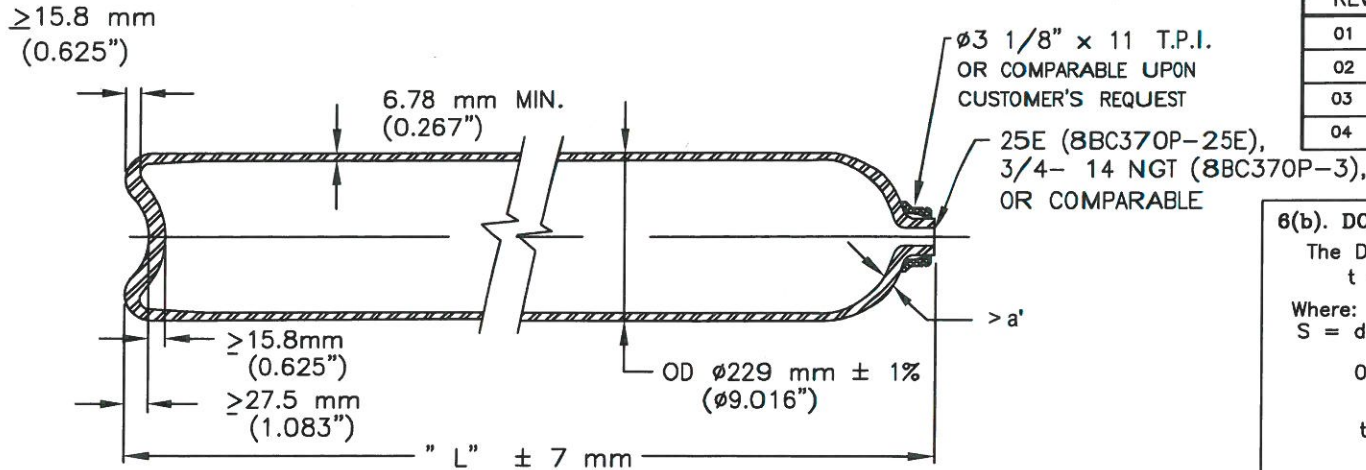


DRAWING FOR REFERENCE ONLY



REV.	ECN - DESCRIPT.	DATE	DRWN.	CHKD.	APP.
01	2867	04/21/10	JJM	SAM	
02	2963	05/04/10	JJM	SAM	
03	2979	7/26/10	JJM	SAM	
04	2981	8/31/10	JJM		

8(b). DOT 3AA CALCULATIONS:

The DOT formula can be written as:

$$t = 0.5 \times OD \times \left(1 - \sqrt{\frac{S - 1.3 Ph}{S + 0.4 Ph}} \right)$$

Where:

S = design stress; the lower of 0.67xRg or 70ksi (483 MPa)

$$0.67 \times Rg = 0.67 \times 112.4 = 75.3 \text{ ksi} \\ (\text{use } S = 70 \text{ ksi})$$

$$t = 0.5 \times 9.016 \times \left(1 - \sqrt{\frac{70000 - 1.3 \times 4835}{70000 + 0.4 \times 4835}} \right)$$

$$= 0.265'' \text{ (6.73 mm) - DOT calculated Min.}$$

*For Dual ISO/DOT design t min = 6.78 mm (0.267")

SPECIFICATION: ISO 9809/1: 1999 AND/OR DOT 3AA 2900

1. Service Conditions: (1 bar = 14.5 psi)

- ISO rated working pressure: 222 bar (3219 psi)
- DOT rated service pressure: 200 bar (2900 psi)
- Min. test pressure: 334 bar (4843 psi)

2. Material:

Cr-Mo-Steel (4130X) complying with the requirements of clause 6.2 of ISO 9809-1, 49 CFR 175.37(b), and Norris' Specification for 4130 - EO-A1.

3. Manufacture:

Hot billet extrusion followed by hot drawing

4. Heat Treatment: Quenched and Tempered

- Austenitize: ~899°C (1650°F)
- Quenchant: Water based polymer: (temperature $\leq 60^\circ\text{C}$ (140°F))
- Temper: ~621°C (1150°F) (Min. 30 minutes at temp.)

5. Mechanical Properties: (at room temperature)

- Tensile (Rg): 775 - 890 MPa (112.4 - 129 ksi)
- Yield (Re): ≥ 620 MPa (89.9 ksi)
- Elong (A): $\geq 14\%$ (ON 5.65 $\sqrt{S_y}$)
 $\geq 20\%$ on 2" G.L. for DOT

5. Mechanical Properties: (continued)

- Out-of-roundness, Straightness, and Verticality per ISO 9809-1 sections 8.5- <math><2\%</math>, 8.7- <math><3 \text{ mm per m}</math>, and 8.8- <math><10 \text{ mm/m}</math>
- Hydraulic and volumetric expansion test per 11.2 of ISO 9809-1 and 49 CFR 178.37(i) for DOT
- Hardness: 225 - 270 BHN
- Flattening test: 6 x t without cracks for ISO 9809-1
6 x t without cracks for DOT
- Charpy test (-50°C, Trans): $\geq 35 \text{ J/cm}^2$ (avg.)
 $\geq 28 \text{ J/cm}^2$ (ind.)
- UT flaw detection: Each cyld. per ISO 9809-1
- ISO Batch burst test: $P_b \geq 534$ bar (7749 psi)

8(a). Thickness Calculations: (ISO 9809/1: 1999)

$$a = 0.5 \times D \left(1 - \sqrt{\frac{(10FRe - \sqrt{3} Ph)}{(10FRe)}} \right)$$

Where:

- Ph = Test Pressure (bar) = 334 bar (4843 psi)
- D = External diameter of container = $\phi 229.0 \text{ mm}$
- F = Lesser of 0.65/(Re/Rg) or 0.85; $Re/Rg \leq 0.9$
= Lesser of 0.65/0.80 or 0.85 = 0.813 (for $Re/Rg = 0.80$)

$$a = 0.5 \times 229.0 \left(1 - \sqrt{\frac{(10 \times 0.813 \times 620 - \sqrt{3} \times 334)}{(10 \times 0.813 \times 620)}} \right) = 6.77 \text{ mm} \text{ (0.266'')}$$

NOTE: a, the guaranteed min thickness = 6.78 mm (0.267") exceeds/equals calculated min thickness, a.

MODEL	LENGTH 'L'		Min WATER CAPACITY		APPROX. WGT. W/O FITTINGS	
	MM	IN	LITERS	IN ³	KG	LBS
8BC370P	1550	61	50.0	3058	73	161
*Vmin	708	27.9	20	1220	37.7	83
*Vmax	2311	91	77.0	4699	107	236

*Note: Model 8BC370P is the design qualification test cylinder. Vmin and Vmax represent the range covered by the same design family. For max ovality, max verticality deviation, and max Straightness deviation see Norris document: 363-00



NORRIS CYLINDER COMPANY
4818 WEST LOOP 281 LONGVIEW, TEXAS 75603 USA

REFILLABLE SEAMLESS STEEL CYLINDER
FOR PERMANENT GASES INCLUDING
EMBRITTLING GASES PER ISO 11114-1

SCALE	NOT TO SCALE	DRAWING NO.		REV.
DWN. BY	R.S.	8/17/04	901A-A-9649	04
CHK'D BY				
APP'D BY		SHEET NO. 1	OF 1	SHEETS