INTERNATIONAL CONSTRUCTION CONSULTING, LLC

JOB No:	**NA**	**PREPRD.BY:**	**G Lamberson**	**DATE:**	**05-Sep-16**
CLIENT:	**Chevron Neftegas**	**CHECKD.BY:**		**SHEET:**	**1 of 1**
PROJECT:	**CPC Expansion Project**				
SUBJECT:	**Safe Distance for Pneumatic Testing**				

In accordance with industry Best Practices, the safe distance for pneumatic testing is calculated using the following formula:

$$E = (PV / k-1) \times (1-(P_{atm} / P)^{k-1/k}$$

E = Energy in Joules
P = Absolute pressure in Pascals
V = Test volume in M^3
P_{atm} = Atmospheric pressure in Pascals
k = Ratio of specific heat of air

Then;

$$TNTlb = E \times 4.8 \times 10^{-7}$$

TNTlb = Equivalent TNT in pounds

The safe distance can then be calculated by: $SD = 15 \, (TNTlb)^{.5}$

SD = Safe distance in meters

Test Details:

Test pressure	120	(psi)
Diameter =	42.000	(inches)
Wall thickness =	0.500	(inches)
Exposed length =	400	(feet)
Ambient temperature =	85	(degrees F)
Specific heat ratio =	1.400	(k value)

Calculated safe distance =	**66**	**(meters)**
Calculated safe distance =	**216**	**(feet)**

Because the stored energy associated with a pneumatic test is much higher than a hydrostatic test, due to the compressibility of the air used in lieu of water, certain precautions should be taken when conducting a pneumatic test and include, but not limited to:
   1) increasing pressure in steps,
   2) use of relief valve(s), and
   3) limiting personnel access to the area during testing.

For these reasons, the above calculations are provided in order to maintain a safe working distance for personnel.