



EAC

No. 139-45

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RUNWAY SURFACE EVENNESS

1. In adopting tolerances for runway surface irregularities, the following standard of construction is achievable for short distances of 3 m and conforms to good engineering practice:
Except across the crown of a camber or across drainage channels, the finished surface of the wearing course is to be of such regularity that, when tested with a 3 m straight edge placed anywhere in any direction on the surface, there is no deviation greater than 3 mm between the bottom of the straight-edge and the surface of the pavement anywhere along the straight edge.
2. Caution should also be exercised when inserting runway lights or drainage grilles in runway surfaces to ensure that adequate smoothness of the surface is maintained.
3. The operation of aircraft and differential settlement of surface foundations will eventually lead to increases in surface irregularities. Small deviations in the above tolerances will not seriously hamper aircraft operations. In general, isolated irregularities of the order of 2.5 cm to 3 cm over a 45 m distance are acceptable, as shown in Figure A-3. Although maximum acceptable deviation vary with the type and speed of an aircraft, the limits of acceptable surface irregularities can be estimated to a reasonable extent. The following table describes acceptable and tolerable limits. Immediately if aircraft operations are to be continued:
 - a) If the irregularities exceed the acceptable limit but are less than the tolerable limit, corrective action should be undertaken as soon as reasonably practicable to improve the surface condition. The runway may remain in service; and
 - b) If the irregularities exceed the tolerable limit, the area of the runway where the roughness has been identified warrants closure until repairs are made to restore the condition to within the acceptable limit and the aircraft operators may be advised accordingly.

| Surface Irregularit | Length of irregularity (m) | | | | | | | | |
|---|----------------------------|------------|------------|------------|-------------|-------------|-------------|-------------|-----------|
| | 3 | 6 | 9 | 12 | 15 | 20 | 30 | 45 | 60 |
| <u>Acceptable surface irregularity height (cm)</u> | <u>2.9</u> | <u>3.8</u> | <u>4.5</u> | <u>5</u> | <u>5.4</u> | <u>5.9</u> | <u>6.5</u> | <u>8.5</u> | <u>10</u> |
| <u>Maximum acceptable surface irregularity height (or depth) (cm)</u> | <u>3.9</u> | <u>5.5</u> | <u>6.8</u> | <u>7.8</u> | <u>8.6</u> | <u>9.6</u> | <u>11</u> | <u>13.6</u> | <u>16</u> |
| <u>Maximum tolerable surface irregularity height (or depth) (cm)</u> | <u>5.8</u> | <u>7.6</u> | <u>9.1</u> | <u>10</u> | <u>10.8</u> | <u>11.9</u> | <u>13.9</u> | <u>17</u> | <u>20</u> |

Note that “Surface Irregularity” is defined herein to mean isolated surface elevation deviations that do not lie along a uniform slope through any given section of a runway. For the purposes of this concern, a “section of a runway” is defined herein to mean a segment of a runway throughout which a continuing general uphill, downhill or flat slope is prevalent. The length of this section is generally between 30 and 60 metres, and can be greater, depending on the longitudinal profile and the condition of the pavement.

The maximum permissible step type bump, such as that which could exist between adjacent slabs, is simply the bump height corresponding to zero bump length at the upper end of the acceptable region of the roughness criteria of Figure A-3. The bump height at this location is 1.75 cm.

4. Figure A-3 illustrates a comparison of the surface roughness criteria with those developed by the United States Federal Aviation Administration. Further guidance can be found in EAC 139-11).
5. Deformation of the runway with time may also increase the possibility of the formation of water pools. Pools as shallow as approximately 3 mm in depth, particularly if they are located where they are likely to be encountered at high speed by landing aeroplanes, can induce aquaplaning, which can then be sustained on a wet runway by a much shallower depth of water. Improved guidance regarding the significant length and depth of pools relative to aquaplaning is the subject of further research. It is, of course, especially necessary to prevent pools from forming whenever there is a possibility that they might become frozen.

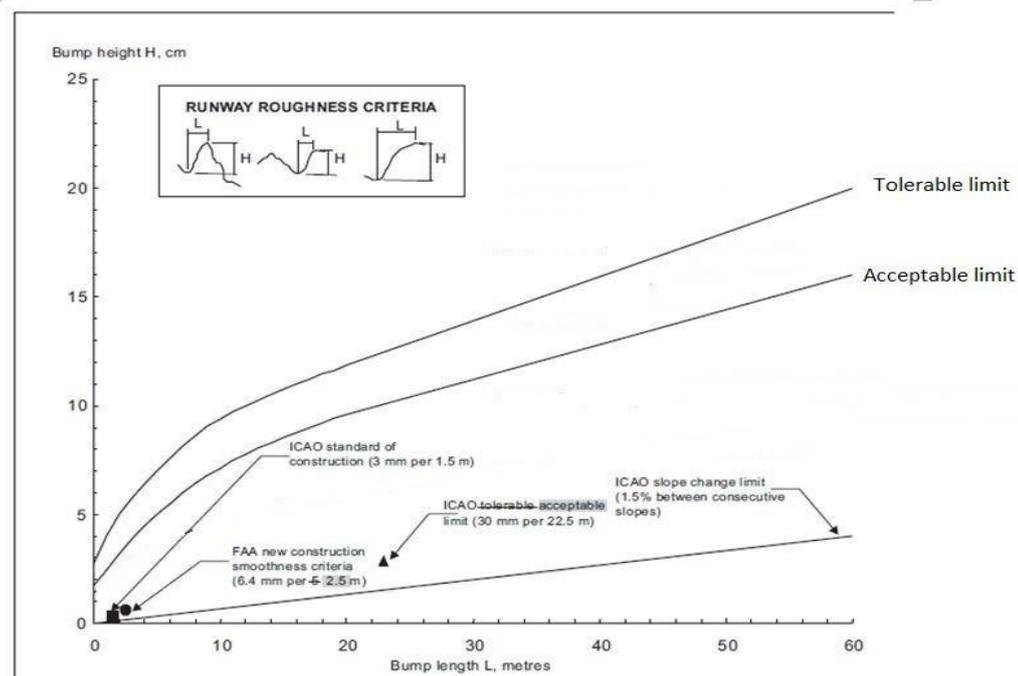


Figure A-3. Comparison of roughness criteria

Note —This criteria addresses single event roughness, not long wave length harmonic effects nor the effect of repetitive surface undulations.