To enable the cost-effective use of composite brake blocks on freight wagons the following images and descriptions aim to enable potential damage arising during operational use to be:

- correctly recognised and
- appropriately assessed as well as
- supporting decision-making relating to the necessary action.

Monitoring the development of damage is to enable an evaluation of the structural design and the frictional material properties and provide proof of their continued validity as well as identifying potential for necessary optimisation measures.

The basis for this damage catalogue for the assessment of composite brake blocks is formed by the relevant operational assessment criteria according to

- GCU, appendix 9, annex 1, code 3.2.2 and appendix 10, chapter A, point 3.8

For the assessment of the wheelsets and brake blocks the established criteria of the railways essentially remain valid.

For composite block braked vehicles the following specific points are also to be considered.

**Index of damage images for composite brake blocks**

1. **Damage requiring brake block replacement**
   1.1 Cracked through to plate
   1.2 Shelling of the friction material
   1.3 Metal inclusions

2. **Damage requiring brake block replacement when certain criteria are met**
   2.1 Detachment from plate
   2.2 Cracks in the direction of the wheel circumference
   2.3 One-sided wear

3. **Damage not requiring block replacement**
   3.1 Cracked through at the predetermined breaking point
   3.2 Radial cracks
   3.3 Signs of high thermal stress
   3.4 Surface structure of the rubbing surface
   3.5 Contact pattern

**Index of damage images for wheel treads**

4. **Damage requiring wheelset replacement when particular criteria are met**
   4.1 Slot formation
   4.2 Groove formation
   4.3 Groove worn in tread
   4.4 Excessive thermal stress on wheelsets
   4.5 Wheel profile
1.1 Cracked through to plate

**Designation:** Radial crack in friction material from the rubbing surface to the plate

**Appearance:**

**Actions:**
Block replacement necessary (see GCU, appendix 9, annex 1, code 3.2.2)

1.2 Shelling of the friction material

**Designation:** Shelling of the friction material along more than ¼ of the length of the block (correlates to total length > 63mm for 250mm brake blocks or total length > 80mm for 320mm brake blocks)

**Appearance:**

**Actions:**
Block replacement necessary (see GCU, appendix 9, annex 1, code 3.2.2)
1.3 Metal inclusions

Designation: Metal inclusions

Appearance: Wheel surface usually shows wear marks (e.g. slots) or shiny metallic marks

Actions:

Block replacement necessary
2.1 Detachment from plate

Designation: Detachment from plate

Appearance:

Actions:
Block replacement if detachment > 25mm

2.2 Cracks in the direction of wheel circumference

Designation: Cracks in direction of wheel circumference
2.3 One-sided wear

**Designation:**
One-sided wear

**Appearance:**
Large difference in block thickness between the upper and lower block ends

**Actions:**
Block replacement required if the thinnest part is less than 10mm thick (see GCU, appendix 9, annex 1, code 3.2.2)
3.1 Cracked through at the predetermined breaking point

**Designation:**
Cracked through at the predetermined breaking point

**Appearance:**

**Actions:**
No action necessary (see GCU, appendix 9, annex 1, code 3.2.2)

3.2 Radial cracks

**Designation:**
Radial cracks in the block material

**Appearance:**

**Actions:**
No action necessary (see GCU, appendix 9, annex 1, code 3.2.2)
3.3 Signs of high thermal stress

Designation: Signs of high thermal stress (white layer, friction carbon deposits)

Appearance:

'white layer' in the rubbing surface near to the surface area, up to 10mm thick

Or

Extensive shelling from the rubbing surface, friction carbon deposits high

Actions:

No action necessary
3.4 Surface structure of the rubbing surface

**Designation:**
Surface structure of the rubbing surface

**Appearance:**
Various features possible:
- Heavily ramified structure of thermal cracks
- Predominantly axial thermal crack structure
- No thermal cracks (see also vitrification)
  Friction carbon deposits present

**Actions:**
No action necessary
4. Index of damage images for wheel treads

4.1 Slot formation

Designation: Formation of slots on the wheel tread
Appearance:
Slots are characterised by sharp edges.
Slots usually occur along the wheel circumference and can be present across the whole width of the tread.
Actions:
Reprofiling necessary

4.2 Groove formation

Designation: Formation of grooves in the wheel tread
Appearance:
Grooves are rounded in form and have no sharp edges.
Grooves occur over part of the width of the tread and are generally no more than 40 to 50 mm wide.
Actions:
When maximum values are exceeded reprofiling necessary
Criterion: Depth > 2mm
4.3 Groove worn in tread

**Designation:**
Groove worn in tread on the wheel tread

**Appearance:**
Groove worn in tread is formed by the removal of material over a large area of the wheel tread. Generally the area affected will have no surface irregularities and no sharp edges. A kind of flange (‘raised area’) forms towards the outer face of the wheel profile when the removal of material does not extend as far as the chamfered corner. This phenomenon may also occur on the flange side and create a second flange. The groove extends over the whole circumference of the wheel.

**Actions:**

Criterion: Depth > 2mm

When limit values are exceeded reprofiling necessary

4.4 Excessive thermal stress on wheelsets

**Appearance**
Paint becomes clearly burnt in the flange/disc transition radius. The paint in this area then becomes cracked and peeling. Build-ups of metal and colouring from overheating can be seen on the tread. The flange may also become a bluish colour.

**Actions**

Wheels which are not compliant with UIC Leaflet 510-5:
Dismantle wheelsets and perform wheelset maintenance.

Wheels compliant with UIC Leaflet 510-5:
Dismantle wheelsets and perform wheel maintenance if Becorit 929-1 brake blocks are installed or if or if the type of brake block is not clearly identifiable.

**N.B.:**
*The wheelsets of wagons with Becorit 929-1 blocks do not obtain the marking with a discontinuous white strip for thermally stable wheels as per UIC Leaflet no. 510-2, appendix H*

4.5 Wheel profile
Appearance

When evaluating the wheel profile, particular attention should be paid to flange thickness and height considering the permitted maximum and minimum values.

Actions

Wheelsets on which the flange thickness or height are too high or low must be changed and wheelset maintenance performed.