Thatcham®
Quality Assured
Repair Equipment

THE MOTOR INSURANCE REPAIR RESEARCH CENTRE

TQA® Repair Equipment Adhesives

PRODUCT EVALUATION PROCESS AND CRITERIA

The terms “The British Insurance Industry” and the “The Insurance Industry” used in this document mean those Insurance Companies and Syndicates who are Members of the Association of British Insurers (ABI) and Lloyd’s Market Association (LMA) respectively and underwrite motor vehicle insurance. The Motor Insurance Repair Research Centre (Thatcham) has been authorised to produce this document by the aforementioned Members of ABI and LMA.

The Product Evaluation Process

The Product Evaluation

The product evaluation is intended to demonstrate a minimum acceptable level of performance and reliability with respect to Safety, durability, Functionality and Documentation.

The evaluation shall be performed, in accordance with this *Criterion* on the samples and documentation submitted to Thatcham by the Applicant and in accordance with the requirements of Thatcham's Quality Assurance Manual (TQAM) including manufacturing assessment against Thatcham's Quality Assurance Process for Manufacturers (TQAP-M).

The Applicant shall ensure that the product is complete and representative of the series production. For the evaluation all required samples shall be submitted free of charge at specified times in the process. The exact number may vary depending upon the test programme.

The Products, where applicable shall be visibly marked with the following information:

- The Manufacturer's name or trade mark.
- The model number or name.
- Component part number.
- The serial number or batch number or date of manufacture.

In addition, each component containing software shall be labelled with the software version, number or code.

The applicant shall be required to complete the Assurance process within a period no greater than 6 months. Failure to complete within 6 months may cause the product to be rejected and a new application with full associated costs and evaluations may be required. At a minimum the manufacturing assessment shall need to be revisited and associated costs chargeable.

No Applicant can claim compliance until such time that a certificate of compliance has been completed and the Applicant has agreed to the Terms and Conditions of Listing.

Product Review (referred to as Phase 1)

A meeting with the Applicant, together with an initial examination of the product and/or system, shall normally be requested as part of this Phase. A close dialogue is encouraged between the Applicant and Thatcham engineer. The requirements for testing at Phase 2 and Phase 3 shall be discussed and agreed. It is acceptable at this stage to present a prototype sample of the product.
Defined Phase 2 test requirements may, where a product is installed within vehicles, specify that several vehicle models are to be inspected and multiple reports are required depending on defined vehicle fitment policy. In such cases a product versus vehicle model matrix shall be provided to Thatcham in order to clearly define fitment policy of the product or system variant.

Requirements for inspection of quality control procedures at installation locations will be defined.

An analysis of the product for Phase 3 testing requirements may demonstrate that it has multiple derivatives, variants, optional components or will have to be tested in a modular way.
Documentation and sample requirements for Phase 3 testing will be specified at this Phase and these items will be requested and checked.

Plans are to be agreed for the manufacturing site assessment in line with the requirements established by Thatcham Quality Assurance Manual (TQAM).

Product Functional Testing (referred to as Phase 2)

A predefined number of samples shall be provided to Thatcham, free of charge, for evaluation.
TPAP documentation including, where applicable, dimensional and material performance results, specific installation instructions, user instructions and parts list shall be provided at this Phase. Any other required documentation shall be specified by the Thatcham engineer. The product and installation shall be accurately representative of standard production specification with all components provided for inspection.
The quality of installation, where applicable, shall be inspected in accordance with the technical standards laid down in the *Criteria.*
A summary report shall be issued to the Applicant detailing any non-compliances and recommendations.
The level of validation shall depend upon the particular circumstances and shall be determined by Thatcham at Phase 1 after defining the fitment policy.
The product shall be evaluated against this criterion for functionality, fit for purpose, ergonomics and conformance to Thatcham's minimum requirements.

Phase 2 testing is normally revalidated every 2 years.

Product Durability and Environmental Testing (referred to as phase 3)

Normally one complete sample of the product shall initially be provided free of charge by the Applicant directly to Thatcham. This shall be checked against Documentation and Sample lists for completeness. All requested samples shall be provided free of charge to the Test Laboratory. Samples shall be supplied in various formats depending on the projected test programme. This may require that they are functionally connected and mounted on test boards; functionally connected only; or boxed/packaged as supplied to the installer. These samples shall be subjected to the component test regime defined by the Performance Test Specifications, copies available from Thatcham. Validation of software may involve detailed discussions with the Applicant in order to establish the integrity of the design.

Important: *It is strongly requested that any correspondence with the Test Laboratory should be conducted by email.*

During Phase 3 testing, the Test Laboratory will, at its discretion, issue periodic reports to the Applicant indicating progress and failures. It should be noted that the Test Laboratory is *not obliged* to issue interim reports on request.

At the conclusion of Phase 3 the Applicant shall have a 2 month period to recall the tested samples before they are discarded.

Review and Notification (referred to as phase 4)

The results of the previous Phases shall be examined along with the results from the TQAP-M assessment of the manufacturing and, if considered satisfactory, a certificate of compliance shall be issued to the Applicant indicating successful certification of the product.

The product shall be issued with a unique Thatcham Evaluation Number. This number, where required, shall be stated on Certificates of Installation and quoted in any further correspondence with Thatcham.

Following successful certification the product will be subject to revalidation testing every second year from the date of the certification. It is the applicant's responsibility to ensure that the product is revalidated prior to the expiry date on the certificate. This revalidation testing will normally take the form of a phase 2 test but may at the discretion of the Thatcham engineer include elements of phase 3 testing. A full revalidation may be required on the 4th anniversary of the date the product was initially certified or last tested in accordance with this criterion.

Classification of Failures

Any single failure against the criteria will be considered as cause to refuse certification of the system / product.

Minimisation of Delays

In order to achieve a steady progression of the evaluation through the *Compliance Procedure*, the Applicant should observe the following guidelines:

- Ensure the return of the *Application form* and payment of the application fee.
- Read and understand the Specifications thoroughly.
- Conduct extensive validation prior to submission of the product in order to establish high confidence that the product will comply. Failures shall delay the progression of the evaluation, and may lead to enforced delays before work may continue.
- Ensure that samples are fully representative of production for Phase 2 and Phase 3.
- Check samples functionally and visually before submission. Physically non-compliant samples shall be rejected at an early stage. Samples should be properly marked.
- Check that all documentation is complete and accurate – only correct drawings and instructions shall be accepted. Failure to provide adequate and complete documentation in the correct format shall delay testing and shall constitute a non-compliance.
- Ensure that manufacturing quality of samples is satisfactory. Poorly manufactured samples shall be rejected immediately.

If retesting is requested as a result of non-compliances at any stage of the evaluation, this can extend the duration of the evaluation significantly and the Applicant shall incur associated retesting fees. These will be charged at normal Test Laboratory rates, supplemented by a Thatcham administration charge.

Administrative and Technical Documentation

Correct and complete electronic documentation is a prerequisite of testing at each of the Phases 1, 2 and 3. It may also be required on request in the event of a System Audit following Listing.

All documentation submitted shall be in English.

All documentation shall be submitted to Thatcham.
The following documentation [normally one copy of each item, unless otherwise indicated] shall be submitted no later than the commencement of the appropriate Phase.

Prior to Phase 2

- Application Form
- Purchase order or payment of application fee

Phase 2

- Questionnaire (if applicable)
- Features Matrix
- TPAP and Supporting documentation as specified
- System/Vehicle fitment plan [matrix]
- User Instructions
- Vehicle Specific Installation Instructions
- Vehicle

Phase 3

- User Instructions
- Special Operating Instructions for the product under test. These shall include commissioning procedures, use of any vehicle emulation or diagnostics equipment, data transmission protocol, timing diagrams/flow charts, decoding of data/batch codes on labels, vehicle functions and addition/deletion of electronic keys or key codes.
- General Installation Instructions. These may be in draft form, the definitive version being submitted subsequently. The Installation Instructions shall meet the requirements laid down in the appropriate section of the Criteria.
- Details of existing test results including reports [as requested]
- Any other documentation specifically required by Thatcham's chosen laboratory

Electronic technical documentation submitted shall be provided with the name of the manufacturer, component identification, drawing/document number and date. Component issue levels shall be clearly specified.

Part numbers, descriptions, issue levels and dates shall be clearly marked on all and any instructions and drawings provided.

All documents shall be complete, clear and legible.

Components to be submitted

For the purposes of the evaluation, a defined number of complete samples [fully functional] of the product shall be submitted. Additional components may be requested at Phase 2 for the purposes of component substitution. All necessary simulation and diagnostics equipment shall be provided. Connected systems shall be such that monitoring of all outputs is straightforward

The Criterion
Windscreen Bonding Adhesive

1.0 Product Specification

2 Component adhesive (Single pack would be considered if it could be proven to satisfy this criterion).
Shall have a minimum working time / open time of approximately 15minutes before skinning but skinning shall commence within a maximum period of 2 hours.
Curing shall be unaffected by standard environmental conditions.
To maintain vehicle structure and safety Material shall Have Modulus exceeding 2MPa and be proven to have low conductivity properties eg..10 ^{10}Siemens / cm or similar..
Material shall be suitably sag resistant.

2.0 Documentation

Consumers shall be provided with clear and concise application instructions. Such instructions shall at a minimum include –

- Appropriate application tools
- Instructions for surface preparation
- Application instructions
- Clear instructions for working time
- Clear safe drive away times
- Documented Technical Data
- All required Safety Data Sheets

3.0 Minimum safety standard

Independent verification, by an internationally recognised testing centre, of satisfactory Screen adherence to vehicle frame through internationally recognised standards using test practices as specified within this criterion. All testing shall be carried out demonstrating compliance with the standard within the advised drive away time following screen replacement.

Independently verified compliance with the requirements of FMVSS 212 using a vehicle, test devices and instrumentation as described in S6.1 (a).

EuroNCap frontal crash performance demonstrating a minimum rating of adequate with windscreen retention recorded as greater than 75% of the total adhered area of the screen.

If such independently verified and certificated tests are not available Thatcham have the ability to devise a test based on FMVSS 212 within its crash facility.

Note:
Thatcham retain the privilege to amend the required minimum safety standard and as such it is recommended that any applicant discuss the status of this document prior to proceeding with expensive testing to any standard in the desire to achieve Thatcham Quality Assurance.

4.0 Product Performance Testing.

Each production batch shall be tested to prove comparative performance with the original production batch from which product was used to demonstrate minimum safety requirements compliance. Evidence of batch traceability must be provided upon application for Thatcham Quality Assurance.
An example of acceptable methods of batch testing are -

Shore Hardness (DIN 53505)
Tensile Strength (DIN 53504)
Stress (DIN 53504)
Shear Modulus (DIN 54451)
Elongation to break (DIN 53504)
Shear Strength (DIN EN 1465)
Volume Change (DIN 52451)

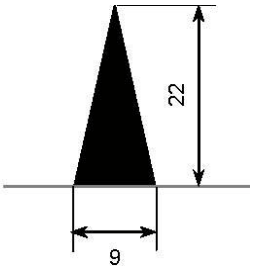
5.0 Phase 2 testing

To prove working time is consistent with user instructions, manufacturer's claims and this criterion a bead of material shall be applied to a surface and examined at 5 minute intervals.
There shall be no skinning detectable prior to the 15 minute timeframe and up to the working time declared by the manufacturer.
All product preparation instructions as detailed in the user instruction pack shall be followed.

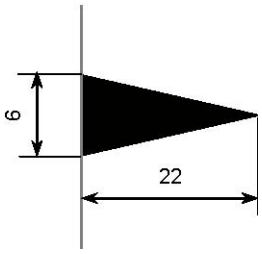
To prove sag resistance two beads, a minimum of 100mm in length, shall be produced. The beads shall be produced using a triangle nozzle. One shall be left to stand upright on a flat horizontal surface and one shall be applied across a flat vertical surface.

Example:

Example A



Example B



After 10 Minutes the sag shall be measured. The horizontal bead, Example A, shall not sink by greater than 3mm and the vertical bead, Example B, shall not droop greater than 3mm from the centre line.

A windscreen replacement following the user instructions will be carried out by an experienced and qualified Thatcham engineer. A judgement based on the usability of the product and the detail included within the application instructions will be made for consideration. Any major concerns based on product usability, performance or ineffective installation instructions shall be cause for failure.

Normative references
[1] BS EN 13887:2003
Structural adhesives – Guidelines for surface preparation of metals and plastics prior to adhesive bonding
August 2003

[2] BS EN 1465:2009
Adhesives – Determination of tensile lap-shear strength of bonded assemblies
February 2009

[3] SAE J1863
Coach Joint Fracture Test
Reaffirmed November 1993

[4] BS EN ISO 9142:2003
Adhesives – Guide to the selection of standard laboratory ageing conditions for testing bonded joints
December 2003

[5] BS EN 14444:2005
Structural adhesives – Qualitative assessment of durability of bonded assemblies – Wedge rupture test
October 2008

Phase 1 (Technical Specification)

1.0 Minimum Product Specification / Description

Structural adhesive compound designed for metal to metal bonding which when cured will hold similar strength and load bearing properties of the substrates that it adheres to while maintaining equal corrosion protective properties as the substrates involved.

For application the working / open time must be clearly advised within user instructions and be suitable for use in common structural vehicle repair applications.

Typical applications include the bonding of quarter panels, rear body panels, roof panels, door skins, crossbeams and sills.

2.0 Documentation

Consumers shall be provided with clear and concise application instructions. Such instructions shall at a minimum include –

Recommended storage instructions
Appropriate application tools
Suitable applications
Instructions for surface preparation
Application instructions
Clear instructions for working time
Full Strength Curing guidelines
Documented Technical Data
All required Safety Data Sheets

This documentation will be reviewed for completeness and appropriateness for application and use within the vehicle repair industry during the Phase 1 technical review.

Phase 2 (application and practical use)

1.0 Working time / open time

To prove working time is consistent with user instructions, manufacturer's claims and this criterion a bead of material shall be applied to a surface and examined at 10 minute intervals.

2.0 Practical Assessment

A practical assessment following the user instructions will be carried out by an experienced and qualified Thatcham engineer. A judgement based on the usability of the product and the detail included within the application instructions will be made for consideration by the Assurance department. Any major concerns based on product usability, performance or ineffective installation instructions shall be cause for failure.

3.0 Batch approval Testing.

Each production batch shall be tested to prove comparative performance with the original production batch from which product was used to demonstrate phase 3 requirements compliance. Evidence of batch traceability must be provided upon application for Thatcham Assurance.
An example of acceptable methods of batch testing are -

Shore Hardness (DIN 53505)
Tensile Strength (DIN 53504)
Stress (DIN 53504)
Shear Modulus (DIN 54451)
Elongation to break (DIN 53504)
Shear Strength (DIN EN 1465)
Volume Change (DIN 52451)

Phase 3 (Performance Evaluation)

Destructive mechanical strength tests.

The following tests shall be applied to samples.

[5] BS EN 14444:2005
Structural adhesives – Qualitative assessment of durability of bonded assemblies – Wedge rupture test
October 2008

[2] BS EN 1465:2009
Adhesives – Determination of tensile lap-shear strength of bonded assemblies
February 2009

[3] SAE J1863
Coach Joint Fracture Test
Reaffirmed November 1993

The sample size requirements are as follows:
- 40 coupons of 100x25 mm, creating 20 samples with 12.5 mm overlap for tensile lap shear test.
- 40 coupons of 100x25 mm, folded, creating 20 samples with 18.5 mm joint area for t-peel test.
- 20 coupons of 150x25 mm, creating 10 samples for cycle test, after wedge rupture test.

Substrate
The substrate/s shall be supplied by Thatcham.
The substrate/s used for tensile lap sheer and t-peel tests shall be 1mm thick uncoated mild steel and for the wedge rupture test shall be 3mm uncoated mild steel
If the adhesive is defined as suitable for aluminium repair then this substrate type can also be evaluated to the same criteria. Aluminium substrate will be 2mm thick for lap shear and t-peel and 3mm thick for wedge rupture.

Pre-treatment
The pre-treatment of the substrate will be subject to the adhesive supplier's product requirements. If this is not available, then a standard process of cleaning and abrading the surface will be applied according to the standard BS EN 13887 [1] table 1 – Basis of preparative method for metals and alloys.

Application of adhesive
The application of the adhesive will be carried out in accordance to the application instructions provided. These guidelines must be complete, easy to follow and in compliance with section 2.0 of this criteria.

After the application of the adhesive, all samples will be clamped using clamps (e.g. crocodile clips) for the stipulated cure time. Any excessive adhesive forced out of the joint shall be cleaned off after removal. Following the full cure time the coupons shall be removed from the clamp and left to rest with no applied force for a minimum 24 hours.

Following full curing and resting all test samples shall be subject heat exposure to replicate 2 cycles of paint processing during the repair of an automotive vehicle. Each cycle will be as follows:
- place in an oven and allow oven to heat up to 65 °C ± 2°C.
- maintain this temperature for 35 minutes
- remove from oven and allow to cool to room temperature
- repeat the above step for a second cycle

Mechanical tests

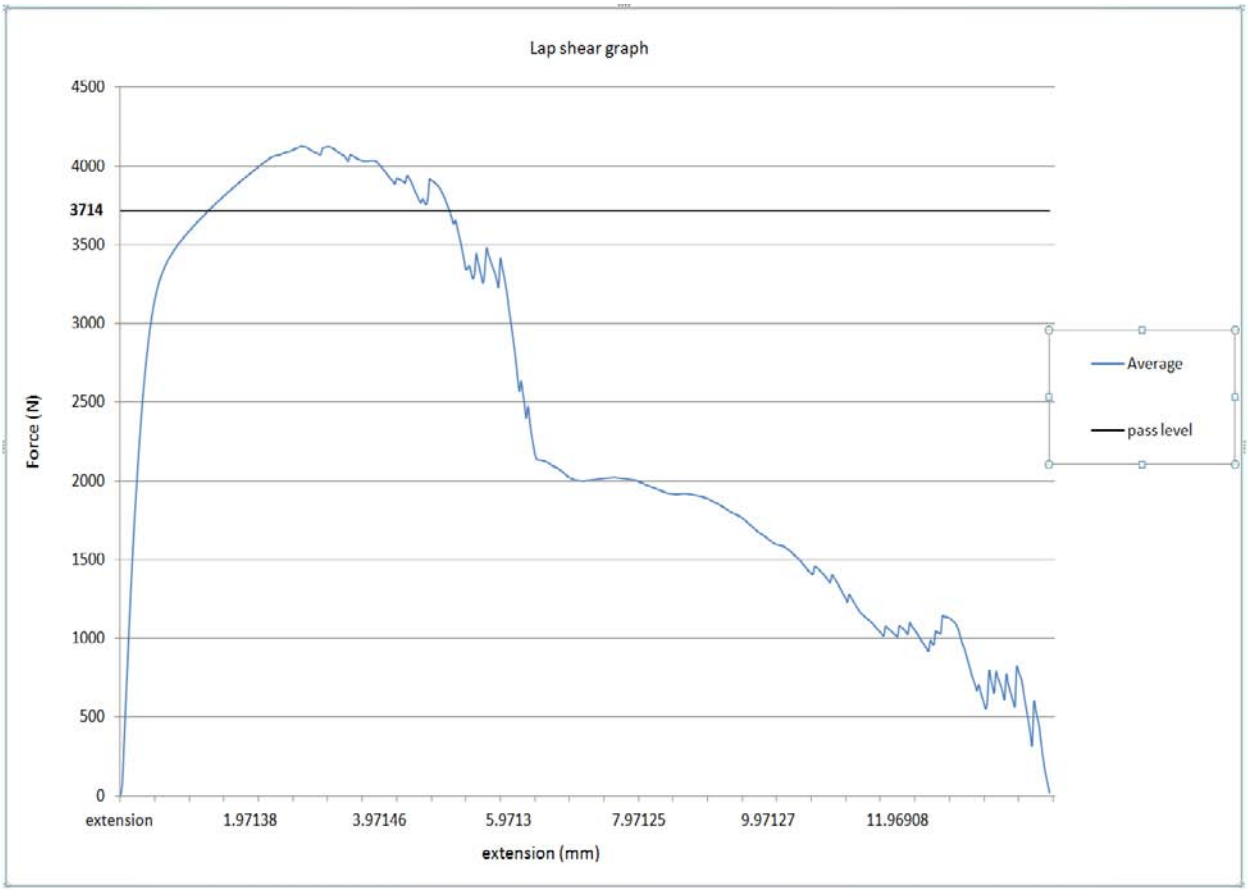
Error sample value correction
All samples will be tested and the single lowest and highest sample value will be deleted from the average calculations.

Lap Shear Strength:

Subject 20 joints, 100 x 25 mm with 12.5 mm overlap, to BS EN 1465:2009 Adhesives – Determination of tensile lap-shear strength of bonded assemblies.

Pass Criteria:

The average determined strength of the 20 joints must be greater than 3714 N.

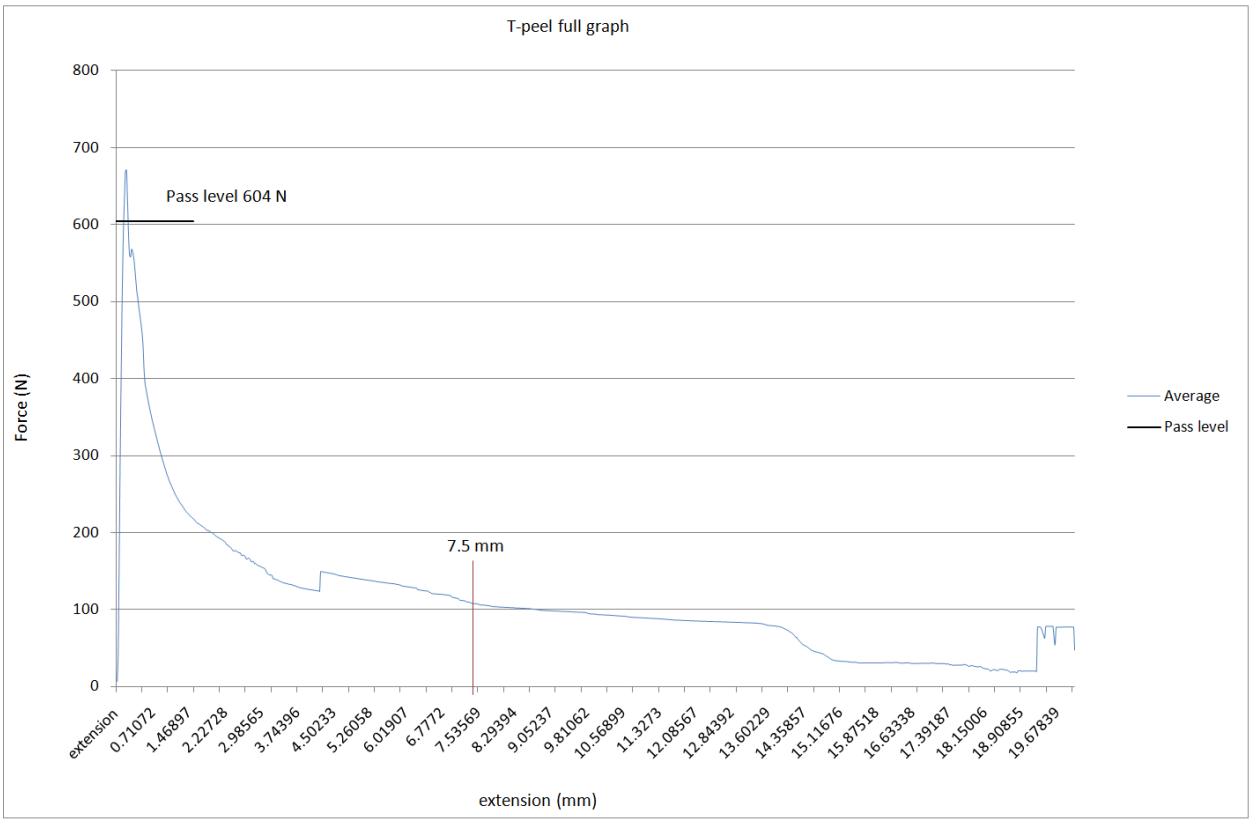


T-Peel test:

Subject 20 Joints, 100x25 mm with 8.5 mm joint area to SAE J1863 Coach Joint Fracture Test

Pass Criteria:

The average determined strength of the 20 joints must be equal or greater than 604 N and the average extension must exceed at least 7.5 mm.



Wedge rupture test:

The wedge rupture test shall be conducted with age conditioning in accordance with BS EN ISO 9142.

Ageing cycling conditioning:

The 150x25 mm samples will be exposed to the following conditioning test:

- 7 days in de-ionised water at 50°C which is equivalent and alternative to 50°C / 95% humidity maintained using a conditioning cabinet.

Measurements of the crack will be taken at the following intervals:

- Initial crack measurements shall be taken within a maximum of 1 hour after inserting the wedge in the joint and prior to exposure, and then after 24 hrs, 3 days and 7 days of exposure to the age conditioning.

Pass Criteria:

The initial average crack measurement from both sides shall not exceed 35 mm and shall not exceed 50 mm at the end of the aging cycle.