Protocol for the Gas Measurement Component of NPL's Gas Measurement and Gas Cylinder Proficiency Testing Scheme Round 16 (Version1)

1. INTRODUCTION

1.1 This document describes the procedure which should be adopted by participants in the **Gas Measurement Component** of the NPL Gas Measurement & Gas cylinder PT Scheme. In order to ensure comparability of the results, it is important that, as far as possible, the same protocol is adopted by all participants. It is also important, and in the true spirit of a PT scheme, that the measurements from the stack simulator are carried out in a manner which is as close as possible to that used under operational conditions. This increases the benefit that participants will gain from the scheme and will make the scheme more appropriate for use with quality control systems.

2. OUTLINE OF THE SCHEME

2.1 The scheme will use the stack simulator at the NPL site. The NPL stack simulator produces a wide range of simulated stack gases under controlled conditions. The simulator is a recirculating system, which recreates a cross section of a 1.5 m duct. Four standard 5-inch ports are available for sampling probes or cross stack instruments to be installed. The 5-inch ports will be available to participants, **normally on a basis of 1 port per participant**. In addition a number of extractive gas analysers may be connected to gas extraction ports. The gas extraction ports will be used for reference measurements and are not available to participants.

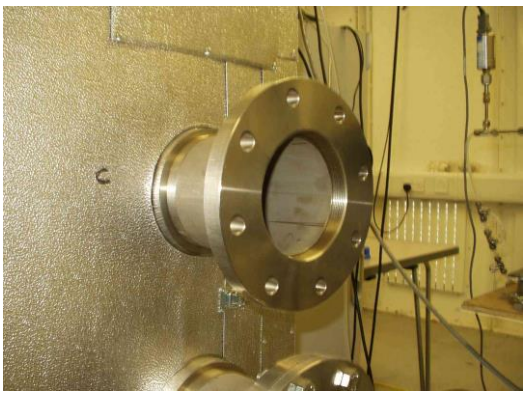
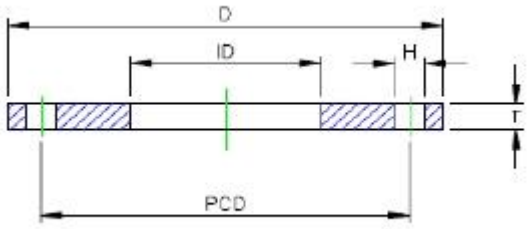


Figure 1: Stack simulator 5-inch port



N.B (ins)	Size (mm)	D (ins)	PCD (ins)	H (ins)	T (ins)	ID (ins)
5	125	10	8 1/4	11/16	9/16	5.66

Figure 2: BS10 table E flange size

Maximum probe length allowed = 0.9m

Minimum recommended probe length = 0.3m

2.2 During each day the stack simulator will be set to three different conditions typical of WI, LCP & Gas Turbine (GT) sites. The range of test concentrations to expect is show in Table 1.

Pollutant	Maximum	Minimum	Unit
SO_2	90	5	PPM
NO	180	20	PPM
NO_2	60	2	PPM
CO	70	5	PPM
C_3H_8	9.9	1.5	PPM
O_2	17	2	%
H_2O	20	1	%

Table 1: Range of test concentrations to expect in stack simulator

3. PROTOCOL

3.1 Teams will be allocated a day in which to undertake testing on the stack simulator. As up to three teams will be working on the stack simulator at any one time it is requested that each team be limited to a maximum of 2 people. To enable teams to complete the testing in the allotted time you will be asked to observe the following timetable:

Time	Activity
08:00 – 10:00	Instrument calibration + GC
10:00 – 10:30	Test 1
10:30 – 11:45	Instrument calibration+ GC
11:45 – 12:15	Test 2
12:15 – 13:30	Instrument calibration+ GC
13:30 – 14:00	Test 3
14:00 – 15:00	Instrument calibration+ GC
15:00 – 15:30	Pack up and depart

This timetable will be strictly enforced. If a team is not ready for testing then they will have to forfeit that test to ensure that they are ready in time for the next test.

Participants will be able to arrive on the day before testing after 16:00 to set up their equipment to ensure it is fully warmed up before testing. Teams will have to be off site by 18:00.

3.2 Teams should arrive at NPL as if they were arriving at a real test site to undertake measurements according to the MCERTs performance standard and their own UKAS accredited procedures. The working area should be kept tidy with cylinders secured safely and trip hazards minimised.

3.3 NPL will not provide tubing, Swagelok, extension reels and other connectors. NPL will provide one 110V socket, two 220V sockets and a bench top (120cm x 70cm) per team. **Participants should bring appropriate flanges to adapt the 5-inch ports to their gas sampling systems and, because the simulator is at a slight positive pressure, have the means to seal a sample probe in the stack**.

3.4 The monitoring location is at ground level with power supplies less than 3 metres from the sample ports. Power supplies are adjacent to participant work locations.

3.5 Parking for vans/mobile laboratories is adjacent to the stack simulator with distance to sample ports being no more than 10 metres.

3.6 For the safety of other participants please vent all instrument exhausts outside the confines of the stack simulator.

3.7 Teams must sign the NPL risk assessment before commencing work.

3.8 Participants wishing to work from mobile laboratories and not within the confines of the simulator please advise NPL as soon as possible with power requirements. We will endeavour to provide suitable supply.

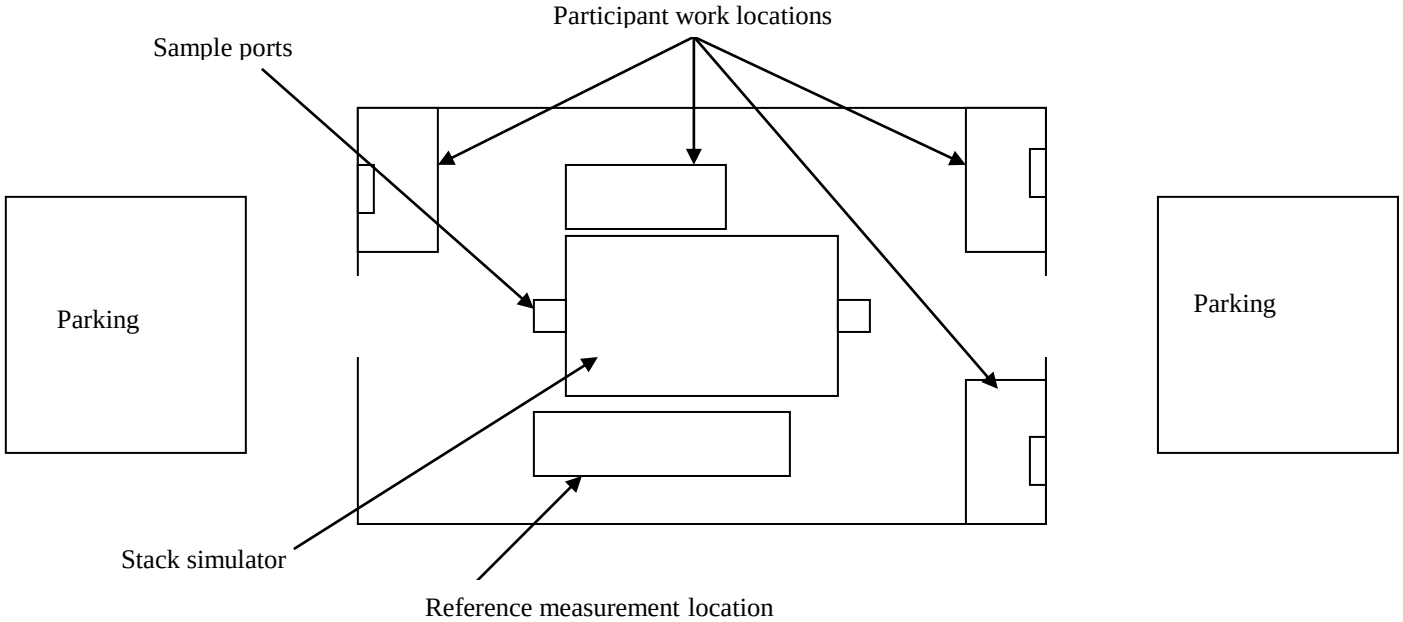


Figure 3: Stack simulator outline plan

4 COLLUSION

4.1 Participants are requested not to discuss results during the proficiency tests.

4.2 A member of the proficiency test team will make spot readings from participants' instruments during each proficiency test.

5 REPORTING RESULTS

5.1 **NO**, **NO_2** **SO_2,** and **CO** data should be expressed as ppm on a dry gas basis, uncorrected for oxygen. **O_2** data should be expressed as a percentage.

5.2 **VOC** data should be expressed as ppm propane equivalent on a wet gas basis, uncorrected for oxygen.

On the day

5.3 Teams are required to provide raw test and calibration data from their instrument acquisition software on a memory stick in Excel format. This should be given to the organiser at the end of the day.

5.4 Test teams are required to provide one-minute averages for each 30-minute test.

Within 10 working days

5.5 Within ten working days test teams are required to provide a thirty minute average for each test period, stating the measurement uncertainty as required by the MCERTs performance standard. Results to be e-mailed to results@stack-pt-schemes.net and gabrielle.stevenson@npl.co.uk.

5.6 Participants are also requested to fill in the attached pro-forma and return it to the PT Scheme Coordinator on the day or email within 10 working days to results@stack-pt-schemes.net and gabrielle.stevenson@npl.co.uk.

Gas Measurement PT Scheme Reporting Sheet

Date	
Company	
Team Members	
MCERTs Level 2 signature	

	Instrument and serial number
NO / NO_2	
SO_2	
CO	
O_2	
VOCs	
Sample Conditioning system	

Calibration Gas	**Cylinder Number**	**Certified concentration**	**Uncertainty, % or +/-**	**Calibration approach, i.e. zero and span, bracketing etc.**
NO				
NO_2				
SO_2				
CO				
O_2				
VOCs				

Return to:
David.butterfield@npl.co.uk **David Butterfield (PT Scheme Coordinator)**
or
results@stack-pt-schemes.net and gabrielle.stevenson@npl.co.uk