HIGH TEMPERATURE MECHANICAL TESTING COMMITTEE
Annual General Meeting

Minutes of 59th Committee Meeting,
held on Wednesday 11th May 2011 at Rolls Royce, MTOC Dahlewitz (Berlin), Germany
The meeting was held in conjunction with 2nd International Workshop on Thermo-Mechanical Fatigue
held at BAM, Berlin on 12th & 13th May 2011.

Dates of Next Meetings:
- 60th Meeting – Wednesday 2nd November 2011, at Imperial College, London.
  [To be held in conjunction with Working Groups]
- 61st Meeting (AGM) EDF Barnwood Gloucester, Tuesday 15th May 2012, 9.30am – 12 noon to be held in Conjunction with the QA Workshop Part 1: Tues/Wed 15th & 16th May 2012
  [Please note these dates in your diaries – Thank you]

<table>
<thead>
<tr>
<th>Item</th>
<th>Topic</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>INTRODUCTION &amp; WELCOME</td>
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<td></td>
<td>1.1 General. Dr Klingelhoeffer (Chairman) welcomed the Committee and Observers.</td>
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<td></td>
<td>1.2 Dr Steve Brookes Introduced Dr Michael Born, the Director of the Rolls Royce MTOC (Mechanical Test Operations Centre GmbH), who welcomed the Committee and gave a brief overview of the development of the MTOC. A brief summary outlining details of the MTOC is given in Appendix 1.</td>
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<td></td>
<td>1.3 The Agenda, given in Appendix 2, was agreed.</td>
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<td>2</td>
<td>ATTENDANCE &amp; APOLOGIES FOR ABSENCE</td>
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<td></td>
<td>The business cards of the members present and observers together with a list of apologies received/attendance record are given in Appendix 3 &amp; 4.</td>
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<td></td>
<td>The following committee members were present: Miss Kate Abbott (SITL), Prof. M Bache (Univ. Swansea), Dr P Barnard (Doosan-Babcock), Dr Stephen Brookes (RR), Dr S Holdsworth (EPMA), Dr Klingelhoeffer (BAM), Mr P. McCarthy (Consultant), Mr M S Loveday (Secretary) &amp; Mr O. O’Grady (Exova).</td>
<td></td>
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<td></td>
<td>Also attending were: Michel Fajfpowski (MTS) Dr. Andrew Harrison (Exova), Steve Jaques (Serco), Dave McLennon, (EDF), Andrew Mills (SITL) and Andrew Wisbey (Serco).</td>
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<td>It was noted that no responses were received from Dr P Häehner &amp; Dr P Morris.</td>
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<td>3</td>
<td>MINUTES OF PREVIOUS MEETING</td>
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<td></td>
<td>The Minutes of the 58th meeting held on 2nd November 2011 at SITL, Lincoln, UK, having previously been distributed via E-mail, were accepted as a corrected record with the amendment of the correct location of the RR MTOC as Dahlewitz,D-15827 Blankenfelde-Mahlow and not Dahlwitz-Hoppegarten. In addition some minor typos were amended in Section 4.3</td>
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<tr>
<td>Item</td>
<td>Topic</td>
<td>Action</td>
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<tr>
<td>4</td>
<td><strong>MATTERS ARISING</strong> <em>(Items not covered elsewhere on the Agenda)</em></td>
<td>All</td>
</tr>
<tr>
<td>4.1</td>
<td>Facilities Survey – The Secretary reported that to date only four organisations had responded to the request to supply information about HT testing facilities. The Survey form would be re-circulated with the Minutes.</td>
<td>All</td>
</tr>
<tr>
<td>4.2</td>
<td>List of Standards – The Secretary reported that in line with the Action in Section11 of the minutes of the previous meeting held at SITL, Lincoln, he had prepared a draft list of Standards which had been circulated. The list will be updated and circulated with these minutes <em>(Appendix 5)</em> and members were requested to make further updates to the list.</td>
<td>All</td>
</tr>
<tr>
<td>5</td>
<td><strong>CORRESPONDENCE</strong></td>
<td>MSL</td>
</tr>
<tr>
<td></td>
<td>The Secretary reported that the necessary annual returns had been submitted to Companies House (£15) in January and to the Charity Commission. Details of the Accounts would be lodged after this AGM. See the Charity Commission new website: <a href="http://www.charitycommission.gov.uk">www.charitycommission.gov.uk</a></td>
<td>MSL</td>
</tr>
<tr>
<td>6</td>
<td><strong>CHAIRMAN'S REPORT</strong></td>
<td>MSL</td>
</tr>
<tr>
<td></td>
<td>Dr Klinglehoeffer presented slides outlining the activities of the HTMTC during the last year; his presentation will be available on the website: <a href="http://www.htmtc.com">www.htmtc.com</a>. He summarised the activities of the HTMTC during 2010 and a copy of his report is given in Appendix 6. The Chairman highlighted the successful meeting held at SERCO on HT Testing in Controlled Environments (May 2010) and on the preparation for the 2nd International TMF Workshop. All the Officers and Committee were thanked for their hard work and support throughout the year. An abbreviated version of the report will be prepared for the ESIS Newsletter</td>
<td>MSL</td>
</tr>
<tr>
<td>7</td>
<td><strong>TREASURER'S REPORT</strong></td>
<td>LC, PB, MSL, PB, LC</td>
</tr>
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<td></td>
<td>Dr Barnard presented slides summarising the financial position of the HTMTC: Facilities had been set up to allow conference fees to be paid via Paypal and a Euro Account had also been established. The final account from the Workshop on Mechanical Testing in Controlled Environments (HTMET) held at SERCO, Risley in May 2010 showed a profit of £1,676.58 although credit notes for five delegates will be carried forward to future events for those unable to attend due to the Icelandic volcano ash cloud. In 2010 the total income was £4,942 and the total expenditure was £5,249, transactions mainly being associated with the HTMET Workshop, and administrative expenses including the Website, Company House registration and Secretarial expenses. The funds remaining on the Account at the end of 2010 were £7,564.95. The Accounts had been approved by the Independent Examiner and adoption of the Accounts were proposed by H Klingelhoeffer, seconded by P McCarthy and carried <em>nem con</em> The Treasurer was thanked for his diligence in preparing the Accounts. Four copies of the Accounts were signed by the Chairman &amp; Treasurer and will be forwarded to the Vice Chairman for signature before being returned to the Secretary (via the Treasurer) for submission to Companies House. The Treasurer agreed to thank the Independent Examiner in an appropriate manner. The forms for the change of signatories on the bank account were signed by those officers present at the meeting and a form will be forwarded to the Vice Chairman for signing.</td>
<td>LC, PB, MSL, PB, LC</td>
</tr>
</tbody>
</table>
Following the meeting in Lincoln two flyers had been produced and circulated to HTMTC Corresponding members in March 2011. The 1st flyer gave a overview of the two Workshops which were also to include a web link for papers. The second flyer was focused on the first workshop held at EDF, Barnwood.  On 22nd of November 2011 meeting Announcements had been made that some members had not attended for several meetings and so their membership would be ratified at the next meeting. The End of the meeting was extended by a few minutes to allow a clarification of the scope and remit of the two workshops and to discuss the programme of the two workshops – 1st Workshop New Labs and new staff to exist and 2nd Members. Minutes of the TMF Symposium at BAM Berlin were published in December 2010 in International Journal of Fatigue and Materials at High Temperatures. A detailed AGM minutes will be presented. The organising committee have negotiated with both the Symposium and Membership of the HTMTC.

ELECTION OF COMMITTEE (COUNCIL) MEMBERS

APPOINTMENT OF SECRETARY

APPOINTMENT OF INDEPENDENT EXAMINER

FUTURE HTMTC SYMPOSIUMS / WORKSHOPS

Dr Dogan reported via e-mail that more work is done on the crack initiation (ASTM preferred to call it Crack Formation), on creep-fatigue testing. The international EPRIC F-C Expert Group (chair: B. Dogan),
of which K Nikbin is also a member, has been very active during last 3 years and drafted 2 testing standards which are published by ASTM as ASTM Standards, one on C-F Crack Formation ASTM E2714-09, the other one is on C-F Crack Growth (ASTM E2760-10). Copies are available on request. The C-F Experts Group is now running a Round Robin on C-F Crack formation, and a second RR is planned to be started on C-F Crack Growth later this year. The current work is on Base materials of P91 and P92 steels, SS316 and Alloy 617. Work is already initiated to include weldments.

14.3 Testing in Controlled Environments WG  
(Convenor: O O’Grady)

The Convenor apologised that as yet the Scope and Objectives for the WG had not been finalised in consultation with the other members of the WG and circulated. The Remit should be forwarded to the Secretary by the end of July 2011 for circulation and would be reviewed by the Committee at the next meeting.

14.4 Temperature Measurement for HT Testing  
(Convenor – M S Loveday)

The Convenor reported that further development of the draft Code of Practice (CoP) for temperature Measurement in HT Testing was awaiting the findings of the thermocouple inter-comparison exercise being co-ordinated by Dr Wisbey. Results from 4 laboratories had been received and results are awaited from the other six partners who volunteered to participate. A Wisbey agreed to customise his slides so that anonymity could be preserved and the slides will be lodged on the HTMTC Website in due course. A summary of the findings and the implications for temperature measurement in high temperature testing will be incorporated into the CoP. Information relating to ‘drift’ of thermocouples from Exova & Alstom. The CoP would be re-circulated and all the members of the WG were asked to review the draft CoP and add additional sections plus more papers to the bibliography.

11 STANDARDS ACTIVITIES

a) Feedback on ISO TC 164 meetings at NIST, Boulder, Colorado, Sept 2010

As reported at the previous meeting it is being proposed that determination of Modulus will be included in a new Annex to ISO 6892 Pt 1. The Secretary reported that he had attended the meeting of SO TC164 SC1 WG4 held at DIN, Berlin held on 9th -11th May 2011 at which the proposed new annex was discussed, and a revised draft will be circulated to the WG in time for comments to be considered at the ISO TC164 meetings to be held in Paris 18th -25th September 2011. In addition details of reference data sets for validating software for the determination of industrially important parameters that characterise ductility and formability are the tensile strain hardening ‘n’ values and the plastic strain ratio ‘r’ of metallic materials are determined in accordance with ISO 10275: 2007 ( n-values) and ISO 10113:2007 ( r-values). These characteristic values are determined during a tensile test following procedures outlined in ISO 6892 Pt 1 Tensile Testing of Metallic Materials at Ambient Temperature. It was also highlighted that a proficiency testing exercise is underway organised by IfEP (DE) with a view to certifying a materials for Young’s Modulus, see Section 13.5.

[Post Meeting Note: ISO 12106:2003 Metallic materials – Low Cycle Fatigue Axial Strain-controlled method is being revised by ISO TC 164 SC5 and extended to include HT Creep-Fatigue testing; further information is available from the Secretary.]

12 CEN TWA on Ontologies & Schema

Discussions are still proceeding regarding the hosting of the computer compatible Schema for reporting results of Tensile Tests in accordance with ISO 6892 Pt 1. The final CWA Report has now been approved and will appear under the title of ‘A Guide to the Development & Use of Standards-Compliant Data Formats for Engineering Materials Test Data’. CEN have now uploaded the CWA onto their website as CWA ELSSI-16200:2010, where it is available as a downloadable pdf, see http://www.cen.eu/cen/Sectors/Sectors/ISSS/Activity/Pages/WS-ELSSI.aspx

13 ANY OTHER BUSINESS

13.1 HTMTC Web site - www.htmtc.com

Amendments discussed at the previous meeting have been incorporated into the Website including a ‘hit counter’ by Phil Jones, the webmaster. In addition links to other Websites, eg the IOM3, could be of reciprocal benefit. The minutes will be uploaded in due course.

13.2 List of Conferences of possible interest to HTMTC Members

The list of meetings circulated with the previous minutes has been updated and given in Appendix 6.

13.3 E-mail address

The Secretary reported that Phil Jones has now set up an HTMTC e-mail account hosted

AW
O O’G
PJ
MSL
All

Malcolm S. Loveday (17/06/2011)
on an independent server as outlined in the previous minutes. The committee approved the £100 website hosting fees. The e-mail address htmechtest@htmtc.com can be accessed via pop.123-reg.co.uk or imap.123-reg.co.uk and is password protected. The officers and webmaster will be issued with the password. Mr Jones was thanked for completing the action on this task.

### 13.4 Promotional ‘Goodies’

The treasurer reported that he had investigated a range of promotional items which could display the HTMTC logo and website address; a number of useful items were available typically costing ~£3 and would require a minimum outlay of approximately £300 - £450, see below. Key ring fobs, memory sticks, desk ruler/calculators and reasonable quality pens or lazer pointers were suggested. Peter Barnard was authorised by the Committee to pursue the matter in consultation with the Chairman and Vice-Chairman, and the QA workshop organisers were tasked to see if £500 could be allocated for purchased of suitable goodies for this workshop.

<table>
<thead>
<tr>
<th>Kit</th>
<th>Test</th>
<th>Type</th>
<th>Material</th>
<th>T°</th>
<th># of specimens</th>
<th>Dimensions of the cuts (mm)</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kit 1-1</td>
<td>Tensile</td>
<td>Cylindrical</td>
<td>TA6V</td>
<td>Room T</td>
<td>5</td>
<td>12x12x75</td>
<td>245 €</td>
</tr>
<tr>
<td>Kit 1-2</td>
<td>Tensile</td>
<td>Cylindrical</td>
<td>Al 2024</td>
<td>Room T</td>
<td>5</td>
<td>12x12x75</td>
<td>170 €</td>
</tr>
<tr>
<td>Kit 1-3</td>
<td>Tensile</td>
<td>flat</td>
<td>Al 2024</td>
<td>Room T</td>
<td>5</td>
<td>30 x 160 x 4</td>
<td>185 €</td>
</tr>
<tr>
<td>Kit 2-1</td>
<td>Tensile</td>
<td>Cylindrical</td>
<td>Inco 718</td>
<td>750 °F</td>
<td>5</td>
<td>Ø 16 x 75</td>
<td>240 €</td>
</tr>
<tr>
<td>Kit 2-2</td>
<td>Stress rupture</td>
<td>Cylindrical</td>
<td>Inco 718</td>
<td>1200 °F</td>
<td>5</td>
<td>Ø 16 x 55</td>
<td>265 €</td>
</tr>
<tr>
<td>Kit 4-1</td>
<td>Fracture toughness</td>
<td>CT</td>
<td>Al 2024</td>
<td>Room T</td>
<td>5</td>
<td>78 x 40 x 81</td>
<td>295 €</td>
</tr>
<tr>
<td>Kit 4-2</td>
<td>Crack growth propagation</td>
<td>Da/dN CT</td>
<td>Aluminium</td>
<td>Room T</td>
<td>5</td>
<td>99 x 95 x 16</td>
<td>411 €</td>
</tr>
<tr>
<td>Kit 5-1</td>
<td>Charpy</td>
<td>KCV</td>
<td>35NCD16</td>
<td>Room T</td>
<td>5</td>
<td>Ø 16 x 60</td>
<td>145 €</td>
</tr>
<tr>
<td>Kit 6-1</td>
<td>Hardness</td>
<td>RockwellC</td>
<td>35NCD16</td>
<td></td>
<td>1</td>
<td>Ø 16 x 10</td>
<td>145 €</td>
</tr>
</tbody>
</table>
13.5.3 IRMM (formerly Bureau Community of Reference, BCR) also supply European Certified Reference Materials including CRM 425 Creep RM and CRM 661 Tensile RM, both being Nimonic 75 in the form of 12mm diameter bar; see http://irmm.jrc.ec.europa.eu/reference_materials_catalogue/Pages/index.aspx

13.6 Acronyms
The Secretary agreed to prepare an initial draft of a list of commonly used acronyms relevant to HTMTC activities, see Appendix 7. Members were asked to review the list and insert additional acronyms.

13.7 Indentation Creep
It was reported that a meeting was being held on 27th -28th June 2011 at Nottingham University to consider the preparation of a CoP on Indentation Creep, largely based on the work of Prof Tom Hyde, Steve Brett and colleagues. A number of HTMTC Members had been invited to attend including MB, PB, BD & SH. The HTMTC applauded this initiative and would be happy to publicise the document or circulate a draft for comment amongst the Corresponding Members if that would be helpful.

13.8 HTMTC Aims Leaflet
The Secretary agreed to update the HTMTC Aims Leaflet with the List of Main Committee Members for 2011 / 2012, (see Appendix 8)

14 CLOSE OF MEETING
The Chairman gave a vote of thanks on behalf of the Committee to Steve Brookes, RR for hosting the meeting.
The meeting was followed by a conducted tour of the MTOC high temperature testing facilities and fan spin / burst test laboratory.

15 LIST OF APPENDICES
1. Rolls Royce MTOC
2. Agenda
3. Business cards, RR MTOC Committee Meeting
4. Apologies & Attendance Record
5. List of Standards relevant to High Temperature Testing
6. List of Forthcoming meetings
7. Acronyms

Secretary Contact Details: malcolm.loveday#npl.co.uk [Note; replace # by @ in e-mail address; this avoids the given address being picked up by spam search engines]
APPENDIX 1
Rolls Royce Material Test Operation Centre (MTOC) , Dahlewitz, Berlin, Germany .
May 2011 [Prepared by Dr Stephen Brookes ]

The Rolls-Royce Mechanical Testing Operations Centre (MTOC) at Dahlewitz, Germany, is an innovative test centre for the Rolls-Royce Group for mechanical and structural evaluation of gas turbine components during development, production and in service phase. The reasons for investing in a new testing facility, hardware and infrastructure was due to a number of issues. There is a need for a response to meet the urgent needs of new product innovation and aftermarket support. A need for a robust rationalisation and optimisation of mechanical, materials and vibration test capability into a single facility and organisation brought together into one centre. Dahlewitz, near Berlin, is close to important Rolls-Royce business partners and suppliers (i.e. Anecorn, DLR, BAM, GEVA, IMA, IABG). MTOC is involved with various collaborations and internationally funded test programmes and has developed strong professional links with other test establishments, test organisations (e.g. UKAS) and academia (UTCs). MTOC offers a spectrum of capabilities with the choice of over 40 different test types, such as fan-blade-off, bird ingestion, spin, fatigue, vibration and materials testing. The facility is approximately 7000 m³ in size, employs 50-80 people, and has involved an investment volume of approximately € 65 Million.
HIGH TEMPERATURE MECHANICAL TESTING COMMITTEE

www.htmtc.com

(59th Meeting)

2.00pm Wednesday 11th May 2011 [ start 2.00 pm ] to be held in conjunction with the TMF Workshop: 12th & 13th May 2011, at BAM, Berlin ( see www.tmf-workshop.bam.de )

AGM AGENDA

1 INTRODUCTION & WELCOME

2 APOLOGIES FOR ABSENCE / see Appendix A/

3 MINUTES OF PREVIOUS MEETING

Minutes of 58th Committee Meeting, held on Tuesday 2nd November 2010 at the Holiday Inn, Lincoln, hosted by Siemens Industrial Turbomachinery Ltd ( SITL) have been distributed via E-mail. To be approved

4 MATTERS ARISING ( Items not covered elsewhere on the Agenda)

a) Facilities Survey – feedback  b) List of Standards – updates ?

5 CORRESPONDENCE

Charity Commission, Companies House etc

6 CHAIRMAN'S REPORT

7 TREASURER'S REPORT    / Approval of Accounts

8 ELECTION OF COMMITTEE (COUNCIL) MEMBERS

In accordance with the Articles of Association of the High Temperature Mechanical Testing Committee and in accordance with the Minutes of the 15th Meeting of the Committee held on 18th October 1988, members of the Committee will come up for re-election on a rolling three year cycle, in the years indicated in the table below:-

<table>
<thead>
<tr>
<th>2011</th>
<th>2012</th>
<th>2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>C. Austin</td>
<td>(05)</td>
<td>Dr. P. Barnard</td>
</tr>
<tr>
<td>L. Candler</td>
<td>(02)</td>
<td>Prof. M Bache</td>
</tr>
<tr>
<td>S. Collins</td>
<td>(02)</td>
<td>Miss Louise Brown</td>
</tr>
<tr>
<td>Dr. P. Hähner</td>
<td>(02)</td>
<td>P. R. McCarthy</td>
</tr>
<tr>
<td>Prof. K Nikbin</td>
<td>(05)</td>
<td>Dr. P. Morris</td>
</tr>
<tr>
<td>O. O’Grady</td>
<td>(05)</td>
<td>Dr S Holdsworth</td>
</tr>
<tr>
<td>M. Spindler</td>
<td>(08)</td>
<td></td>
</tr>
</tbody>
</table>

The year a member joined the Committee is shown in brackets ( )

The formal membership as a Council Member of the following expires at the AGM: Colin Austin (Serco, Risley), Larry Candler (Exova), Steve Collins (Incotest), Dr. P. Hähner (IE-JRC, Petten, NL), Prof. K Nikbin (Imperial College, London), Owen O’Grady (Exova), M. Spindler (EDF, Barnwood)

a) Resignations : Mike Spindler

b) Other Changes in Membership: a) New Members: Dr Stephen Brookes (Rolls Royce, Dahlewitz, DE), b) Changes in contact details

If you wish to propose anyone else for membership, (with their agreement), please inform the Secretary before Monday 25th April 2011, so that their name may be circulated to the committee prior to the meeting. Note since the Council Membership now stands at 20 it may be appropriate to hold a ballot for the vacated posts if there are more nominations than vacant posts.

9 ELECTION OF OFFICERS

Nominations are required for the following positions:

Chairman : Dr Hellmuth Klingelhofer
Proposer: Peter Barnard
Vice Chairman : Larry Candler
Proposer: Owen O’Grady
Seconder: Peter Barnard

Treasurer : Peter Barnard
Proposer: Hellmuth Klingelhoffer
Seconder: Paul McCarthy

Additional nominations for any of the posts are invited. Please send nominations to the Secretary before 25th April 2011

10. APPOINTMENT OF SECRETARY
Nominations for this post are invited
(Mr Malcolm Loveday is willing to continue in the post of Secretary.)

11. APPOINTMENT OF INDEPENDENT EXAMINER
The Present examiner is Mr Nick Green who is willing to continue.

12 a) FUTURE HTMTC Symposia / Workshops
b) Quality Assurance Issues for High Temperature Testing
[See APPENDIX B for information about other meetings & Websites of possible interest to HTMTC Members]

13 WORKING PARTY REPORTS
13.1 Testing in Controlled Environments WG: Scope & objectives O.O’G
13.2 Temperature Measurement for HT Testing: feedback MSL
   a) Thermocouple Calibration Inter-comparison – Andrew Wisbey AW
13.3 Crack Initiation & Measurement: future activity? KN
13.4 Testing of Welds: future activity? BD

14 HTMTC: Administration & Promotional Activities
   a) Web Site – hit counter? PG
   b) HTMTC E-mail Address PG/MSL
   c) ‘Freebies’ – promotional materials PB

15 ESIS Feedback
   Newsletter c) ESIS Council in see: www.structuralintegrity.eu
   Membership- FESI www.fesi.org.uk

16 STANDARDS ACTIVITIES
   b) Feedback on ISO TC 164 meetings in Boulder, Colorado Sept 2010 MSL
   c) ISO TC164 SC1 WG 4 Tensile Testing – Modulus + r & n values KN/BD
   d) Other Standards / VAMAS activities eg TWA 25 Component Testing, TWA 31 Residual Stress

17 DATES & VENUES OF NEXT COMMITTEE MEETINGS
   • 60th Meeting : Wednesday 2nd November 2011, INCO Hereford, to be held in conjunction with the QA Workshop (Part 1): Wed / Thurs 2nd & 3rd November 2011 [Note: Subsequently postponed to May 2012]
   • 61st Meeting ( AGM ) – EDF Barnwood Gloucester, Tuesday 15th May 2012, 9.30am – 12 noon to be held in Conjunction with the QA Workshop Part 2 : Tues/Wed 15th & 16th May 2012

18 ANY OTHER BUSINESS :
APPENDIX 3: Business Cards

HTMTC Meeting at Rolls Royce MTOC, Dahlewitz, (Berlin)
Germany Wednesday 11th May 2011

Dr. Ing.
Hellmuth Klingelhöffer
Vorstand der Arbeitsgruppe Werkstoffmechanik der Metallverfahrenstechnik
Bundesanstalt für Materialforschung und -prüfung
Fachgruppe V2 Werkstoffmechanik
Unter den Eichen 35
12205 Berlin
Phone: +49 30 8104-1021
Fax: +49 30 8104-1257
E-Mail: hellmuth.klingelhoeffer@bam.de
Internet: www.bam.de

Pete Barnard
Doosan Babcock Energy
Birmingham New Road, Tipton,
West Midlands, DY4 8YR United Kingdom
T: +44 (0)121 530 5900
D: +44 (0)121 530 5194
F: +44 (0)121 530 5193
M: +44 (0)7771 372 393
E: pbarnard@doosanbaboock.com

Siemens
Energy
Siemens Industrial Turbomachinery Limited
Rutland House, Waterside South
Lincoln LN5 7FD

Professor Martin R. Bache BA PhD MInstP CPhys FIMMM CEng
Swansea University
Materials Research Centre
School of Engineering, Singleton Park, Swansea, SA2 8PP, Wales, UK
Tel: +44 (0)1792 295287 Fax: +44 (0)1792 295693
Email: m.bache@swansea.ac.uk

Dr. Stephen Brookes
Test Engineer - Materials Testing
Rolls-Royce Mechanical Test Operations Centre GmbH
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Tel: +49 337066-1550 Fax: +49 33708-6-511550
Email: stephen.brookes@MTC@Rolls-Royce.com

Miss Kate Abbott
Group Leader
Metallurgical Laboratory

Stuart Holdsworth
Empa
Swiss Federal Laboratories for Materials Testing and Research
Oberlandstrasse 129
CH-8606 Dübendorf
Switzerland
Tel: +41 44 823 55 11
Fax: +41 44 823 42 32
Email: stuart.holdsworth@empa.ch

Paul McCarthy Consulting
Paul R. McCarthy
B.Sc. D.I.C. C.Eng. FIMMM
10 Monkseafld
Three Bridges
Crawley West Sussex RH10 1PL
United Kingdom

Owen O’Grady
Exova
Oxgangs House
White Cross, South Gosforth
Newcastle upon Tyne
United Kingdom

Testing, Advising, Assuring
Malcolm S. Loveday
Beta Technology Consultant
Secretary, HTMC-ESIS TC 11
Chairman: BSI - ISE/NFE 4
Mechanical Testing of Metals

Home: 0944 (01932 561576)
E-mail: malcolm.loveday@npl.co.uk

11th May 2011 Malcolm S. Loveday (17/06/2011)

Also in attendance:
(Business cards not supplied):
Dave McLennon, EDF Barnwood, UK
Michel Fajfrowski, MTS, Fr
Steve Jaques, SERCO, Risley, UK
1. Introduction
The committee has continued to be active throughout the past year, primarily through working group activity, organising a Workshop and international standards representation.

2. General Activities

2.1 European Structural Integrity Society (ESIS)
The High Temperature Mechanical Testing Committee (HTMTC) operates as Technical Committee 11 (TC11) of ESIS whilst retaining its status as a UK Charity and a Company Limited by Guarantee.

2.2 Conferences and Seminars
At 20-21 April 2010 an International Workshop on High Temperature Mechanical Testing Techniques in Controlled Environments (HTMET-Workshop 2010) was held at SERCO in Warrington-Risley. It was a very interesting and successful meeting with 61 participants.

In 2011 the 2nd international workshop on Thermo Mechanical Fatigue (TMF) is prepared to be held on 12-13 May 2011 at BAM, Berlin, Germany. A number of approx. 100 participants are expected.

Two Quality Assurance Workshops are planned to be held in 2011 and 2012.
- 1st International Workshop on Quality Assurance in mechanical Testing Laboratories, 2nd-3rd Nov 2011, IncoTest, Hereford, UK
- 2nd International Workshop on Quality Assurance in mechanical Testing Laboratories, Spring 2012,

Furthermore several committee members attended a couple of successful meetings and conferences outside the HTMTC umbrella.

2.3 Working groups
During the year the following Working groups have been active:
- The testing of Weldments Working Group, under the chairmanship of Prof. Bilal Dogan. Through the past year no meeting took place organised by the HTMTC. However the working group continued his work. The publication of conference contributions of the welds 2009 conference have been conducted within for journals. The effort of the working group is ongoing.
- Temperature Measurement for HT Testing chaired by Malcolm Loveday which includes a round robin test programme for Thermocouple calibration between committee members to verify that external calibration labs which are used to calibrate reference thermocouples are working properly. Furthermore a Code of Practice for Temperature measurement is under development.
- Crack initiation and measurement chaired by Kamran Nikbin. Through the past year no meeting took place organised by the HTMTC, but the working group is continuing to work together with EPRI, BSI, ASTM and VAMAS who help in the objectives which have not been fully achieved. It was reported that Kamran Nikbin had forwarded the latest draft of ASTM E2760 -10 'Standard Test Method for Creep – Fatigue Crack Growth Testing'.
- Testing in controlled environments chaired by Owen O'Grady. As yet there was nothing to report. The Convenor agreed to prepare a Scope and Objectives in consultation with the other members of the WG.

2.4 Related activities
In 2010 the German fatigue standard committee has been re-established after 15 years inactivity where Hellmuth Klingelhöffer has been elected as the chairman of this committee. It is acting as the mirror committee for the ISO TC164 SC5 committee which consists of 14 working groups. The following standards are presently under development or review:
- ISO 1143 Metallic Materials – Rotating bar bending fatigue testing
- ISO/FDIS 1352 Metallic Materials – Torque-controlled fatigue testing
- ISO/TR 12105 Methods of Fatigue testing – Guide to general principles
- ISO/DIS 12107 Metallic Materials – Fatigue testing – Statistical planning and analysis of data
- ISO/DIS 12108 Metallic materials – Fatigue testing – Fatigue crack growth method
- ISO/CD 12110-1 Metallic Materials – Fatigue testing – Variable amplitude fatigue testing Part 1: general principles, test method and reporting requirements
- ISO/FDIS 12111 Metallic Materials – Fatigue testing – Strain-controlled thermomechanical fatigue testing method
- ISO/DIS 23788 Metallic materials – Fatigue testing – Verification of the alignment of fatigue testing machines
Messrs Loveday, McCarthy & McEnteggart from the main HTMTC committee together with several other corresponding members provided significant technical input to the various technical committees and Working Groups which met in September 2010. The issues of Uncertainty of Measurement were also reviewed by the various SC’s for their relevant testing & calibration standards. In addition generic issues were discussed by the TC164 ad Hoc Group under the Convenorship of Mr Loveday, in particular the issues affecting the testing standards in the accreditation standard ISO 17025 and the GUM and its successor documents now under revision by the JCMG.

It was noted that determination of Modulus will be included in a new Annex to ISO 6892 Pt 1 which will be discussed by SC WG4 at a meeting in Berlin in May 2011

CEN WSA Ontologies …

Mr Loveday gave a presentation about the European funded project to produce a CEN Workshop Agreement (CWA) on ‘Economic & Logisitics of Standards-Compliant Schemas for Interoperability of Engineering Materials Data’ (ELSSI – EMD)*. The final CWA Report has now been approved and will appear under the title of ‘A Guide to the Development & Use of Standards-Compliant Data Formats for Engineering Materials Test Data’. CEN have now uploaded the CWA onto their website as CWA ELSSI-16200:2010.

2.5 Main committee meetings

The main committee met twice in 2010: the AGM on 20th April at SERCO, Warrington-Risley, & on 2nd Nov 2010 at Lincoln, UK. The minutes and ancillary papers from these meetings have been circulated to all members.

2.6 Administrative improvements

To organise European and international workshops more efficiently the treasurer Peter Barnard explored and arranged to install an additional HTMTC bank account which is working in EURO currency. Furthermore a Paypal account has been installed for easy payment e.g. to collect workshop fees of attendees. The installation of an online bank account is ongoing.

3. Membership

Currently the main committee comprises of 20 members, including 3 from mainland Europe and 1 from USA with representatives from Industry, Research Organisations and Universities. In addition there are approximately 100 further participants on the Corresponding Members mailing list.

At the AGM April 2010 the following officers were elected:

Chairman Dr. Hellmuth Klingelhöffer, BAM, Germany
Vice Chairman Mr. Larry Candler, EXOVA, UK
Treasurer Dr Peter Barnard, Doosan, UK
Secretary Mr Malcolm S Loveday, Beta Technology Consultant/NPL, UK

During the last months the following changes have occurred in the committee representation:

Resignations: Prof. Roger Hurst resigns from the committee due to his expected retirement in the near future. Mr. Neil Clarke has been resigned from the committee due to the movement of the Rolls Royce testing labs from UK to Germany. He isn’t any longer involved in mechanical testing.

New member: Miss Louise Brown, NPL, Teddington, UK.

In addition several new corresponding members joined during the course of the year. A list of main committee members can be found on the HTMTC website.

4. Conclusions

The Committee continues to operate as a very effective Thematic Network. In-depth technical discussions and networking has been continued with full and corresponding members participating in test technique developments and contributing to the preparation of European and ISO standards. The latter item has involved significant effort from members of the committee over the past year. This helps to fulfil our remit to maintain testing methods for high temperature testing field at a state of the art level. Furthermore a Code of Practice is under development to reflect up to date temperature measurement developments in technology and operational practice. Our aim for the future, as a committee, should be focused on the generation of other such codes of practice, benefiting both the European and global testing communities. In addition workshops on advanced topics should be held to discuss up to date topics in high temperature mechanical testing and related problems and challenges.

In conclusion I would like to thank all of the members of the HTMTC for their efforts and support, especially the members of the Working Groups who have moved forward the activities of the committee once again. Additionally I would like to express my appreciation to our hard working Secretary, Malcolm Loveday, for preparing meetings, minutes of meetings and especially for leading the temperature measurement working group. Furthermore I would like to express my appreciation to our Treasurer Dr. Peter Barnard for his hard work to negotiate with Bank companies to create new possibilities to organise financial things of the HTMTC in a much more effective way.

I look forward to another busy year for the committee and its continuing work in the development of state of the art testing methodologies.

Dr.-Ing. Hellmuth Klingelhöffer, Chairman HTMTC (ESIS TC11), BAM – Federal Institute for Material Research and Testing, Unter den Eichen 87, 12205 Berlin, Germany, mailto: hellmuth.klingelhoeffer@bam.de, Phone +49 30 8104 1521
## APPENDIX 4

<table>
<thead>
<tr>
<th>Members 2010-11</th>
<th>53rd Meeting Petten</th>
<th>54th Meeting Barnwood</th>
<th>55th Meeting Zurich</th>
<th>56th Meeting Doosan Birmingham</th>
<th>57th Meeting Serco</th>
<th>58th Meeting SITL Lincoln</th>
<th>59th Meeting BAM, Berlin</th>
<th>59th Meeting Apologies</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>April 08</td>
<td>Nov 08</td>
<td>April 09</td>
<td>Oct 2009</td>
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<tr>
<td><strong>Attend</strong></td>
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<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td><strong>Apology</strong></td>
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</table>

### Chairman
- **Dr. H. Klingelhoffer**
  - BAM, Berlin, Germany
  - Attend
  - Apology (28/04/2011)

### Vice-Chairman
- **Mr. L. Candler**
  - Exova, UK
  - Attend
  - Apology (3/5/2011)

### Secretary:
- **Mr. M. S. Loveday**
  - Beta Technology (NPL) UK
  - Attend
  - Apology (28/04/2011)

### Treasurer
- **Dr. Peter Barnard**
  - Doosan-Babcock, Birmingham, UK
  - Attend
  - Apology (18/02/2011)

### Council Members
- **Miss Kate Abbott**
  - Siemens Ltd, UK
  - Attend
  - Apology (21/02/2010)

- **Mr. Colin Austin**
  - Serco, Risley, UK
  - Attend
  - Apology (3/5/2011)

- **Prof. M. Bache**
  - Univ. Swansea, UK
  - Attend
  - Apology (7/3/2011)

- **Mr. Carl Barrett**
  - UKAS, UK
  - Attend
  - Apology (4/3/2011)

- **Dr. Stephen Brookes**
  - Rolls Royce MTOC, DE
  - Attend
  - Apology (2/5/2011)

- **Miss Louise Brown**
  - NPL, UK
  - Attend
  - Apology (20/4/2011)

- **Mr. S. Collins**
  - INCO, Hereford, UK
  - Attend
  - Apology (4/3/2011)

- **Dr. B. Dogan**
  - EPRI, USA
  - Attend
  - Apology (25/02/2011)

- **Dr. P. Hächner**
  - JE-JRC Petten, NL
  - Attend
  - Apology (25/02/2011)

- **Dr. S Holdsworth**
  - EPMA, Zurich, CZ
  - Attend
  - Apology (5/3/2011)

- **Philip G. Jones**
  - Alstom, UK
  - Attend
  - Apology (29/04/2011)

- **Mr. P. McCarthy**
  - Consultant, UK
  - Attend
  - Apology (29/04/2011)

- **Mr. I. McEnteggart**
  - INSTRON, UK
  - Attend
  - Apology (28/4/2011)

- **Dr. P. Morris**
  - Tata Steel, Rotherham, UK
  - Attend
  - Apology (25/02/2011)

- **Prof. K. Nikbin**
  - Imperial College, London, UK
  - Attend
  - Apology (25/02/2011)

- **Mr. O. O’Grady**
  - Exova, UK
  - Attend
  - Apology (25/02/2011)

- **Dr. M. Spindler**
  - EDF, UK
  - Attend
  - Apology (17/02/2011)

Observers: May 2011: 1) ? SITL , 2) Dave McLennon, EDF, 3) Dr. Andrew Harrison (Exova), 4) Andrew Wisbey, SERCO  * Joined the Committee

HTMTC AGM Minutes FINAL 11th May 2011 Malcolm S. Loveday (17/06/2011)
## APPENDIX 5 : Standards of relevance to High Temperature Mechanical Testing DRAFT –To be Updated by Members

### Part 1: Standard under the auspices of ISO TC164 –Mechanical Testing of Metals.

<table>
<thead>
<tr>
<th>Standard</th>
<th>Title</th>
<th>Status</th>
<th>Committee</th>
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<tbody>
<tr>
<td>ISO 204</td>
<td>Creep Testing</td>
<td>Published Sept 2009</td>
<td>SC1</td>
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<tr>
<td>ISO/DIS376: 2004</td>
<td>Calibration of force-proving instruments used for the verification of uniaxial machines</td>
<td>FDIS to be circulated for voting as ISO &amp; CEN before end of 2010</td>
<td>SC1</td>
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<tr>
<td>ISO 7500-1</td>
<td>Uniaxial testing machines - Verification of the applied force</td>
<td>Published</td>
<td>SC1</td>
</tr>
<tr>
<td>ISO 7500-2: 2006</td>
<td>Tension creep testing machines - Verification of the applied force</td>
<td>Re-confirmed 2010</td>
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<tr>
<td>ISO 6892-Pt1</td>
<td>Tensile Testing at Ambient Temperature</td>
<td>Published August 2009</td>
<td>SC1</td>
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<tr>
<td>ISO 6892-Pt2</td>
<td>Modulus of Elasticity by Tensile Testing [Annex for ISO 6892 Pt 1 to be prepared]</td>
<td>To be discussed:WG4-May 2011</td>
<td>SC1</td>
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<tr>
<td>ISO 6892-Pt3</td>
<td>Tensile testing at low temperature</td>
<td>(Revision of ISO 783: 1999) FDIS for voting November 2010</td>
<td>SC1</td>
</tr>
<tr>
<td>ISO 6892-Pt4</td>
<td>Tensile testing at ultra low temperature (Liquid helium)</td>
<td>Draft to be prepared. Experts sought</td>
<td>SC1</td>
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<tr>
<td>ISO/CD 9513</td>
<td>Calibration of extensometers</td>
<td>Draft</td>
<td>SC1</td>
</tr>
<tr>
<td>ISO 26203-1</td>
<td>Tensile testing method at high strain rates – Part 1: Elastic bar type system</td>
<td>Published 2010</td>
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<tr>
<td>ISO/DIS 26203-2:</td>
<td>Tensile testing at high strain rates – Pt 2: Servo-hydraulic &amp; other Systems</td>
<td>FDIS voting November 2010</td>
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<tr>
<td>ISO 10113: 2007</td>
<td>Determination of plastic strain ratio (r-values) using the tensile test</td>
<td>Draft to be prepared. Experts sought</td>
<td>SC1</td>
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<tr>
<td>ISO 10275: 2007</td>
<td>Determination of tensile strain hardening (n values)</td>
<td>Draft</td>
<td>SC1</td>
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<tr>
<td>ISO 1352: 1977</td>
<td>Torsional fatigue</td>
<td>FDIS-complete rewrite</td>
<td>SC5</td>
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<td>ISO 1099</td>
<td>Axial Force Control Fatigue</td>
<td>5 year review in 2011</td>
<td>SC5</td>
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<tr>
<td>ISO 12105</td>
<td>General Principles</td>
<td>CD</td>
<td>SC5</td>
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<tr>
<td>ISO 12106: 2003</td>
<td>Axial Strain Control Low Cycle Fatigue</td>
<td>5 year review – adding creep-fatigue</td>
<td>SC5</td>
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<td>ISO 12107: 2003</td>
<td>Statistical planning and analysis</td>
<td>FDIS after 5 year</td>
<td>SC5</td>
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<td>ISO 12108: 2002</td>
<td>Fatigue crack growth</td>
<td>FDIS after 5 year</td>
<td>SC5</td>
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<tr>
<td>ISO 12110 (Part 1 and 2)</td>
<td>Variable amplitude fatigue</td>
<td>DIS</td>
<td>SC5</td>
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<tr>
<td>ISO/DIS 12111</td>
<td>Thermal- Mechanical Fatigue Testing</td>
<td>Voting on FDIS completed</td>
<td>SC5</td>
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### Part 2: ISO Standards under other ISO Committees

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<th>Description</th>
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<tr>
<td>ISO 17025:2005</td>
<td>General requirements for the technical competence of testing laboratories.</td>
<td>Under review 2010</td>
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### Part 2 ASTM Standards

<table>
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<tr>
<td>E2760 -10</td>
<td>‘Standard Test Method for Creep – Fatigue Crack Growth Testing’</td>
</tr>
<tr>
<td>E2714-09</td>
<td>Standard Test method for creep-fatigue testing</td>
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### Part 3 National Standards

<table>
<thead>
<tr>
<th>Standard Code</th>
<th>Description</th>
<th>Comments</th>
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The GUM is now under the auspices of the Joint Committee for Guides in Metrology (JCGM), chaired by the Director of BIPM; the revised GUM is now issued as JCGM 100 and is supplemented by an additional series of documents, see below:

- JCGM 100:2008. Evaluation of measurement data — Guide to the expression of uncertainty in measurement (GUM),
- JCGM 101:2008. Evaluation of measurement data – Supplement 1 to the "Guide to the expression of uncertainty in measurement" – Propagation of distributions using a Monte Carlo method,
- JCGM 102. Evaluation of measurement data – Supplement 2 to the "Guide to the expression of uncertainty in measurement" – Models with any number of output quantities,
- JCGM 103. Evaluation of measurement data – Supplement 3 to the "Guide to the expression of uncertainty in measurement" – Modelling,
- JCGM 104:2000. Evaluation of measurement data – An introduction to the "Guide to the expression of uncertainty in measurement" and related documents,
- JCGM 105. Evaluation of measurement data – Concepts and basic principles,
- JCGM 106. Evaluation of measurement data – The role of measurement uncertainty in conformity assessment, and
- JCGM 107. Evaluation of measurement data – Applications of the least-squares method.

[ The lack of a year of publication in the above list of JCGM documents means that the documents are still in the process of being prepared at the time of compiling this Bibliography; if using this list please check with JCGM whether further documents have been issued. ]
HTMTC (ESIS TC11)
Forthcoming Meetings of Interest to HTMTC Members
### ACRONYM Table of ACRONYMS & Glossary of Terms

( Please expand & Add new terms ; Add your Initials & Date of Amendment to Footer)

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<tr>
<th>ACRONYM</th>
<th>Meaning</th>
<th>Comment</th>
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<tr>
<td>AFNOR</td>
<td>Association Française de Normalisation</td>
<td>French equivalent of BSI</td>
</tr>
<tr>
<td>ANSI</td>
<td>American National Standards Institute</td>
<td>USA equivalent of BSI</td>
</tr>
<tr>
<td>ASTM</td>
<td>American Society for Testing and Materials</td>
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<tr>
<td>BAM</td>
<td>Bundesanstalt für Materialforschung und</td>
<td>German Federal Institute for</td>
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<tr>
<td></td>
<td>prüfung</td>
<td>Material Research and Testing</td>
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<tr>
<td>BCR</td>
<td>Bureau Community of Reference</td>
<td>Now IRRM</td>
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<td>BSI</td>
<td>British Standards Institute</td>
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<td>BS</td>
<td>British Standard</td>
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<td>BSSM</td>
<td>British Society for Strain Measurement</td>
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<td>CEN</td>
<td>European Committee for Standardization</td>
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<tr>
<td>CoP</td>
<td>Code of Practice</td>
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<tr>
<td>CRM</td>
<td>Certified Reference Material</td>
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<tr>
<td>CWA</td>
<td>CEN Workshop Agreement</td>
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<tr>
<td>DIN</td>
<td>Deutsches Institut für Normung e.V</td>
<td>German equivalent of BSI</td>
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<tr>
<td>ECCC (E3C)</td>
<td>European Collaborative Creep Committee</td>
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<td>EN</td>
<td>European Standard</td>
<td>(Euronorm)</td>
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<td>EPRI</td>
<td>Electric Power Research Institute</td>
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<td>ECISS</td>
<td>European Committee for Iron and Steel</td>
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### Meetings

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<td>17/06/2011</td>
<td>ASME 2011 Pressure Vessels and Piping Conference (PVP)</td>
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<tr>
<td>08/09/2011</td>
<td>8th Int Charles Parsons Turbine Conf.</td>
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<td>Portsmouth</td>
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<td>20/06/2012</td>
<td>ASME 2012 Pressure Vessels and Piping Conference (PVP)</td>
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<td>November 2012</td>
<td>Quality Assurance &amp; Accreditation Issues for HT Testing, Part 2.</td>
<td>HTMTC</td>
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<td>Spring 2013?</td>
<td>Temperature Measurement in Mechanical Testing</td>
<td>HTMTC</td>
<td>?</td>
<td>MSL / PMcC</td>
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<tr>
<td>Acronym</td>
<td>Name</td>
<td>Description</td>
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<tr>
<td>ESIS</td>
<td>European Structural Integrity Society</td>
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</tr>
<tr>
<td>FESI</td>
<td>Forum for Engineering Structural Integrity</td>
<td>UK based, set up in 2001</td>
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<td>GPG</td>
<td>Good Practice Guide</td>
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<td>Set up in 1982</td>
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<td>HTMET</td>
<td>High Temperature Mechanical Testing in Controlled Environments</td>
<td>HTMTC Workshop held at SERCO, Risley, Spring 2010</td>
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<td>ILAC</td>
<td>International Laboratory Accreditation Cooperation</td>
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<tr>
<td>IOM3 (IMMM)</td>
<td>Institute of Materials, Minerals &amp; Mining</td>
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<td>ISO</td>
<td>International Standards Organisation</td>
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<tr>
<td>IRMM</td>
<td>Institute of Reference Materials &amp; Measurement</td>
<td>Based at JRC- Geel, Belgium</td>
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<td>JIS</td>
<td>Japanese Institute of Standards</td>
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<td>JRC</td>
<td>Joint Research Institute</td>
<td>Research Laboratories funded by European Commission</td>
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<td>NAVLAP</td>
<td>National Voluntary Laboratory Accreditation (programme)</td>
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<tr>
<td>NIST</td>
<td>National Institute of Science &amp; Technology</td>
<td>American equivalent of NPL</td>
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<td>NPL</td>
<td>National Physical Laboratory</td>
<td>UK National Standards Laboratory</td>
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<td>Physikalisch-Technische Bundesanstalt</td>
<td>German equivalent of NPL</td>
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<td>RM</td>
<td>Reference Material</td>
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<td>German Steel Standard / Code of Practice</td>
<td>[ Stahl-Eisen-Pruefblatt ]</td>
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<td>TC</td>
<td>Technical Committee</td>
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Aims: To improve high temperature testing by:
- Providing a Forum for discussion
- Organising conferences and laboratory visits
- Publishing conference proceedings and Codes of Practice
- Initiating research activities

A Council usually meets twice a year for conducting formal business, and arranging one- or two-day Symposia.


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