



Television Safe Areas Redefined

For various reasons, televisions using cathode ray tube (CRT) displays deflect the electron beam beyond the edges of the faceplate front of the tube, resulting in areas at the edges of the transmitted picture not being visible to the viewer. This characteristic, known as overscan, requires critical action and titles to be constrained to “safe areas” of the picture. The Society of Motion Picture and Television Engineers (SMPTE) many years ago issued recommendations for what these safe areas should be.

With the increased use of flat-panel LCD, plasma and other fixed pixel matrix display televisions the previously defined safe areas are no longer appropriate and a new SMPTE standard, *Specifications for Safe Action and Safe Title Areas for Television* was published last year, together with a recommended practice *Safe Areas for Protection of Alternate Aspect Ratios*. These were followed last week by an Engineering Guideline *Safe Areas for Television* EG 2046-3, which explains the background and use of the new standards. The following extracts from these documents are reproduced with permission from SMPTE.

“It is the purpose of this Engineering Guideline to explain the use of these documents and the relationships among them. A brief history of TV safe areas and their evolution is also given.

From the early days of film and television, it has been recognized that not all of the information contained in the original image frame will necessarily be presented to the viewer. In television, the principal limitation has been the use of overscan in the viewer’s receiver.

In 1957, the SMPTE Journal included a paper entitled Television Receiver Picture Area Losses, in which the author, Charles Townsend, describes research conducted at NBC’s WRCA-TV in an effort to determine the extent of the broadcast image that was actually seen in viewers’ homes. The paper is reproduced in Annex B. Note that the safe area the author suggests is based on the assumption that all elements within the safe area will be viewable on at least 85% of receivers; no attempt is made to ensure viewability on 100% of receivers.

The safe area pattern recommended is 80% of image height and approximately 80% of image width, adjusted for the shape of the mask, which reflects the circular shape of the CRTs then in use.

In 1961, SMPTE issued SMPTE RP 8, Safe Title Area for TV Transmission, which specified this 80% width, 80% height rectangle with rounded corners as the Safe Title Area. This was followed in 1963 by SMPTE RP 13, Safe Action Area for TV Transmission, which specified a 90% width, 90% height rectangle with rounded corners as the Safe Action Area. In 1968, the two RPs were combined into a revised SMPTE RP 8.

In 2002, SMPTE issued SMPTE RP 218, which brought the specification forward into the digital era by specifying safe areas in terms of pixel and line counts rather than linear dimensions. The rounded corners were also eliminated, as by that time consumer CRTs had square corners. Although superseded, SMPTE RP 27.3 was kept on the books for archival purposes.

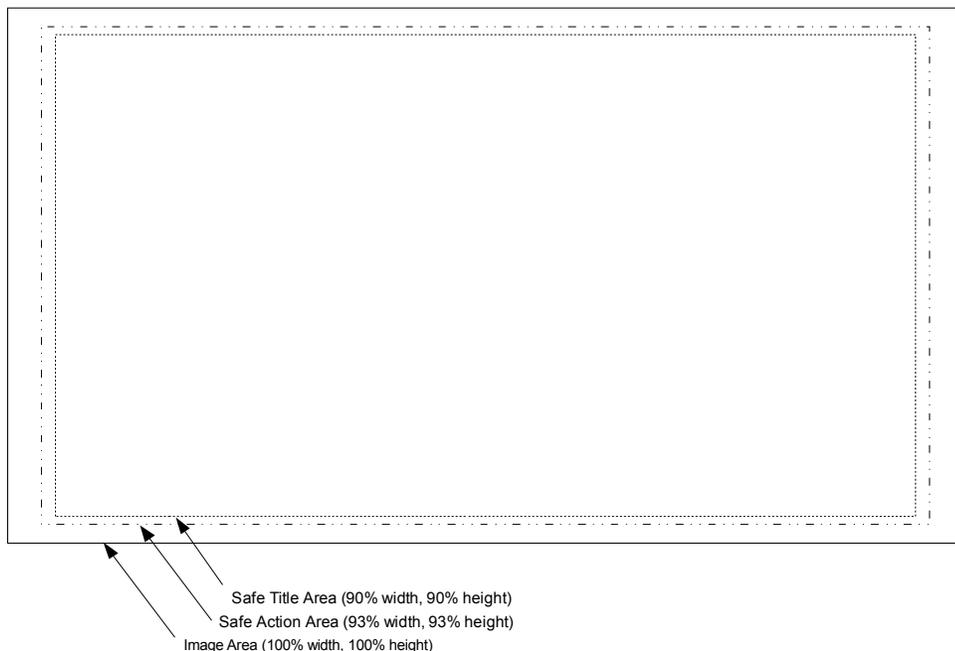
All of these specifications and test patterns were based on the characteristics of CRT-based displays, including rounded corners (except in SMPTE RP 218) and safe-area margins large enough to compensate for centering and geometry errors and the overscan necessary to ensure that the CRT was completely filled with an image even when the receiver’s components had aged or the line voltage sagged. These specifications – a safe action area 90% of the width and 90% of the height of the full image area and a safe title area 80% of the width and 80% of the height of the full image area – persisted until near the end of the first decade of the 21st century, despite significant improvements in CRT-based receiver technology.

By 2007-2008 it had become obvious that the CRT was rapidly being replaced by fixed-pixel-matrix (FPM) displays (plasma, LCD, DLP, etc.) While these technologies have significant differences among them, one characteristic they share is fixed image geometry. No longer is the consumer display subject to changing picture size due to conditions beyond the manufacturer's control. Moreover, since the early 2000s many broadcasters had been utilizing the space between the safe action area and the safe title area for news crawls and other title information, knowing that on modern CRT displays as well as FPM displays this information was virtually certain to be legible. Another complicating factor was the wide adoption of the 16:9 aspect ratio, making it necessary to create images that would be acceptable on both 4:3 and 16:9 displays.

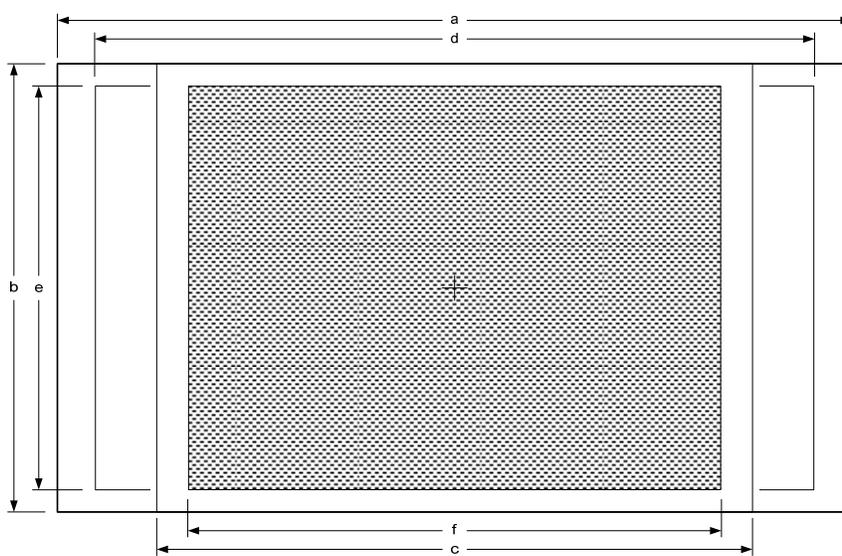
The result was the development of a new Standard, SMPTE ST 2046-1, a new Recommended Practice, SMPTE RP 2046-2, and an amendment to SMPTE RP 218.

Many broadcasters had hoped that it would be possible to utilize the entire active picture area as the safe action area. However, for a variety of reasons, FPM-based consumer receivers, even if they are adjustable to show the entire image area, commonly default to a small amount of overscan to conceal image processing and compression edge artifacts. Moreover, although CRT-based receivers are no longer sold, large numbers of them remain in use. Based on research in the U.S., Europe and Japan, the specifications in SMPTE ST 2046-1 and SMPTE RP 2046-2 were adopted.

SMPTE ST 2046-1 defines the Safe Action Area as a rectangle that is 93% of the width and 93% of the height of the Production Aperture (or 720 x 480 in the case of 480-line formats) and concentric with it. The Safe Title Area is defined as a rectangle that is 90% of the width and 90% of the height of the Production Aperture (or 720 x 480 in the case of 480-line formats) and concentric with it. Annex C of the Standard provides informative tables giving the dimensions of these safe areas in terms of lines and pixels for the most commonly used image formats. Annex D provides example safe area graticules for both 4:3 and 16:9 aspect ratios, as well as a graticule for 4:3 images using the legacy safe area percentages.



SMPTE RP 2046-2 defines safe areas that should be used when composing 16:9 images that will be presented on both 4:3 and 16:9 displays. Two example graticules are defined, one for use when the 4:3 image is to be created by cropping the sides of the 16:9 image and the other for use when the full 16:9 image is to be presented in a letterbox on the 4:3 display. These are described in the context of the Active Format Description (AFD) specifications defined in SMPTE ST 2016-1. SMPTE RP 2046-2 defines only 90%, 90% safe areas.



Amendment 1 to SMPTE RP 218 deprecates its use except for formatting of closed captions as defined in CEA-708. The exception exists because all receivers deployed in countries that require the use of CEA-708 display captions in a window whose extents are defined by the old 80% width, 80% height safe title area defined in SMPTE RP 218. CEA-708 normatively references SMPTE RP 218. For all other applications, the amended RP directs users to SMPTE ST 2046-1 and SMPTE RP 2046-2.”

Users are encouraged to refer to the full documents and not rely on these extracts. Like all SMPTE standards, the new Safe Area documents may be purchased from the SMPTE online store at: <https://store.smpte.org/>.

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