PROFICIENCY TESTING SCHEME FEEDBACK SOILS & GRAVELS, **ASPHALT** & BITUMEN

24th Roads Pavement Forum
6th Nov 2012
CSIR, Pretoria
Barry Pearce

Discussion to include…

- Background
- Revised Methodology
- HMA
  - Results
  - Conclusions
- HMA
  - Review results
- Future PT schemes - 20123
  - Bitumen
  - Soils & gravels
- A final words

Background

- MatCivils committee formed to assist in representing laboratories interests
  - Under guidance of NLA
  - Assisting in planning & programming PT schemes among other issues
- NLA on board to assist in a big way
  - Conference well worth the time
- PT scheme now up & running
- S&G PT needs to be relooked at
  - Particularly Atterberg results

Methodology

- Procedure recommended in ISO13258 Annex A
  - enables treatment of ‘outliers’ at the same time as producing robust values of mean & SD
- Initially used results as determine by Z-score
- Revised to use a stdev based on spec range
- Consensus value is representative of each sample
  - No standard material used as basis to evaluate results
  - As is the case with other lab results assessments

Methodology …2

- PT scheme **NOT** done to point figures
  - All labs identified by a code unknown to others taking part
- Use it as an opportunity to develop into an even better lab
- Sample prepared by Much Aspahlt

Methodology …3

- A Z-score is a normalised value which gives a "score" to each result, relative to other numbers in data set

$$Z_i = \frac{x_{i-\bar{x}}}{s}$$

recommendations of SANS 17043:2010 as follows:

- **|z| ≤ 2** **Satisfactory**
- **2 < |z| < 3** **Questionable**
- **|z| ≥ 3** **Unsatisfactory**

- Robust indicators include both a Robust Mean & Robust Standard Deviation

Info on analysis used & revisions made

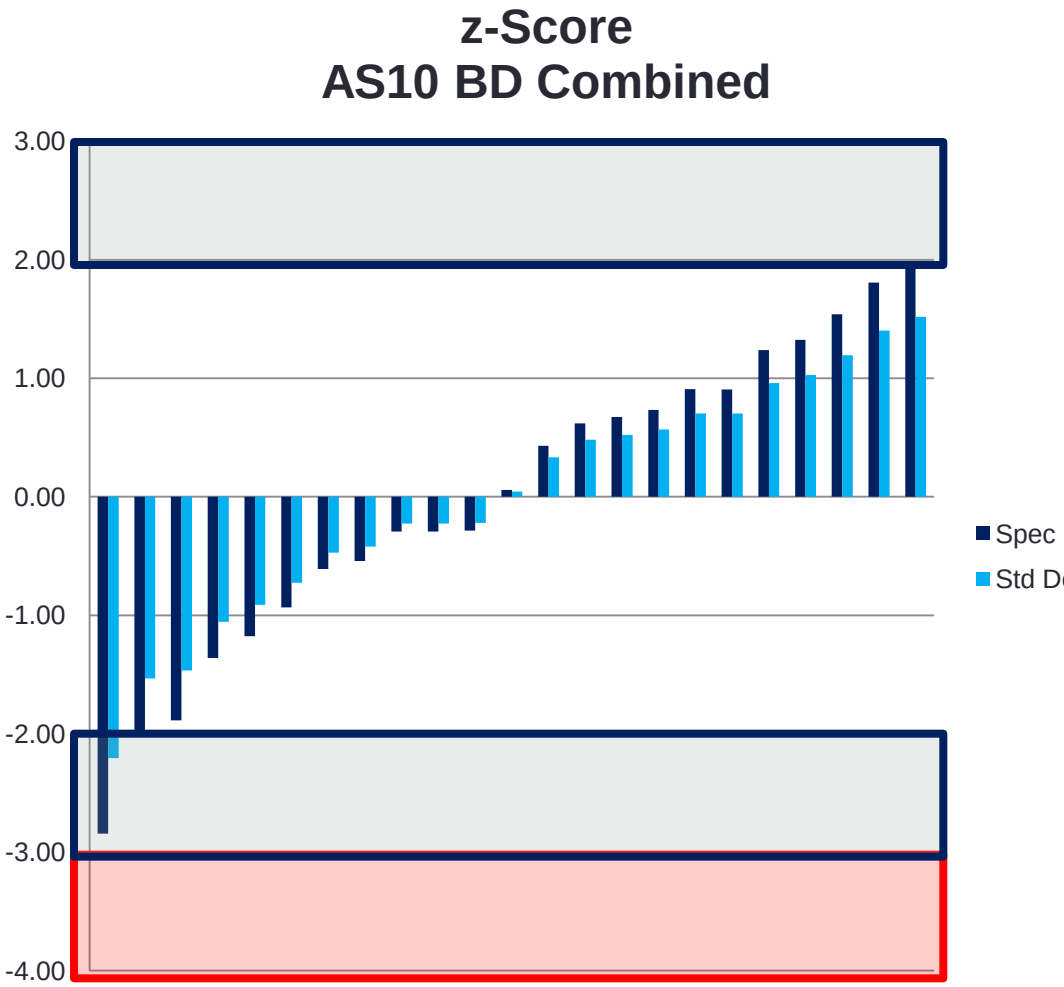
- Not looking at gradings
- Using Spec range as stdev as against calculated stdev of actual results
  - Need to find a system that works best without being overly stringent but also not unreasonably easy to achieve that results in unrealistic complacency
  - Will have to return to Atterberg limits to review using spec as stdev
- Must provide all raw data per individual test result required
  - Don’t only provide average result as per normal report
  - We need to work out average
  - determine labs range.

Info on analysis used & revisions made cont'd

- ASTM z-score more stringent than our current method
  - involves far more labs
  - therefore better correlation
- Different approach to limit variability
  - Single lab to knock all briquettes
  - More consistent compaction
  - Stab&Flow, ITS, BRD should reduce stdev values or range of results

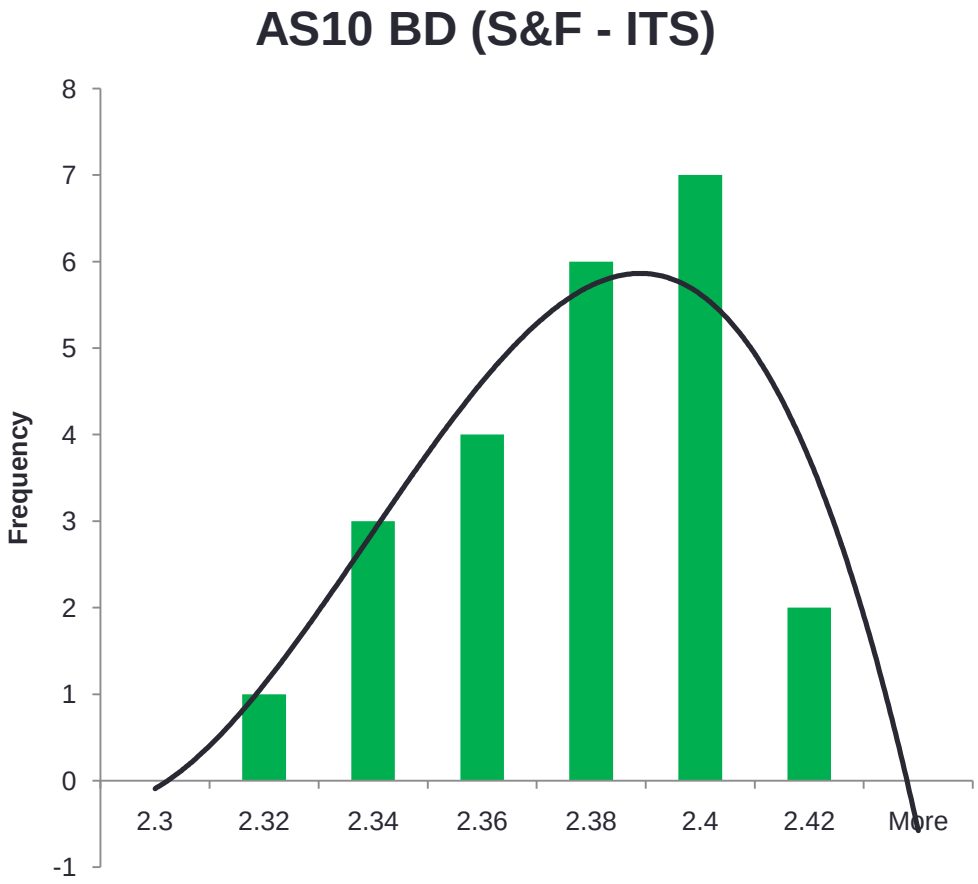
AS10 – BD (BRD)

- Average = 2.3667
- StdDev
  - **Spec = 0.020**
  - Calc = 0.258
- Avg Max = 2.4058
- Avg Min = 2.3098
- Range = 0.0960
- 27 labs,
  - 4 = no results
  - 3 = 1 result (avg??)



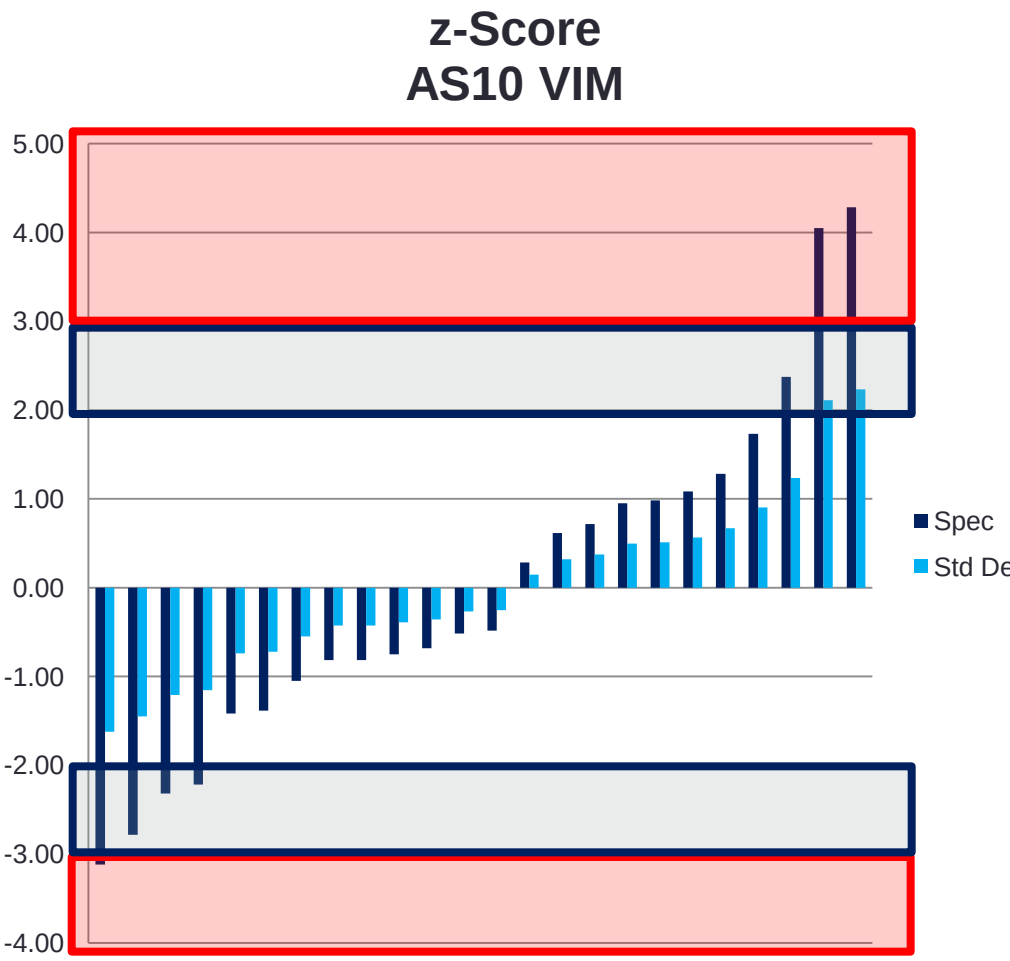
AS10 – BD (BRD) – other comments

- All results returned to BRD format based on temps given in report
- Results a bit skewed
- 4,500 & 1.196
  - Average = 2.848
- Generally - not too bad
  - Possibly still a bit wide



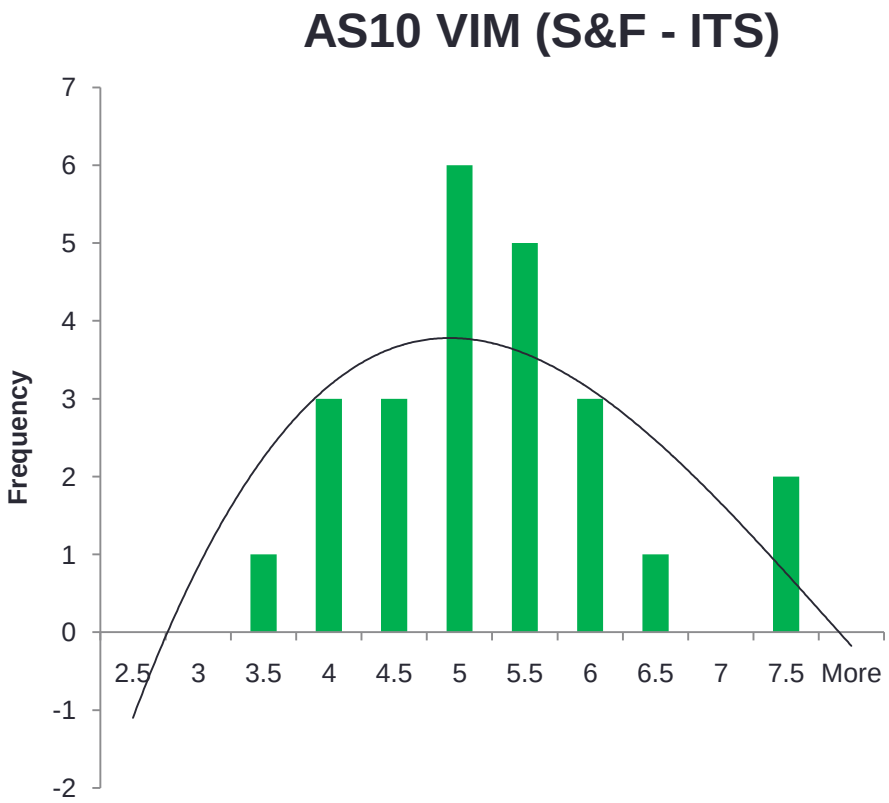
AS10 – VIM's

- Average = 5.008
- StdDev
  - **Spec = 0.5**
  - Calc = 0.959
- Max = 7.150
- Min = 3.450
- Range = 3.7000
- 27 labs,
  - 1 = no results
  - 4 = 1 result (avg??)



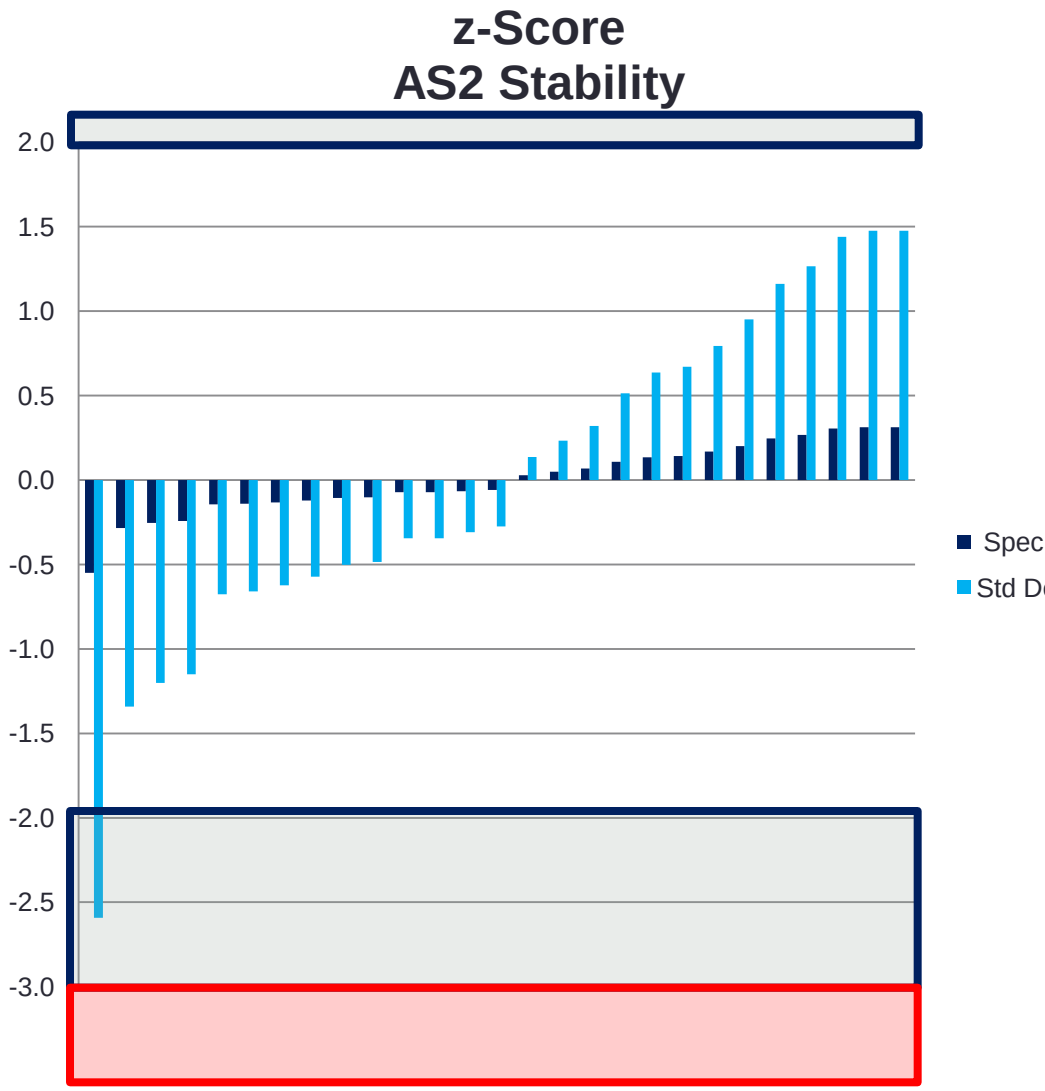
AS10 – VIM's

- Looks OK ….
- Some labs need to give their process some attention
  - Marshall hammer issues
  - Compaction temp
  - Heating of samples



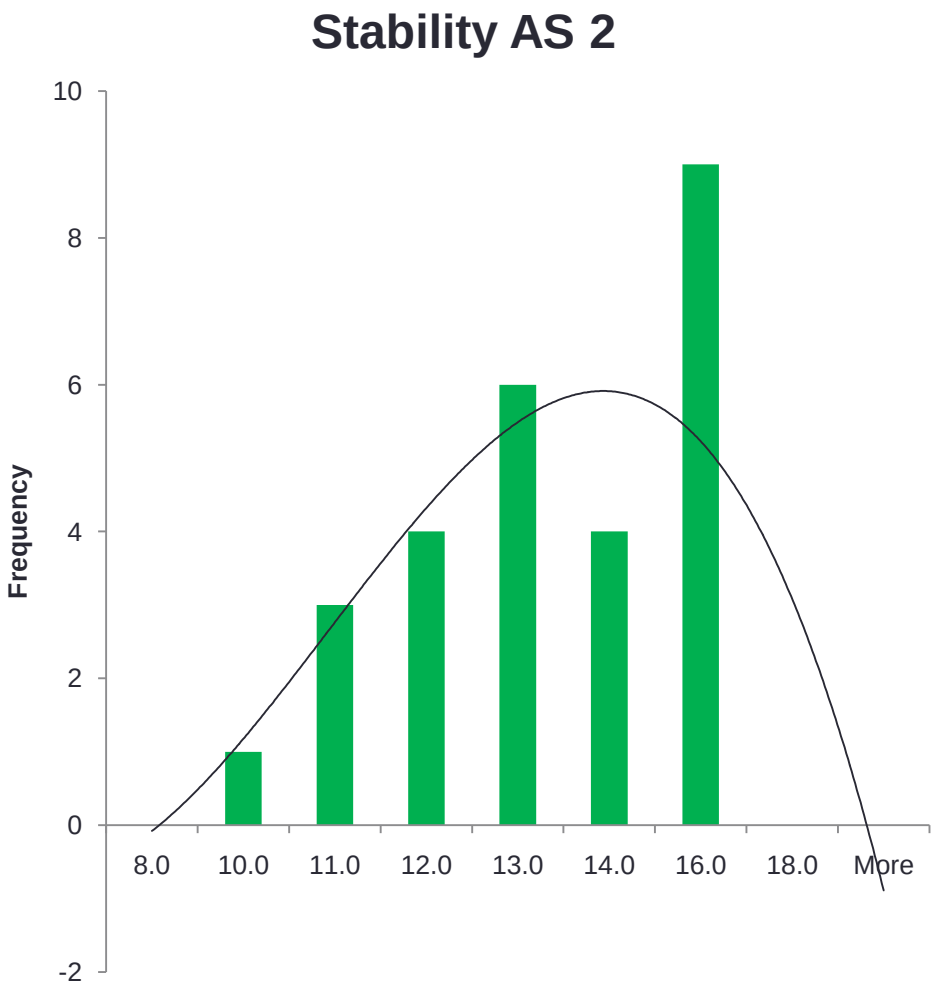
AS2 – Stab

- Average = 12.989
- StdDev
  - **Spec = 9.0**
  - Calc = 1.905
- Max = 16.2
- Min = 7.5
- Range = 8.7
- 27 labs,
  - 3 = 1 result (avg??)



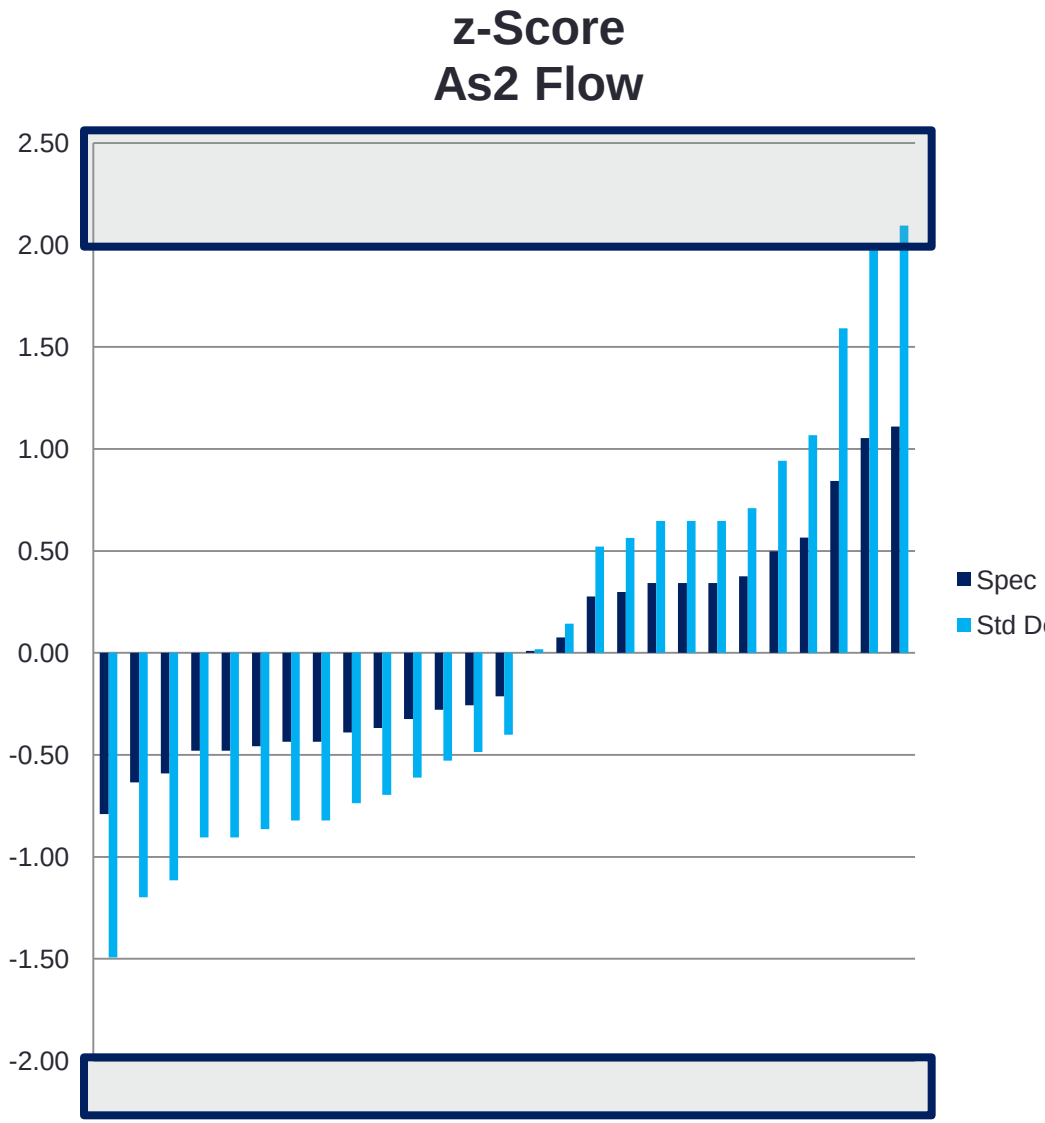
AS2 – Stab

- High % above max spec value
- Stdev values better than spec values
  - spec range is too large



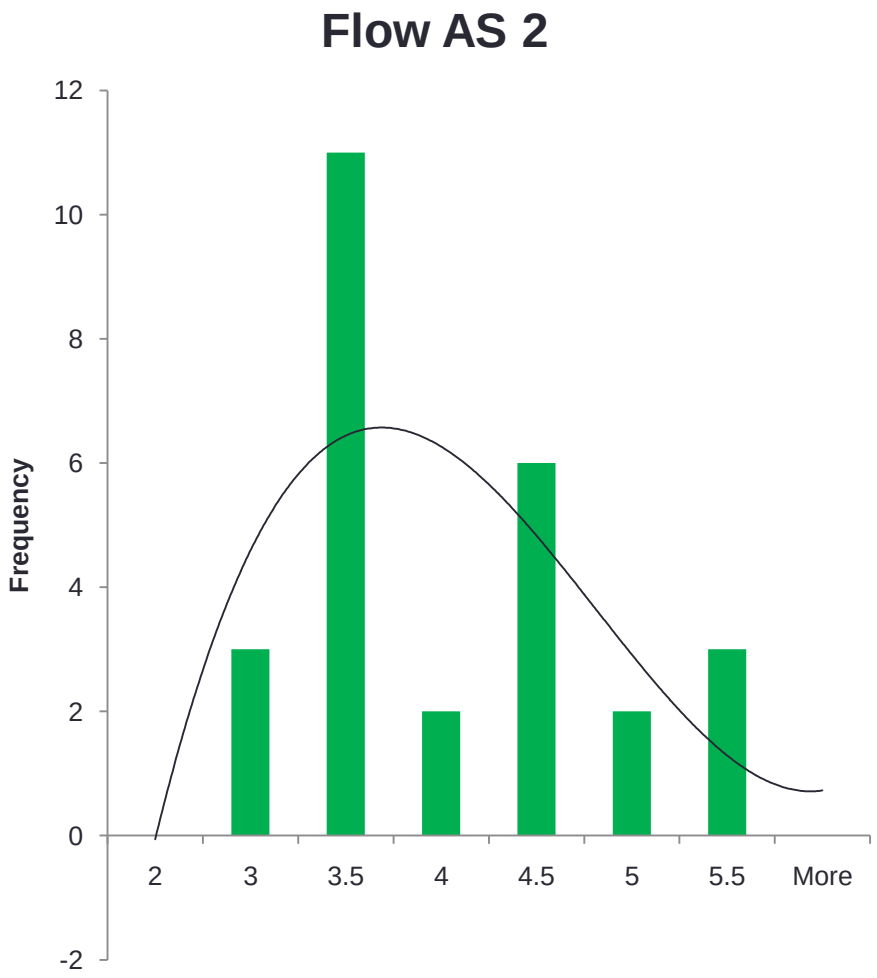
AS2 – Flow

- Average = 3.8
- StdDev
  - **Spec = 1.5**
  - Calc = 0.79
- Max = 5.6
- Min = 2.6
- Range = 3.0
- 27 labs,
  - 3 = 1 result (avg??)



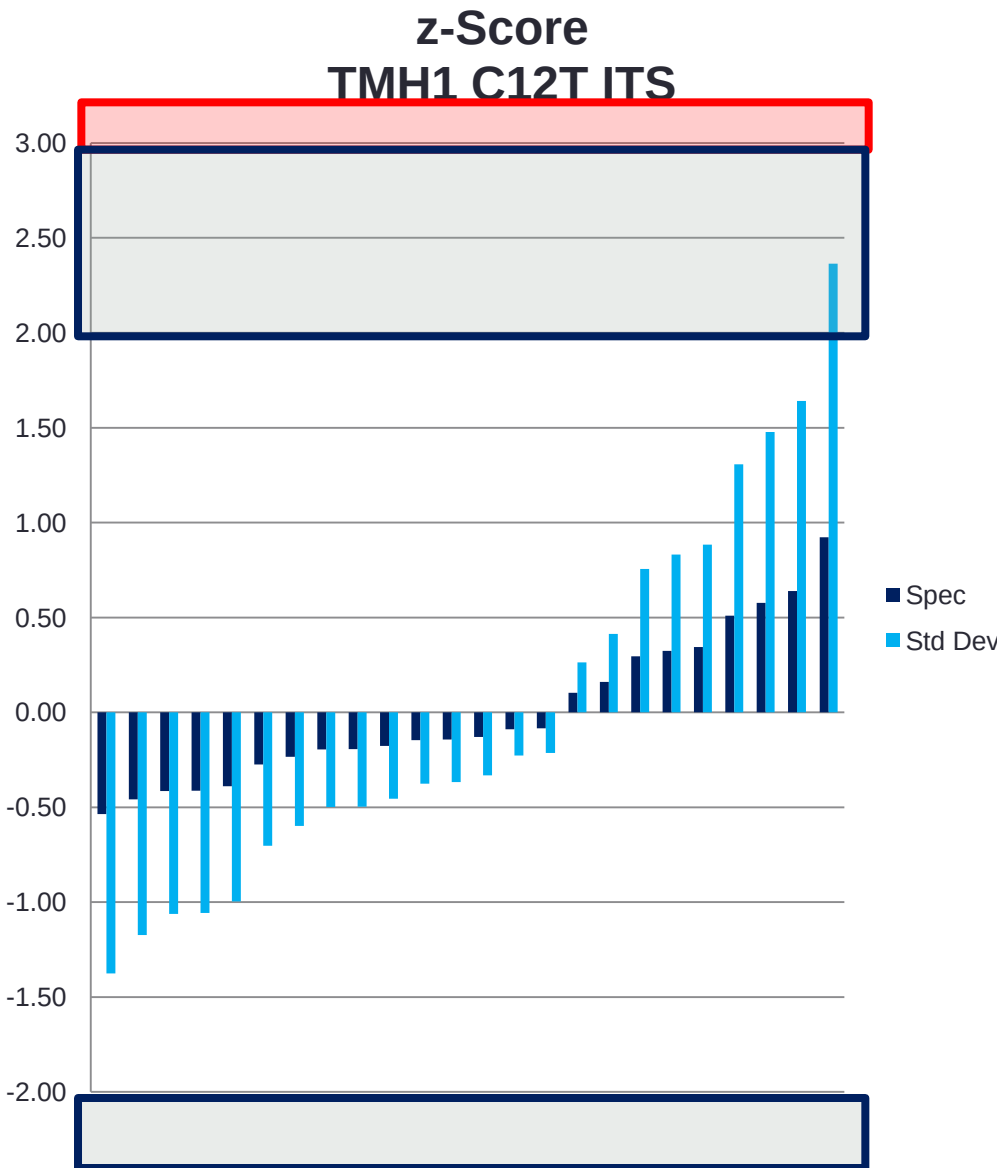
AS2 – Flow

- Oops!!
- No real consensus value
- Needs to be looked into & a better process adopted
- Briquettes knocked at 1 lab & distributed for testing



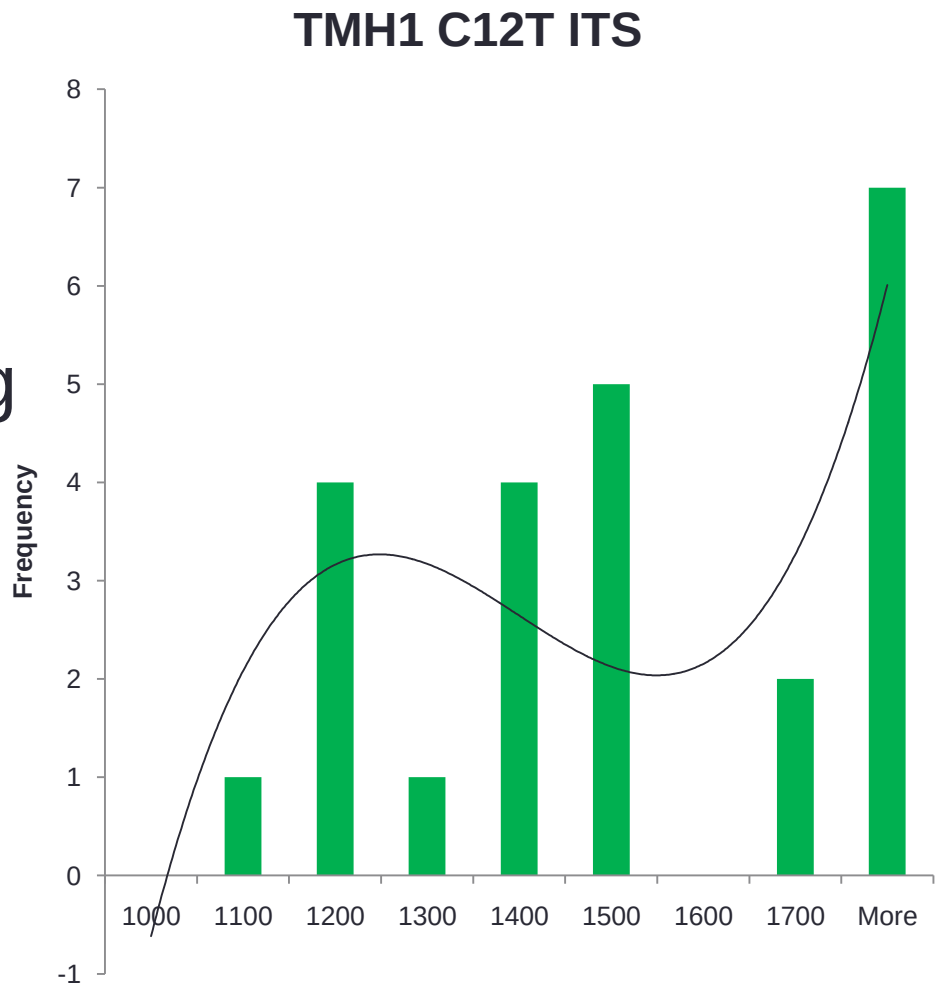
TMH1 C12T - ITS

- Average = 1 543
- StdDev
  - **Spec = 900**
  - Calc = 351
- Max = 2 389
- Min = 1060
- Range = 1 329
- 27 labs,
  - 3 = 1 result (avg??)
- 1.429 & 1.423 reported as ITS values????



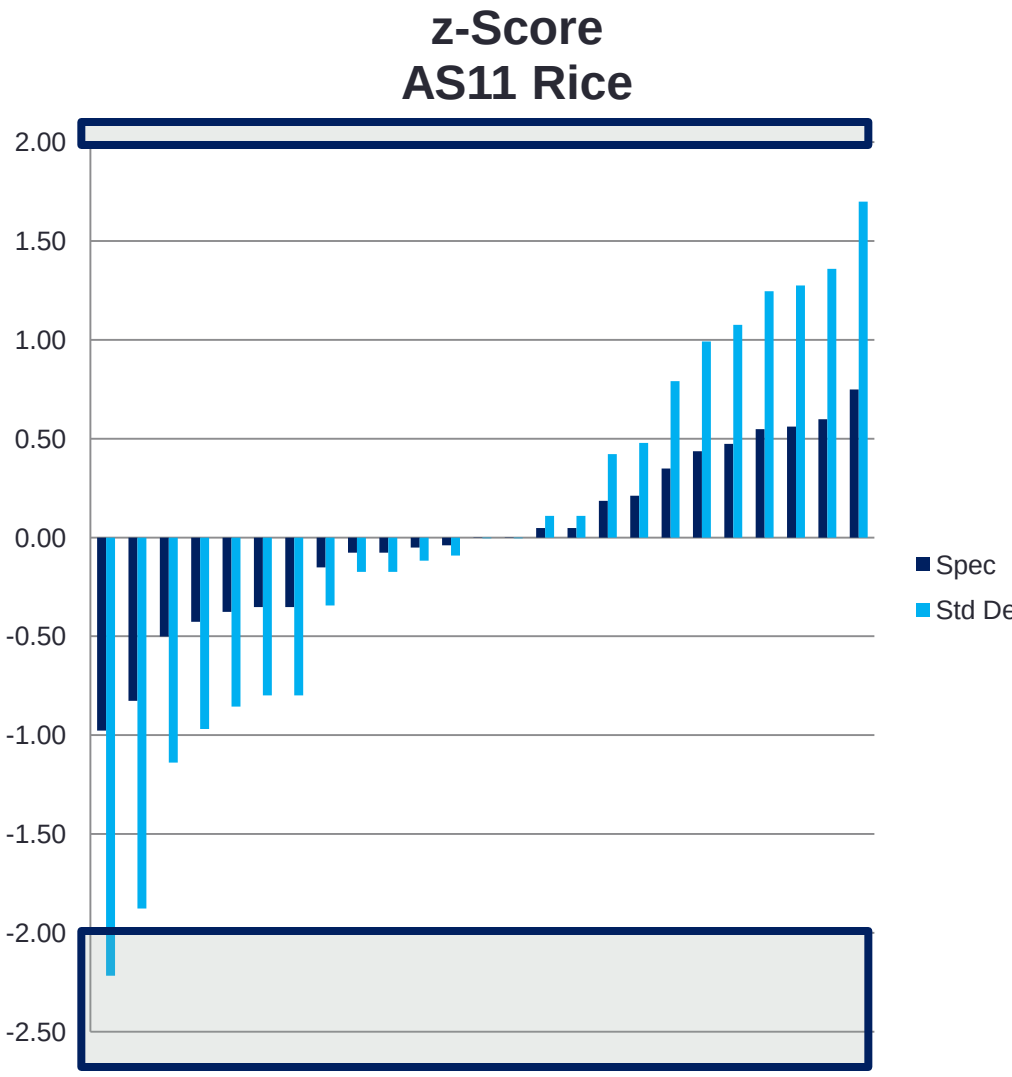
TMH1 C12T - ITS

- Oops!
- Again high % above max spec value
- So - What is this telling us??
  - Anything of value at all?
- High variability & no real consensus



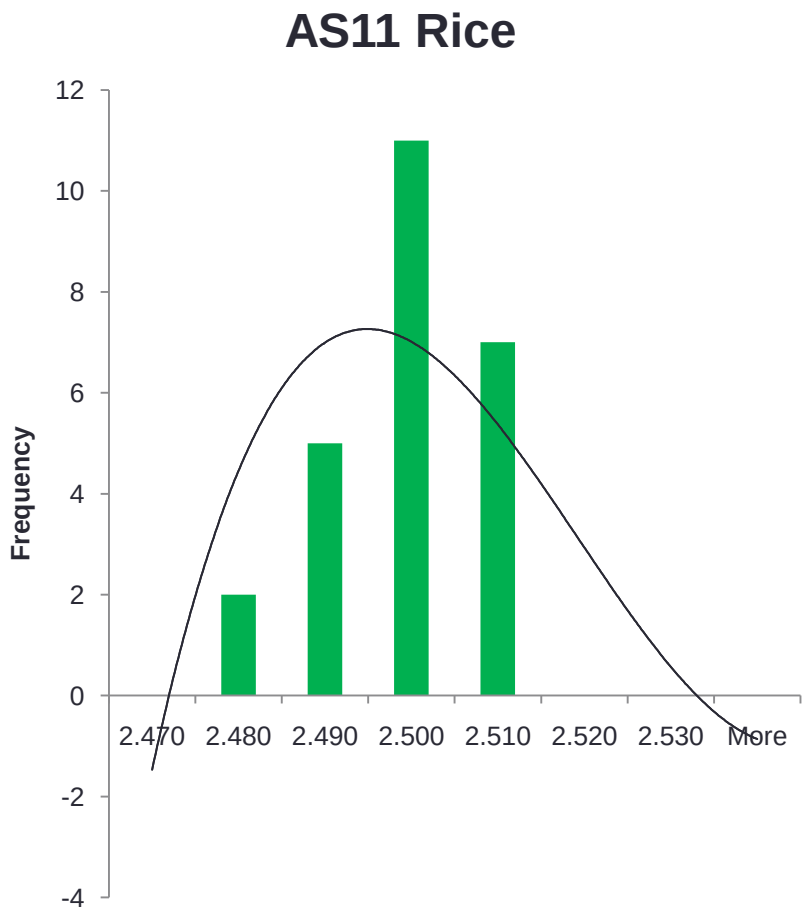
AS11 - Rice

- Average = 2.494
- StdDev
  - **Spec = 0.020**
  - Calc = 0.009
- Max = 2.512
- Min = 2.474
- Range = 0.038
- 27 labs,
  - 7 = 1 result (avg??)
- 6.1 & 7.3 reported as Rice values????



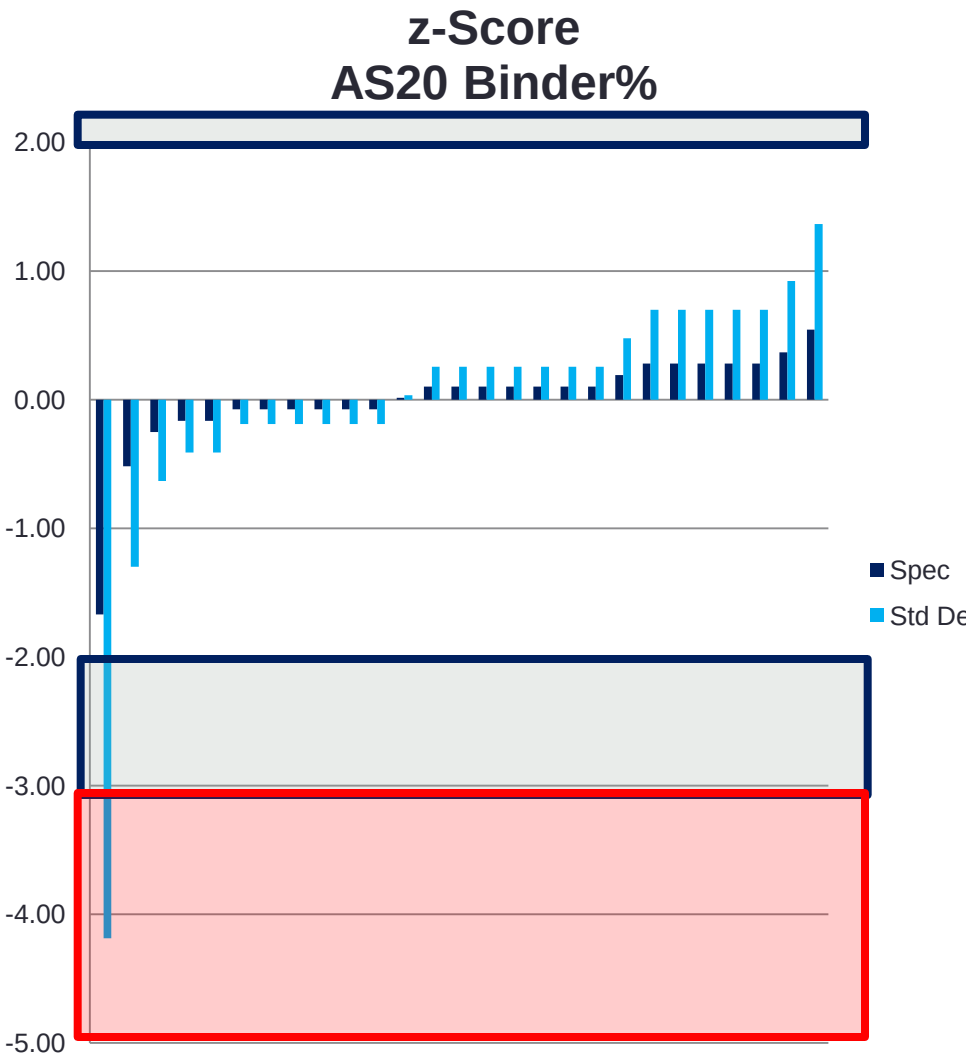
AS11 - Rice

- Good correlation
- Expected due to consistency of test results in general & test method



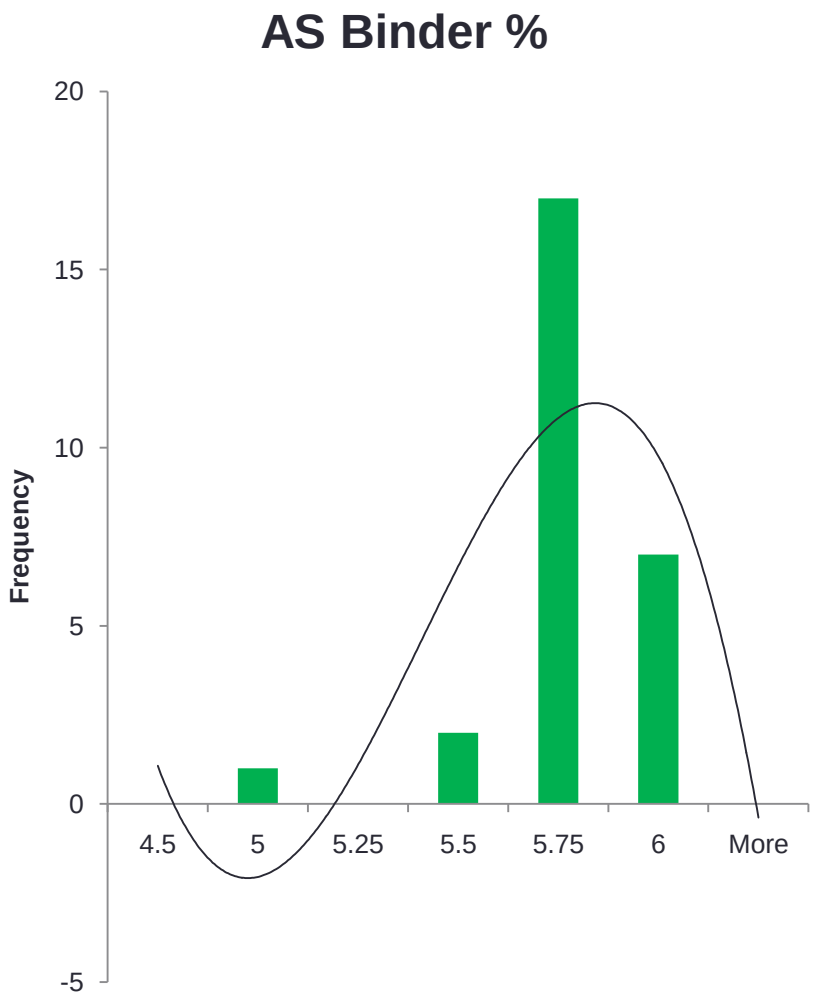
AS20 – binder %

- Average = 5.64
- StdDev
  - **Spec = 0.560**
  - Calc = 0.225
- Max = 6.1
- Min = 4.7
- Range = 1.4
- 27 labs,
  - 7 = 1 result (avg??)



AS20 – binder %

- Mostly OK
- 1 lab needs to check results



HMA PT scheme Round 2 Conclusions

- Lab participation up from 11 to 27
  - A great improvement
  - Far better for analysis
- *Critical* that questionnaires get answered accurately
  - Used as 1st desktop check on discrepancies in test results
- Depending on which system you use depends on the results
  - The more stringent analysis leaves quite a few failing or needing some attention.
  - Except for few results
- **Z-scores 2 < |z| < 3**,
  - conduct a thorough investigation.
- **Z-scores >3**
  - An urgent & thorough investigation

HAN PT scheme Round 2 Conclusions …2

- Participants had no particular difficulty with tests.
  - Mixed Methods used TMH1 & SANS 3001
- Good alignment with homogeneity data
  - independently evaluated
- Individual results MUST be provided to get a better sense of range within a single lab
- Responses to questionnaire.
  - Still need to look thru the answers given

Future PT schemes planned for 2013

- Bitumen PT scheme
  - Programmed for later early 2013
  - To be conducted as per current method you use
  - This will be picked up in the responses to the questionnaire
- Soils & gravels PT round 2
  - MOD & CBR
  - Programmed for early 2013

Need as far reaching laboratory representation to make the process meaningful to broad roads industry

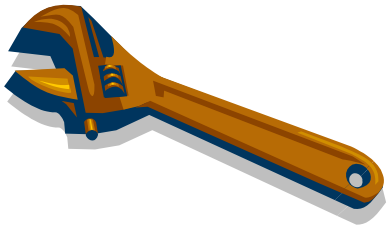
Thanx to …

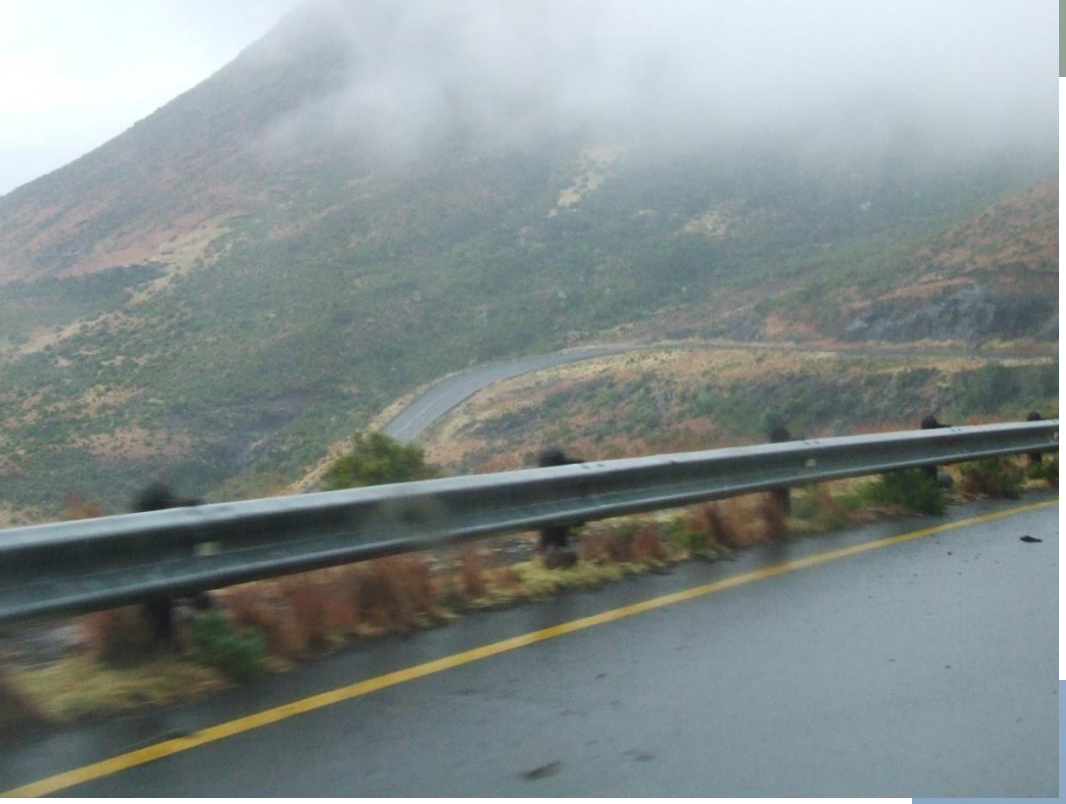
- To all labs for their contribution & participation in HMA PT scheme
  - Much for complied the samples
- SABITA for funding Asphalt & Bitumen PT scheme
- CSIR for homogeneity testing
- NLA for analysing results & compiling the report
  - To follow shortly
- MatCivils committee for their assistance in vetting the Report

Hope I haven't left anyone out ……

In closing…

- Looks like we are heading in the right direction
- It is a learning curve
  - both in writing of the protocols & in evaluating results
  - as it is for the labs in providing information
- in the requested format & manner.
- Some learning curves are steeper than others





- A turbulent sea
- Waiting for the impact

- A slippery steep mountain pass

In closing…

- This will be a regular annual activity
  - on a rotation basis for various testing streams
- **Purpose**
- to *improve consistency* of results between labs
- Assist in identifying potential problem areas
- addressing these issues

- Building towards a more *professional laboratory environment* that will be seen as being
- Trustworthy
- Honest
- Quality driven

Thank you……..