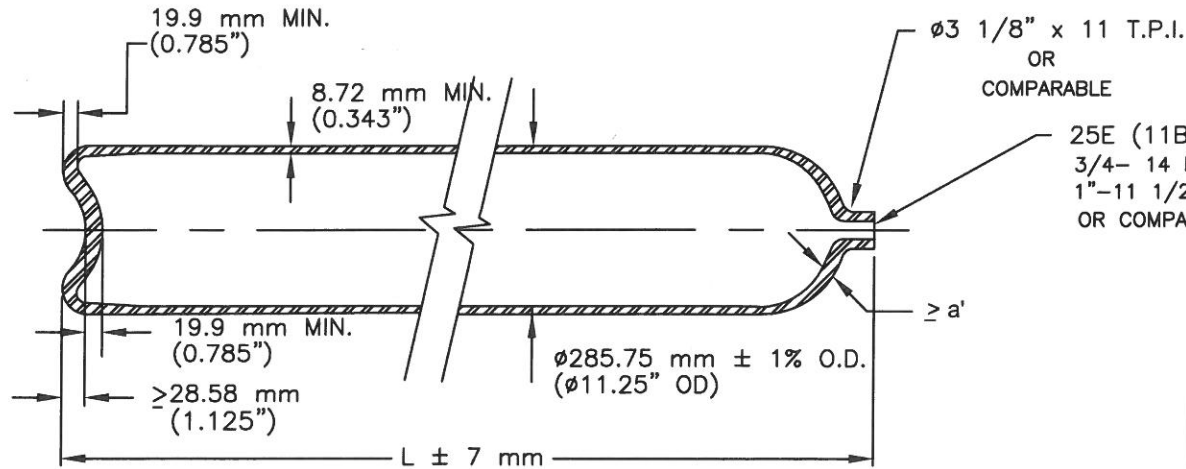


DRAWING FOR REFERENCE ONLY



REV.	ECN - DESCRIPT.	DATE	DRWN.	CHKD.	APP.
01	2935	2/2/10	JJM		

25E (11BC615P-25E),
 3/4- 14 NGT (11BC615P-3),
 1"-11 1/2 NGT (11BC615P-1),
 OR COMPARABLE

6(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)

$$0.67 \times Rg = 0.67 \times 112.8 = 75.5 \text{ ksi}$$

(use S = 70 ksi)

$$t = 0.5 \times 11.25 \times \left(1 - \sqrt{\frac{70000 - 1.3 \times 5002.5}{70000 + 0.4 \times 5002.5}} \right)$$

$$= 0.3426" \text{ (8.70mm) - DOT calculated Min.}$$

*For Dual ISO/DOT design t min = 8.72mm (0.343")

SPECIFICATION: ISO 9809/1: 1999
 DOT 3AA 3000

1. Service Conditions:

- ISO rated working pressure: 230 bar (3335 psi)
- DOT service pressure 207 bar (3000 psi)
- Hydraulic test pressure: 345 bar (5002.5 psi)

(1 bar = 14.5 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 - EA-01.

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 ≤ 60°C(140°F))
- Temper: ~649°C(1200°F) (Min. 30 minutes at temp.)

5. Mechanical Properties: (at room temperature)

- Tensile (Rg): 778 - 930 MPa (112.8 - 134.8 ksi)
- Yield (Re): ≥ 661 MPa (95.8 ksi)
- Elong (A): ≥ 14% (ON 5.65 √S₀)
- Out-of-roundness per ISO 9809-1: 8.5 - <2%
- Straightness per ISO 9809-1: 8.7 - 3 mm per m
- Verticality per ISO 9809-1: 8.8 - 10 mm per m
- Hydraulic and volumetric expansion test per 11.2
- Hardness test: Each end of every cylinder
- Hardness range: 225 - 270 Brinell
- Flattening test: Flatten to 7 x t_m without cracks
- Charpy test (-50°C, Trans): ≥ 40 J/cm² (avg.)
 ≥ 32 J/cm (ind.)
- UT flaw detection: Each cyld. per ISO 9809-1
- Batch burst test: P_b ≥ 552 bar (8004 psi)

6(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) = 345 bar (5002.5 psi)

D = External diameter of container = ø286 mm

F = Lesser of 0.65/(Re/Rg) or 0.85; Re/Rg ≤ 0.9
 = Lesser of 0.65/0.85 or 0.85 = 0.765 (for Re/Rg = 0.85)

$$a = 0.5 \times 286 \left(1 - \sqrt{\frac{(10 \times 0.765 \times 661 - \sqrt{3} \times 345)}{(10 \times 0.765 \times 661)}} \right) = 8.71 \text{ mm (0.343")}$$

NOTE: a', the guaranteed min thickness = 8.72 mm (0.343") exceeds calculated min thickness, a.

MODEL	LENGTH 'L'		Min WATER CAPACITY		APPROX. WGT. W/O FITTINGS	
	MM	IN	LITERS	IN ³	KG	LBS
11BC615P	1626	64	80.0	4893	123.9	273
*Vmin	815	32.1	36	2196	66.2	146
*Vmax	2425	95.5	125.5	7658	172.4	380

*Note: Model 11BC615P is the design qualification test cylinder. Vmin and Vmax represent the range covered by the same design family.



NORRIS CYLINDER COMPANY

4818 WEST LOOP 281 LONGVIEW, TEXAS 75603 USA

REFILLABLE SEAMLESS STEEL CYLINDER
 FOR PERMANENT AND LIQUEFIED GASES
 PER ISO 11114-1

SCALE	NOT TO SCALE	DRAWING NO.		REV.
DWN. BY	JJM	07/29/09	901A-A-9818	01
CHK'D BY	SAM	12/3/09		
APP'D BY		SHEET NO. 1		OF 1 SHEETS