



Introduction

Article 7 considers the Vision Test but, first of all, I wish to comment on Certification events since the last article was written. The most important being the fact that a major international meeting to bring EN 4179⁽¹⁾ and NAS 410⁽²⁾ together has taken place and we look forward to reviewing their progress; secondly, the PED Directive has become live and it is now mandatory that all equipment going into service with a maximum allowable pressure greater than 0.5 bar will have to comply. For the purposes of this Directive, pressure equipment means vessels, piping, safety accessories or pressure accessories.

In this regard it is important to note that the procedure for approval of NDT personnel allows either central certification or employer based programmes (SNT-TC-1A)⁽³⁾. There are rumours that only centrally certified NDT personnel will be accepted for the PED. This is NOT the case.

My final comment is in relation to aerospace certification and I concur with John Thompson's comments in his letter published in Insight (April) that where the level of policing by regulatory bodies is at a high level, e.g. NADCAP (National Aerospace and Defence Contractors Accreditation Programme), then the employer based programme: SNT-TC-1A schemes are the real answer. It is clear that, as the level of auditing of these employer based programmes increases so the recognition of the validity of such schemes increases, giving more confidence to industry with respect to the certification of NDT personnel.

I also consider that other industry sectors – rail, power, oil, gas, etc. would do well to consider the NADCAP approach to third party accreditation; indeed this programme would be well suited to an article in its own right – any offers?

The main subject of this Article 7 however, is the Vision Test, and I will now discuss this aspect of NDT Operator Certification.

Background

My research takes me back to the original publication of SNT-TC-1A in 1966. Under item 6.2 Examination is a section as follows. 'Examination to verify physical and technical qualification shall consist of...'

- a. *Physical*
 - 1. J-1 letters near vision test, natural or corrected, conducted annually.
 - 2. Colour vision and/or additional medical requirements should be considered when preparing the employer's Written Practice.

This remained in all editions until 1975 when there were considerable changes as follows.

- a. *Physical*
 - 1. Near Vision – downgrading to J-2, natural or corrected in at least one eye.
 - 2. Capable of distinguishing and differentiating contrast between colours used in the method for which qualified, as demonstrated by the practical exams or test performance.
 - 3. Additional physical requirements should be considered when preparing the employer's Written Practice.

1980 The whole physical exam to be administered annually and results kept on file.

1981 Requirement that near vision be annually tested but the colour test changed to every three years.
Removal of the clause relating to 'additional physical capabilities are required by the employer'.

1996 Within colour contrast differentiation the following is added: 'differentiating contrast among colors or shades of gray (US spelling) used in the method...'

No further changes in the 2001 edition.

Other Employer Based Programmes

- | | | |
|----|-----------------------|---|
| a. | NAS 410 | Near vision J1
Colour – as used in Method |
| b. | EN 4179 | Near vision J1
Colour – as used in Method. When not possible to devise a test, Ishihara may be used. |
| c. | CP 189 ⁽⁴⁾ | Near vision J1
Colour – as used in Method |

In practical terms, an optician faced with such an open-ended requirement often finds it difficult to give the NDT department the information required. However, this can be simplified.

Near Vision

Jaeger eye charts exist for near vision and are easy to get hold of in Europe and America at least. The chart should be read at not less than 30cm with at least one eye corrected or uncorrected under good light.

This is J1 ($\frac{4}{72}$ " \equiv N4)

'The end of the match was near, the score was two-one to the City team and the underdogs were up against it. The young lads from the Town side were tiring and the wind was against them. I looked to the sky and prayed for a little good luck. The City team launched another attack, but good defending got the ball back to the keeper. The wind dropped as he fired the ball as far as he could, the young striker collected the ball and took it in his stride into the penalty area. The burly defender clattered into the striker and the referee blew the whistle.'

This is J2 ($\frac{5}{72}$ " \equiv N5)

'It was one of those days when everything had been going so well. His early morning walk was unusually warm and the spring sunrise just seemed that little clearer. In his mail he received a letter which he had been waiting for weeks to arrive, and at work he had been informed by his manager that he had been successful in his exams. He bought an evening paper on the way home to check the lottery numbers and to his dismay realised that his six numbers had come up. Now, he thought – where exactly did I put my ticket!'

All the NDT department needs to know is if the operator can read this type and be given a statement saying so.

EN 473⁽⁵⁾ and ISO 9712⁽⁶⁾ both ask for the same Near Vision Test – J1.

It is accepted that the employer is responsible for conducting an annual eye test for near vision to ensure continuing validity of certification.

Colour Vision – Contrast and Greys

Colour vision is a much more difficult area to examine. No document mentioned above requires the use of Ishihara Colour Plates. EN 4179 however, says these may be used where a suitable test cannot be devised by the employer.

PCN complicates matters as follows. In the General document (PCN Gen 2000⁽⁷⁾) it states the visual candidate shall distinguish and differentiate contrast between the colours used in the NDT Method, but then adds AS SPECIFIED BY THE EMPLOYER!! – exactly as stated in

the EN 473, ISO 9712 and SNT-TC-1A. However, reference is made to further PCN requirements for colour vision and acuity of vision as covered in another document PSL/44. This document confirms that, initially, all candidates for PCN will have their colour perception tested by the Ishihara method. This test must include 24 plates with no statement of how many plates need to be read accurately to be passed; however, it adds 'In the event a colour perception deficiency is detected by the Ishihara test, a further 'Trade Test' is to be carried out by the employer'!

So, on the one hand, we have a Central Certification Programme asking for a 24 plate Ishihara Test but, failing that, if the Employer gives the okay, PCN/BINDT will accept it. Evidence of the Employer test must be presented to BINDT upon request.

I find it confusing that a Central Certification Programme is prepared to accept that the Employer has done a colour vision test and yet, when the operator moves Employer, there is no PCN procedure in place to check that the new employer validates the eye test as being appropriate to the new employer's requirements.

An Ishihara Test is probably most well known as the coloured dots (*Figure 1*) and is in fact a highly sensitive test which is in excess of what is needed for most every day colour decisions. There are others – The City University Colour Vision Test (1998), which identifies those with significant colour vision difficulties; The Farnsworth Munsell 100 Hue Test; L'Anthony's 40 Hue List (a shortened form of the Farnsworth Test). Then there are the contrast sensitivity tests which rarely, if ever, get mentioned – The Cambridge Low Contrast Grating; The Pelli Robson Contrast Sensitivity Chart and there are, of course stereotests for binocular vision (Lang; Frisby; TNO; West Fly; Randot and so on). And finally there are the Distance vision tests mentioned in some documents.

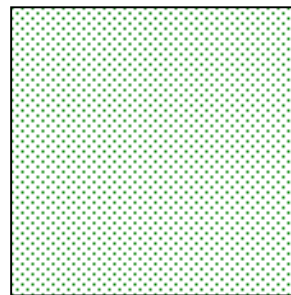


Figure 1

Summary

Clearly, with the Employer being responsible for giving the NDT operator the authorisation to work, the Employer needs to be satisfied that his operator can see correctly.

Near Vision is well documented and a simple rule of thumb is Jaeger 1 (N4) read corrected or uncorrected at a distance of 30 cm from the eye in good conditions and administered annually.

But what do we do about the technician who cannot pass the Ishihara? Well, the Employer could consider the City University Colour Vision Test - less sensitive than the Ishihara but surely acceptable for NDT work. Then there is the 'Trade Test'. I do not think it is appropriate to expect the employer to set up method specific tests, but would recommend they stick with standard repeatable test patterns which should be administered every three years.

Conclusion

1. There is considerable confusion concerning eye tests – which standards to use; how often to test; who is eligible to do the test; who takes the responsibility for the test.
2. The simple solution is as follows:
 - a. Near Vision J1 annual test
 - b. Colour Vision 24 plates Ishihara Test every 3 years.
3. Eyetest and certification to be administered through the NDT Level 3.
4. Whichever programme of certification is used the employer is responsible for ensuring the vision of his NDT operator is in accordance with his Written Practice or the requirements of the Central Certification Programme.
5. Near Vision Charts and Ishihara plates are widely available in the UK, Europe and the United States.
6. The Employer retains responsibility for issuing the operator's authorisation to work, therefore it is in his own interests to ensure the operator can see properly.

References

- (1) EN 4179. *Current Issue 2000. Publisher: BSI*
Official title: Qualification and Approval of Personnel for Non-Destructive Testing – BSI Aerospace series.
- (2) NAS 410 *Current Issue May 1996. Publisher Aerospace Industries Association of America.*
Official title: National Aerospace Standard Certification and Qualification of Non-Destructive Testing Personnel – NAS 410.
- (3) SNT-TC-1A *Current Issue 2001. Publisher ASNT.*
Official title: Recommended Practice No SNT-TC-1A Personnel Qualification and Certification in Non-Destructive Testing.
- (4) ANSI/ASNT CP 189-2001 *Current Issue 2001. Publisher ASNT.*
Official title: ASNT Standard for Qualification and Certification of Non-Destructive Testing Personnel.
- (5) EN 473 (*UK National Scheme PCN*) *Current Issue BSEN 473 2000: Publisher BSI.*
Official title: Non-Destructive Testing – Qualification and Certification of NDT Personnel – General Principles.
- (6) ISO 9712:1999 (E) *published by ISO.*
Official title: Non-Destructive Testing – qualification and Certification of Personnel. Second Edition dated 1999-05-01.
- (7) Official title: General Requirements for Qualification and PCN Certification of NDT Personnel published by BINDT.
Current Issue: Issue 3 Revision B dated 24 July 2001.