Log Summary: Move SCP rendering requirements from Part 3 to Part 4 (and clarify rendering requirements as well as content constraints for the Corneal Topography Map IOD)

Name of Standard
PS3.3, PS3.4

Rationale for Correction:
In PS3.3 Section C.8.30.2.1.2 “Corneal Topography Map Real World Value and Image Transformations”, a rendering requirement is made for an SCP of the Corneal Topography Map Storage SOP Class. Requirements for an SCP shall be specified in PS3.4 instead of PS3.3, so it is proposed to move the corresponding paragraph to PS3.4.

It is also proposed to clarify further details on the rendering requirements for an SCP of the Corneal Topography Map Storage SOP Class and to add further content constraints on the Corneal Topography Map IOD (i.e. for a creator of such instances). Both clarifications are intended to assist the superimposing of a Corneal Topography Map on the corresponding source image and the display of an annotated color scale, which is a typical use case.

Editorial change #1: PS3.4 sometimes uses the wording “a SCU” and “a SCP” and sometimes “an SCU” and “an SCP”. This should be changed consistently to “an SCU” and “an SCP”.

Editorial change #2: PS3.4 sometimes refers to “the Class”. It is proposed to use “the SOP Class” or “this SOP Class” instead (whichever is more appropriate).

Editorial change #3: PS3.3 is rather inconsistent regarding the spelling of the term “Real World Value(s)”, e.g. it is sometimes also written as “real world value(s)” or “Real World value(s)”. General comment: Also see CP-2171 (Define use of Pixel Padding Value for PALETTE COLOR images).

Correction Wording:

Change PS3.4. Editor to change “a SCU” and “a SCP” to “an SCU” and “an SCP” throughout.

Change PS3.4. Editor to change “the Class” to “the SOP Class” instead throughout.

Change PS3.3. Editor to change capitalization of “real world value(s)” or “Real World Value(s)” throughout.

Change PS3.3 Section 2.1 (remove reference to “ISO 19980”)

2.1 International Organization for Standardization (ISO) and International Electrotechnical Commission (IEC)

[...]
Amend PS3.3 Section A.73.4:

A.73.1 Corneal Topography Map IOD Description

The Corneal Topography Map IOD is generated by ophthalmic corneal topography mapping devices, such as reflection-based topography and elevation-based tomography instruments to generate curvature and/or elevation measurements of corneal anterior and posterior surfaces that are presented topographically using a monochromatic image and a pseudo-color map. The pseudo-colored map may be superimposed over the source image for display.

Add new Section A.73.4.2 to PS3.3

A.73.4 Corneal Topography Map IOD Content Constraints

The following constraints on Image Attributes take precedence over the descriptions given in the Module Attribute Tables.

[...]

A.73.4.2 Pixel Padding, Real World Value Mapping and Palette Color LUT

When a Corneal Topography Map is superimposed on the corresponding source image, the background color of the map that is specified by the Pixel Padding Value (0028,0120) Attribute may be rendered “transparently” so that parts of the underlying source image become visible (see Section B.5.1.17 in PS3.4). To support this rendering, no mapping shall be defined in the Real World Value Mapping Sequence (0040,9096) for the value of the Pixel Padding Value (0028,0120) Attribute. The Pixel Padding Range Limit (0028,0121) Attribute shall not be used for this IOD.

Note

1. In order to facilitate the rendering and to preserve backward compatibility with existing implementations, it is suggested that a value of 0 for the Pixel Padding Value (0028,0120) Attribute be used, and to explicitly define this background color in the Palette Color Lookup Table as black (i.e. the corresponding entry in Red, Green and Blue Palette Color Lookup Table Data (0028,1201-1203) is set to 0).

2. There is no reason to specify a range of Pixel Padding Values, since the Corneal Topography Map is the result of a calculation and the background color can, therefore, be specified as a distinct value.

Change PS3.3 Section C.7.6.16.2.1

C.7.6.16.2.11 Real World Value Mapping Macro

Table C.7.6.16-12 specifies the Attributes of the Real World Value Mapping Functional Group Macro.
### Table C.7.6.16-12. Real World Value Mapping Macro Attributes

<table>
<thead>
<tr>
<th>Attribute Name</th>
<th>Tag</th>
<th>Type</th>
<th>Attribute Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Real World Value Mapping Sequence</td>
<td>(0040,9096)</td>
<td>1</td>
<td>The mapping of stored values to associated Real World values. One or more Items shall be included in this Sequence.</td>
</tr>
</tbody>
</table>

>Include Table C.7.6.16-12b “Real World Value Mapping Item Macro Attributes”

Measurement Units Code Sequence DCID 82 “Units of Measurement”, or as specified in the Macro invocation.

### Change PS3.3 Section C.8.30.2.1.2

#### C.8.30.2.1.2 Corneal Topography Map Real World Value and Image Transformations

The Corneal Topography Map SOP Class supports a sequence of transformations that completely define the conversion of a stored image into a displayed image.

The sequence of transformations from corneal measurements to a displayable image is explicitly defined in Figure C.8.30.2.1-1. Figure C.8.30.2.1-1 also conveys the transformation to display the scaling of the color map using its Real World Value Macro (see Table C.7.6.16-12 for more details on the Real World Value Macro).

### Change "Color Palette LUT" to "Palette Color LUT" in Figure C.8.30.2.1-1:

![Corneal Topography Map Real World Value and Image Transformation Pipeline](image)

**Figure C.8.30.2.1-1. Corneal Topography Map Real World Value and Image Transformation Pipeline**

An SCP of the Corneal Topography Map Storage SOP Class, when rendering SOP Instances of the Class shall apply the image transformations (i.e., Palette Color LUT) and the Real World Value LUT to display the annotated color scale. The annotated color scale shall conform to the "ISO Standard 19980 – Ophthalmic instruments – Corneal topographers, second edition, section B.4 Standardized color scale.”

**Note**

Requirements for an SCP of the Corneal Topography Map Storage SOP Class when rendering SOP Instances of this SOP Class are defined in Section B.5.1.17 in PS3.4. Formerly, these requirements could be found in this Section of PS3.3.

### Change PS3.4 Chapter 2  (add reference to “ISO 19980”)
2 Normative References

[...]


[...]

Change PS3.4 Section B.5.1.17

B.5.1.17 Corneal Topography Map Storage SOP Class

The Corneal Topography Map SOP Class encodes a topographic representation of the curvature and/or elevation measurements of corneal anterior and posterior surfaces (e.g., maps that display corneal curvatures, corneal elevations, and corneal power, etc.).

An SCP of the Corneal Topography Map Storage SOP Class that renders SOP Instances of this SOP Class shall apply the image transformations (i.e., Palette Color LUT) and the Real World Value LUT to display the annotated color scale. The annotated color scale shall conform to the "ISO Standard 19980 - Ophthalmic instruments - Corneal topographers, second edition, section B.4 Standardized colour Scale" [ISO 19980].

An SCP may display a Corneal Topography Map superimposed on the image referenced in the Source Image Sequence (0008,2112). When displaying such, Corneal Topography Map pixels with the value of the Pixel Padding Value (0028,0120) Attribute shall be rendered transparently so that the corresponding underlying image pixels are visible. For the display of the annotated color scale, the SCP shall use only those values for which a mapping is defined in the Real World Value Mapping Sequence (0040,9096). The colors that shall be used for both the map and the scale are defined by the Attributes of the Palette Color Lookup Table.

Note

1. The size of the Corneal Topography Map is typically the same as that of the underlying image on which it is superimposed, i.e., the Rows (0028,0010) and Columns (0028,0011) Attributes have the same Values, and the orientation and origin are the same. In this case, there is no need to specify a Spatial Registration.

2. A Blending Presentation State provides additional capabilities for superimposing images, but these are typically not required for this use case, i.e., for rendering a Corneal Topography Map on a source image.

3. Examples for the rendering of superimposed images and the annotated color scale can be found in Section NNN.2 and NNN.3 of PS3.17.

For a device that is both an SCU and an SCP of the Corneal Topography Map Storage SOP Class, in addition to the behavior for the Storage Service Class specified in Section B.2.2, the following additional requirements are specified for Corneal Topography Map Storage SOP Classes:

• An SCP of this SOP Class shall support Level 2 Conformance as defined in Section B.4.1.

Note

This requirement means that all Type 1, Type 2, and Type 3 Attributes defined in the Information Object Definition and Private Attributes associated with the SOP Class will be stored and may be accessed.