Topping definitions – UK and US – Augmented or not?

ANDY FOAN LIMITED

A R Foan   15B03A-ToppingPoster

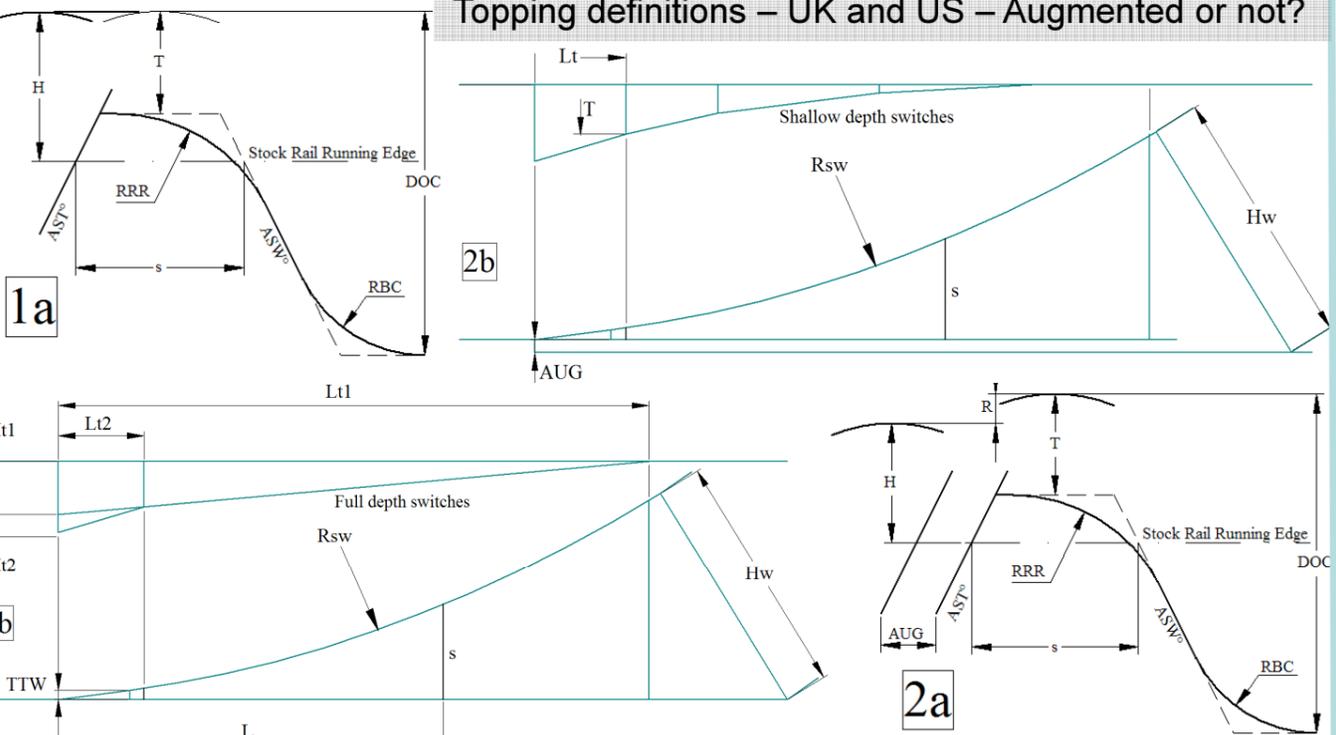Shallow depth switches

Full depth switches

Figure 1 illustrates one way to define topping. Figure 1a shows the stock rail and switch rail faces at their angles AST and ASW to the vertical, separated by the distance s or spread. The depth of the running edge from the stock rail crown is H and the depth of topping at any section T. Figure 1b consists of an elevation and plan view. The elevation has the topping defined by two straight lines with length and height difference at the toe end. These are the first and second topping cuts. The plan shows the locus of the running edge and shows the spread s developing from zero up to the head width of the switch rail.

In Figure 2 there are some slight differences. The diagram 2a shows an augmented switch and stock profile, in which the interface between them is shifted sideways by a distance AUG. Also the switch rail is shown raised above the stock rail by a distance R. These features can be used singly, in combination or not at all. Figure 2b shows a different method of specifying topping, by means of a curve or coordinates.
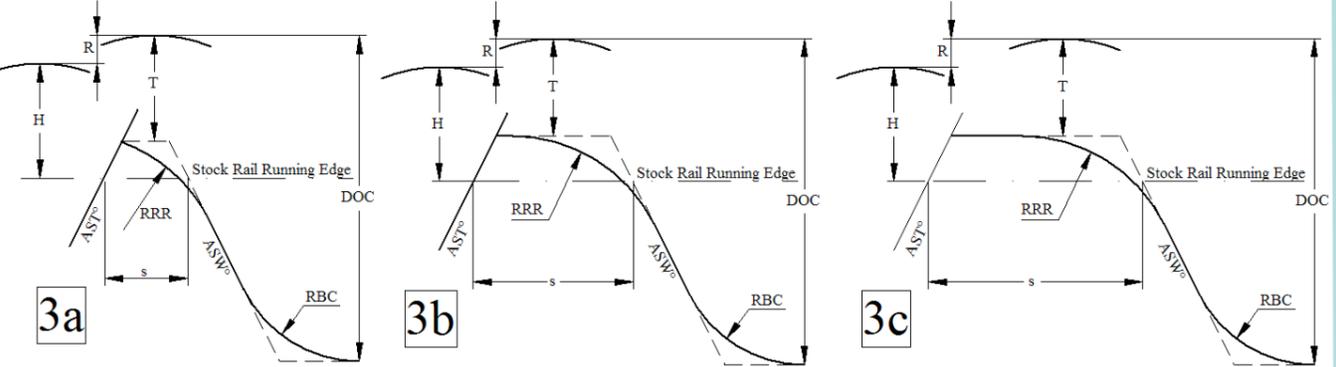
There are several options for defining and interpreting switch topping.
Figure 3 shows the effect of the interaction between running edges and topping at different points along the switch. This is an interpretation based on published designs of US switches, known as AREMA designs. Figure 3a is near the toe and the head width is less than the running edge re-radius but the predefined topping height is maintained. Figures 3b and 3c are at wider switch locations which exhibit a tangential flat part in the section profile.
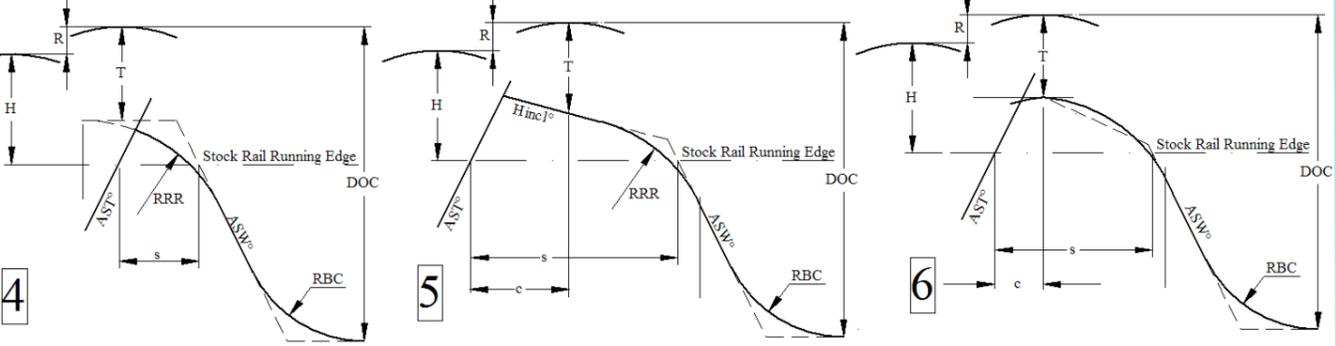

Figure 4 shows how the interaction near the toes is interpreted in the UK for vertical switches. Where there is no flat tangential part, the running edge re-radius is maintained at a constant height therefore the actual height of the rail profile further reduces. Consequently the measured height will not be equal to that computed from the topping ruleset.
More complex rulesets are given in figures 5 and 6. Figure 5 shows inclined topping. This requires the switch topping angle to be defined at some arbitrary transverse distance, say from the stock rail running edge. Figure 6 shows a curved profile being used. This consists of two radii and provides an arguably more conformal profile when compared with the shape of a wheel.
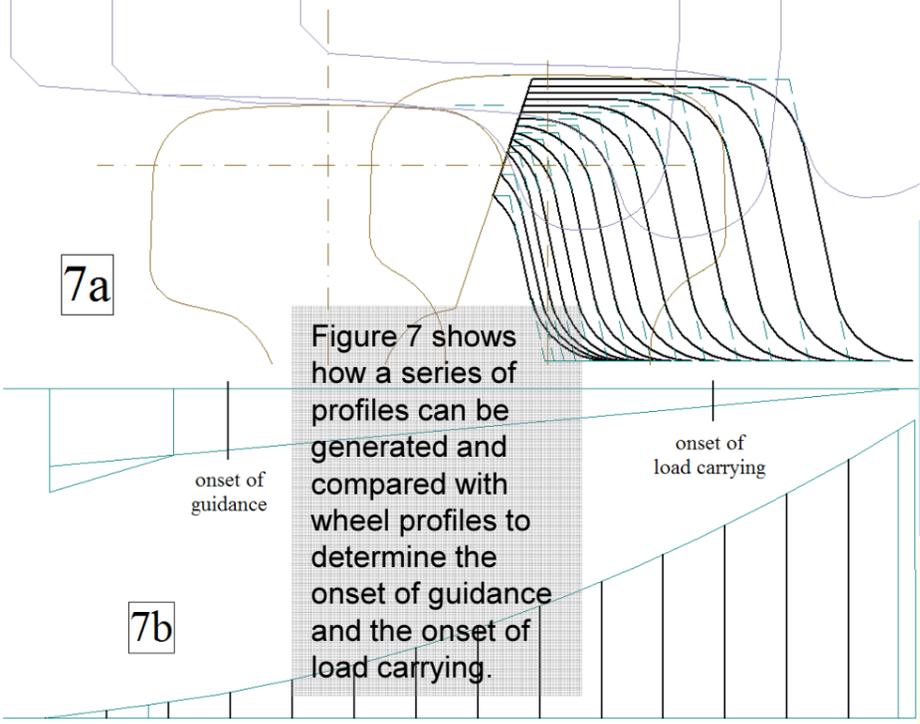
onset of guidance
onset of load carrying

Figure 7 shows how a series of profiles can be generated and compared with wheel profiles to determine the onset of guidance and the onset of load carrying.

The program TOP takes a series of commands written in a text file and generates a set of switch rail profiles. These are modified manually to suit the rail section they are machined from. A 65 degree toe relief can be added using a prescribed curve. Finally 0.2mm diameter semi-overlapping circles are added to follow each profile in turn.

User Guide to TOP input codes

titl
sample dataline titl, 1, text to display,
reproduces text message if switch is set to 1
datm
sample dataline datm, 0, 0,
sets the datum for drawing output
trce
sample dataline trce, 0,
0 turns trace off (default), 1 turns trace on
endf
end of data file
tang
sample dataline tang, 245717.5, 3.5, 74.3,
sets up tangential geometry switch augmentation included in calcs
reri
sample dataline reri, 16, 6.35, 2.8,
16 is depth of running edge below stock rail crown H, 6.35 is height of switch rail crown above stock rail crown R, 2.8 is the amount the switch/stock interface is augmented
tpct
sample dataline tpct, 10000, 20, 1500, 5,
defines the length and height of first and second top cuts
tool
sample dataline tool, 18, 18, 16, 16, 55,
defines the angles of the stock and switch head cuts and radii of tools, and depth from switch rail crown to bottom of cut

toty
Case 1
sample dataline toty, 1,
AREMA vertical method
Case 2
sample dataline toty, 2,
UK vertical method
Case 3
sample dataline toty, 3, 19, 2.8,
inclined head cut
Case 4
sample dataline toty, 4, 60, 2.8,
inclined head cut
clin
sample dataline clin, 1, 70, 4250,
works with prof cases 2 - 4
diag
sample dataline diag, 1, 0.0, 10.0, 100.0,
where 1 is a switch (not yet used), (0.0, 10.0) is the position and 100.0 is the axis separation

prof
requests one or more profile sketches
Case 1
sample dataline prof, 1, 5.16, 25.1, 12.6,
for a topping of 5.16, a spread of 25.1, and a r/e to switch rail c/l of 12.6
Case 2
sample dataline prof, 2, 5000, 25,
calculates topping at a distance 5000 from the toe for a spread of 25
Case 3
sample dataline prof, 2, 5000,
calculates topping and spread at a distance 5000 from the toe for a tangential geometry switch defined by dataline "tang"
Case 4
sample dataline prof, 4, 200, 10,
computes 10 distances and spreads at 200 increments from the toe for a tangential geometry switch defined by dataline "tang"

A second program PicAx is used to extract the data points (centres of the 0.2mm circles) and write them to an excel file for manipulation. After reorganisation and checking of each cross-section profile a summary graph demonstrates that the all the data points are consistent and in an unbroken sequence.

Example
titl, 1, UK REPW203,
titl, 0, Scout v022 or later,
trce, 0,
reri, 16, 0, 0,
tool, 14, 14, 12, 13, 57,
datm, 0, 0,
toty, 2,
prof, 1, 17.0, 0.0, 0.0,
prof, 1, 14.47, 5.0, 2.5,
prof, 1, 11.94, 10.0, 5.0,
prof, 1, 9.41, 15.0, 7.5,
prof, 1, 6.89, 20.0, 10.0,
prof, 1, 4.36, 25.0, 12.5,
prof, 1, 3.42, 30.0, 15.0,
prof, 1, 2.99, 35.0, 17.5,
prof, 1, 2.56, 40.0, 20.0,
prof, 1, 2.13, 45.0, 22.5,
prof, 1, 1.71, 50.0, 25.0,
prof, 1, 1.28, 55.0, 27.5,
prof, 1, 0.85, 60.0, 30.0,
prof, 1, 0.42, 65.0, 32.5,
prof, 1, 0.0, 70.0, 35.0,
endf,