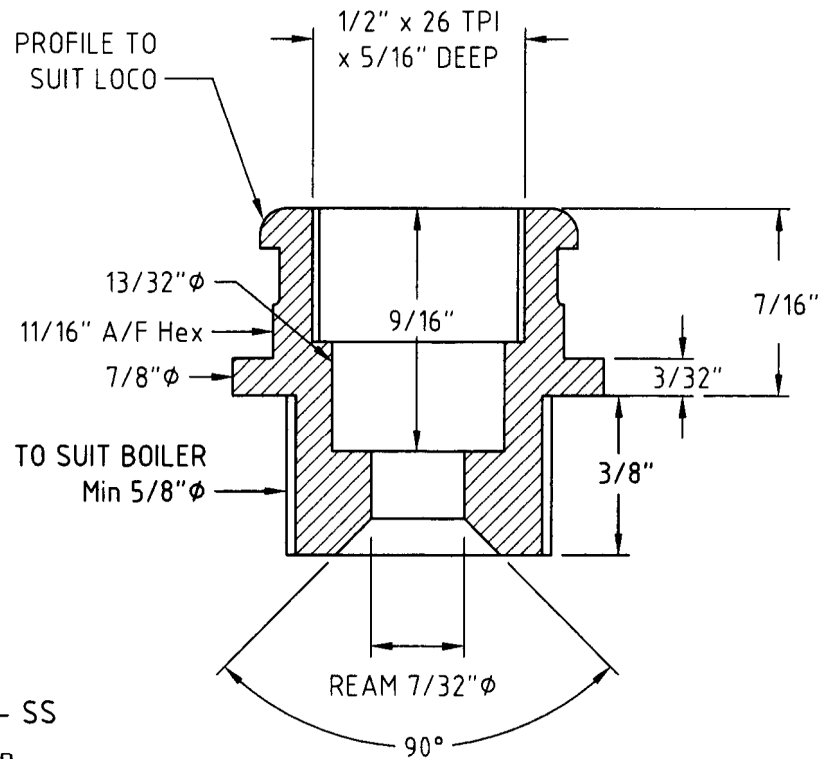
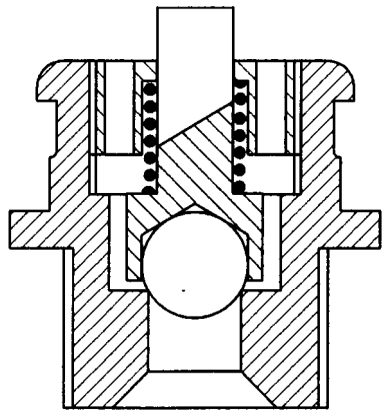
CHAMFER EDGES OF  
CENTRE HOLE &  
VENT HOLES WITH  
CENTRE DRILL



BRASS GUIDE



BODY  
7/8"  $\phi$  BRONZE or G/M



SPRING LEE LC-029C-3- SS

Spring Rate 19.7 Lb/in

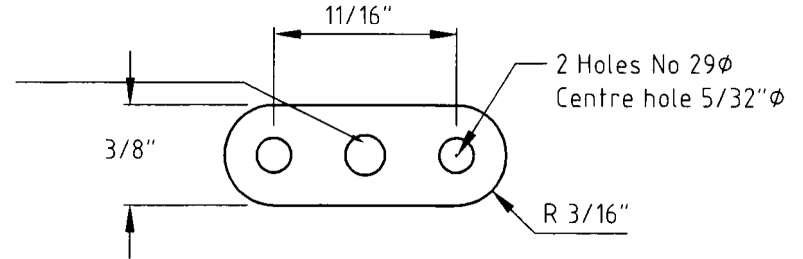
Load @ Solid 5.8 Lb

Theoretical Working Length 0.300" @ 100 Lb/sq in  
(Actual approx. 0.260")

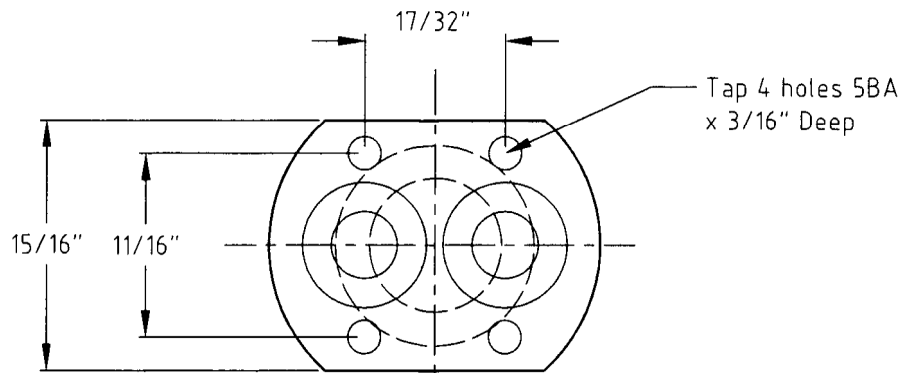
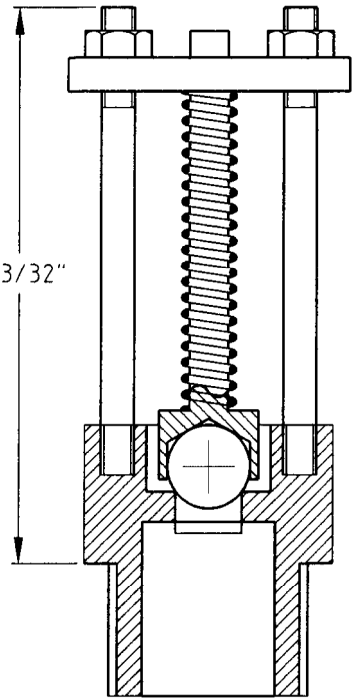
# 1/4" bore Twin RAMSBOTTOM Mild Pop Safety Valve

Nominal Working Pressure  
90 to 100 lb/sq.in

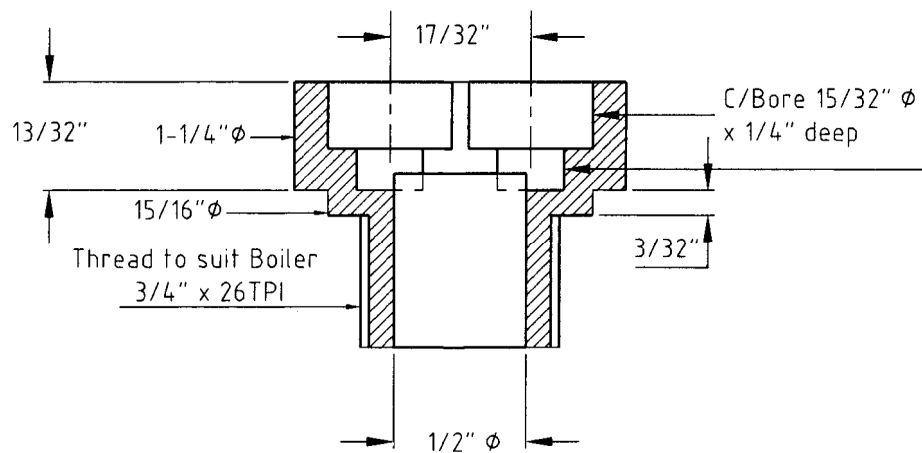
BRASS PLATES 2 off 3/8" x 1/8"



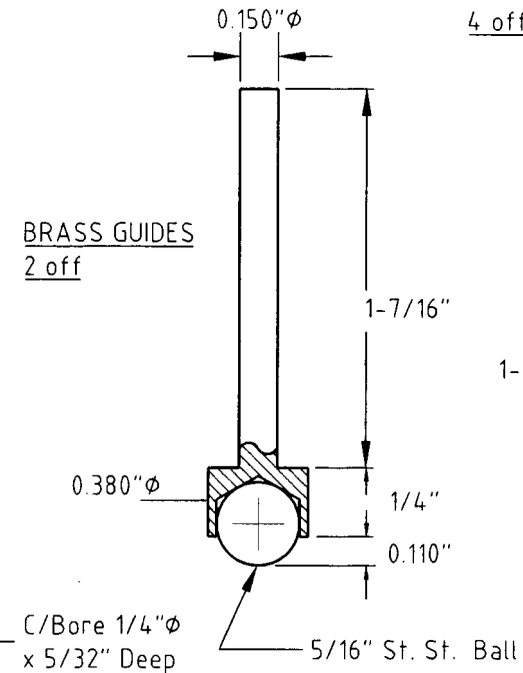
LEE SPRING No. LC-040C-15-SS



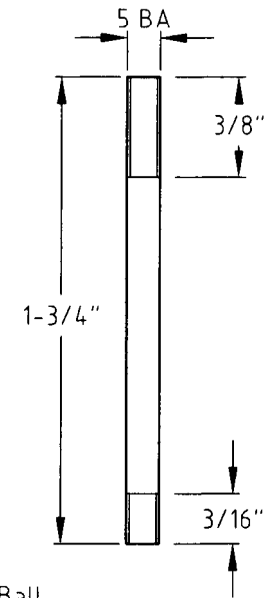
BRONZE SEAT/BODY



BRASS GUIDES  
2 off



4 off BRASS STUDS



NOTE! Shroud dia. could be increased to  
0.395" φ Max. if necessary,  
to increase the capacity