

# Product Bulletin

## SEB PCM and Product Reliability



Attn: All Escalator Service Personnel

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Subject: Obsolescence and Replacement  
Policy Statement – Fabricated  
Escalator Steps with Step Body Cracks

## Obsolescence and Replacement Policy Statement – Fabricated Escalator Steps with Step Body Cracks

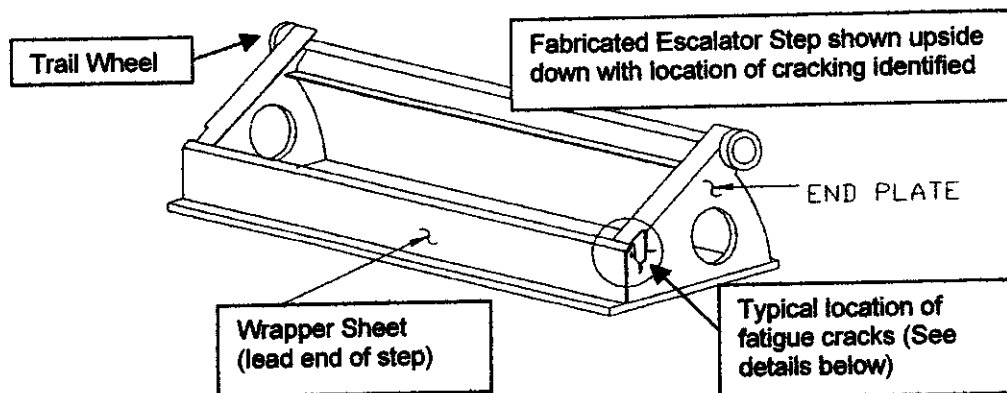
### Product Affected

This bulletin defines type A and type B step cracks that may occur in fabricated steps used on HR type escalators, where the chain rollers are individually flange mounted to the step body end plate. This type of step was manufactured prior to 1993, and all related components are now classed as obsolete.

### Issue

This bulletin is to be used in making a proper determination of when step replacement is necessary. The replacement policy given is based on the continuing policy KONE has followed since we conducted an independent study through the University of Illinois Engineering Dept. in 1981. Additionally, the many years of accumulated field experience with KONE HR escalators, using fabricated steps, has now provided full life cycle knowledge of this component.

During the lifetime of escalator step band components it has been found that on fabricated steps used on HR type escalators, where the chain rollers are individually flange mounted to the step body end plate, cracking can occur in the sheet metal body, due to long term cyclic loading fatigue. The length of time required to develop these cracks is dependent on the equipment operating hours, unit operating speed, loading on the equipment, environmental and building conditions, and service care provided. Therefore regular maintenance inspections are necessary to determine if cracks have developed, and to determine if steps should be replaced.

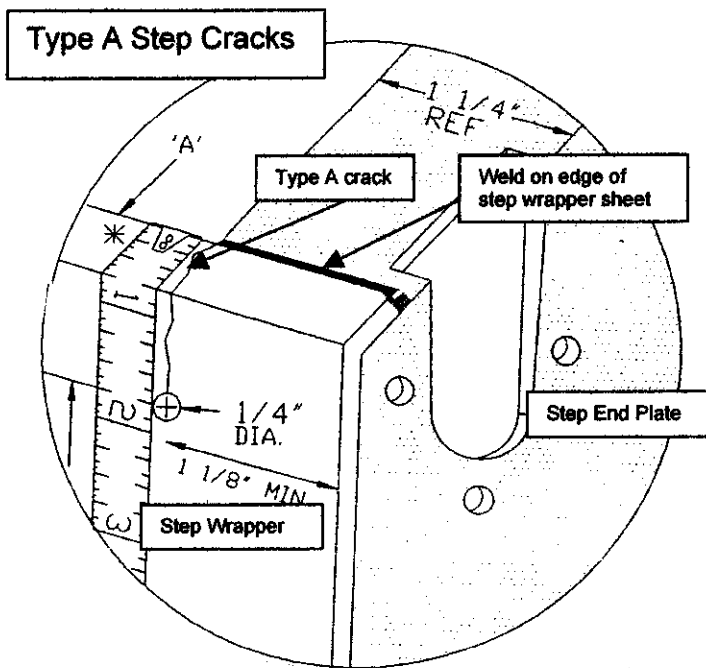


**Cause & Effect**

**Crack type definitions:**

**Type A** – Cracks are located at the lead end of the step (where the chain rollers attach), beginning at the end of the 1" weld on the edge of the step wrapper sheet where it attaches to the end plate. The crack proceeds toward the tread surface at approximately 90 degrees to the weld. (See the diagram below)

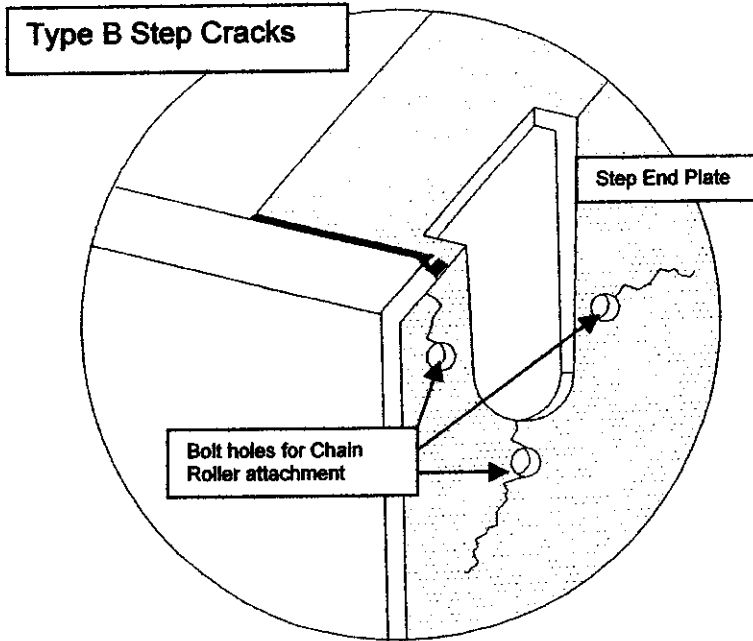
**Type B** – Cracks radiate from the bolt pattern on the end plate where the chain wheel roller flange attaches to the step. (See diagram of Type B cracks for location identification).



Type A cracks are a result of weld stress imparted to the step body during manufacturing. On older style steps, where the step wrapper is welded to the step end plate as shown in the diagram, the step body is quite rigid, and the weld places the wrapper in stress at the end of the weld. In use, the slight twisting that a step is subject to during its travel through the step band path will allow that stress to relieve itself in the form of a crack. The crack is not a result of static loading. Even if a unit is maintained properly, 'A' cracks may develop, and proceed to the point of relief, normally the bend in the wrapper sheet of the step body. However, the crack may progress over the bend in the wrapper sheet, as shown in the diagram, before stopping. *Type A cracks do not necessarily require replacement.* If the crack has not grown beyond 1-3/4" long, as shown in the diagram, measured from point 'A' on the wrapper edge, a relief hole may be drilled at the end of the crack to terminate the cracking.

**Replacement Policy for steps with Type A cracks**

Steps with Type A cracks do not necessarily require replacement. A 1/4" diameter hole may be drilled at the end of the crack to provide a smooth relief surface at the end of the crack. (See diagram above) This relief hole will terminate further progression of the crack. **NOTE:** If the crack has progressed over the bend in the step body wrapper sheet and has turned toward the side of the step, it should be replaced. The diagram above shows the maximum allowable crack progression for Type A cracks.



Type B cracks are a direct result of fatigue due to cyclic loading over time imposed on the end plate by the chain roller mounting flange attachment. As the steps move over the upper 30 degree transition, the combined weight of any loading on the step wheel is transferred through the chain wheel flange attachment to the side of the step resulting in continued flexing of the step body as it moves around the step band. Novatex board adjustment plays a role in determining the length of time that steps may operate before cracking occurs. Novatex boards must be adjusted properly to support the weight of the chain, steps and live load, and improperly maintained novatex boards can cause higher cyclic loading to occur on the step body, with resultant life reduction. The continued cycling of steps moving around the step band, combined with step end plate loading results in fatigue crack formation at the chain wheel flange attachment point. Type B cracks radiate outward from the mounting holes, as shown. (See Life Cycle section of this bulletin)

**Replacement Policy for steps with Type B cracks**  
**ANY STEPS WITH TYPE "B" CRACKS REQUIRE REPLACEMENT**

***Factors affecting step lifetime in service***

In service, steps may develop cracks defined by KONE as Type A or Type B. Type A cracks are a result of weld stress relief in a particular manufacturing design that used a weld on the edge of the step wrapper sheet. This weld was eliminated in later models of the step and replaced by a rivet. Type B cracks form in the end plate and are a result of long term fatigue in the step end plate due to the cyclic loading described above in this discussion.

Tests conducted by KONE, through the University of Illinois in the early nineteen eighties showed that Type A cracks are unrelated to static loading, and if they occur, this will be after 400,000 to 500,000 stepband cycles. Type A cracks do not cause degeneration of structural integrity, and the cracks may be terminated by drilling a small hole at the end of the crack.

Type B cracks however, are degenerate, and occur due to step end plate fatigue. On escalators where the novatex board adjustments are properly maintained, the life of steps has been found to be in excess of 15 years, and is dependent upon loading, hours of service, step-band speed, environmental conditions, and maintenance care. The step design affected by this cyclic loading is now an OBSOLETE component. KONE recommends that this type of step be upgraded to a through axle type of step, or cast aluminum step, which exhibits much better life and is not affected by end plate flexing in the same way.

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### **Corrective Action**

Step cracks do not appear overnight. Normal maintenance procedures and examinations consistent with KONE approved service guidelines for HR Escalators will give warning of potential problems and prevent them from becoming critical. Steps may not be repaired by welding, and any type of repair other than drilling for type A cracks is not an approved repair. Any field documents or letters which may show repairs by welding should be discarded.

### **Contact Person**

For more information, contact the PCM and Product Reliability engineering group at KONE Service Business Center in Moline IL.

### **Approvals & Version History**

Checked by: E.G.S. Date: 2008-1-15

Approved by: J.M.B. Date: 2008-1-16

<b>Issue</b>	<b>Date</b>	<b>Description of Change</b>	<b>Ref. CR</b>	<b>Approved by</b>
R0	2008-01-12	First release		John Bril
R1	2008-01-28	Shorter version of policy statement released in Jan 2007		John Bril