



**International
Standard**

ISO/IEC 23094-2

**Information technology – General
video coding —**

**Part 2:
Low complexity enhancement video
coding**

AMENDMENT 1: Additional levels

*Technologies de l'information – Codage vidéo général —
Partie 2: Codage vidéo d'amélioration de faible complexité
AMENDEMENT 1: Niveaux supplémentaires*

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**AMENDMENT 1
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Low complexity enhancement video coding

AMENDMENT 1: Additional levels

Normative references

Replace "ITU-T H.273 | ISO/IEC 23091-2:2019" with "ITU-T H.273 | ISO/IEC 23091-2"

6.2

Replace:

The variables ShiftWidthC and ShiftHeightC are specified in Table 2, depending on the chroma format sampling structure, which is specified through chroma_format_idc and separate_colour_plane_flag. Other values of chroma_format_idc, ShiftWidthC and ShiftHeightC may be specified in the future by ISO/IEC.

with:

The variables ShiftWidthC and ShiftHeightC are specified in Table 2, depending on the chroma format sampling structure, which is specified through chroma_sampling_type.

7.3.9

Replace Table 13 with the following table:

Table 13 — Process payload – surface

Syntax	Descriptor
process_surface(surface) {	
if (surface.entropy_enabled_flag) {	
if (compression_type_size_per_tile == 0) {	
surface.size	mb
}	
if (surface.rle_only_flag) {	
surface.data_rle	surface.size
} else {	
surface.data_prefix_coding	surface.size
}	
}	
}	

7.3.12

Replace Table 16 with the following table:

Table 16 — Byte alignment syntax

Syntax	Descriptor
byte_alignment() {	
while(!byte_aligned())	
alignment_bit_equal_to_zero /* equal to 0 */	f(1)
}	

7.4.2.2

In Table 19, replace "per picture (if no_enhancement_bit_flag == 0)" with:

per picture (if no_enhancement_bit_flag == 0 or temporal_signalling_present == 1)

Add the following sentence below Table 19:

If a NAL unit as specified in Sec. 7.3.2 contains more than one payload of the same payload_type (where payload_type is equal to 0, 1, or 2), the values given by the last payload of such payload_type within the NAL unit shall be used.

7.4.3.3

Replace

In order to prevent incomplete TUs, as defined in 6.3.2, custom_tile_width shall be an integer multiple of the TU size (nTbS = 2 if transform_type is equal to 0 and nTbS = 4 if transform_type is equal to 1) for each sub-layer and for each plane within a sub-layer.

with

In order to prevent incomplete entropy encoded quantized transform coefficient tiles, as defined in 9.1.1, custom_tile_width shall be an integer multiple of 64 for each sub-layer and for each plane within a sub-layer.

Replace

In order to prevent incomplete Tus, as defined in 6.3.2, custom_tile_height shall be an integer multiple of the TU size (nTbS = 2 if transform_type is equal to 0 and nTbS = 4 if transform_type is equal to 1) for each sub-layer and for each plane within a sub-layer.

with

In order to prevent incomplete entropy encoded quantized transform coefficient tiles, as defined in 9.1.1, custom_tile_height shall be an integer multiple of 64 for each sub-layer and for each plane.

Replace

planes_type specifies the planes to be processed by the decoder according to Table 25.

with

planes_type specifies the planes to be processed by the decoder according to Table 25. If chroma_sampling_type is equal to 0, planes_type shall be equal to 0.

7.4.3.4

Replace:

temporal_signalling_present_flag specifies whether the temporal signalling coefficient group is present in the bitstream.

with:

temporal_signalling_present_flag specifies whether the temporal signalling coefficient group is present in the bitstream. If **temporal_enabled_flag** is equal to 0 or **temporal_refresh_bit_flag** is equal to 1, **temporal_signalling_present_flag** shall be equal to 0.

8.3.2

Delete the following:

— variable **nPlanes** is derived as follows:

```
if (processed_planes_type_flag == 0)
    nPlanes = 1
else
    nPlanes = 3
```

Delete "data = read_byte(bitstream)" from the condition branch below

```
if (surfaces[planeIdx][levelIdx][layerIdx].rle_only_flag) {
    multibyte = read_multibyte(bitstream)
    surfaces[planeIdx][levelIdx][layerIdx].size = multibyte
    surfaces[planeIdx][levelIdx][layerIdx].data_rle =
        bytestream_current(bitstream)
} else {
    data = read_byte(bitstream)
    multibyte = read_multibyte(bitstream)
    surfaces[planeIdx][levelIdx][layerIdx].size = multibyte
    surfaces[planeIdx][levelIdx][layerIdx].data_prefix_coding =
        bytestream_current(bitstream)
    bytestream_seek(bitstream, surfaces[planeIdx][levelIdx][layerIdx].size)
}
```

Delete "data = read_byte(bitstream)" from the condition branch below

```
if (temporal_signalling_present_flag == 1) {
    if (temporal_surfaces[planeIdx].entropy_enabled_flag) {
        if (temporal_surfaces[planeIdx].rle_only_flag) {
            multibyte = read_multibyte(bitstream)
            temporal_surfaces[planeIdx].size = multibyte
            temporal_surfaces[planeIdx].data_rle = bytestream_current(bitstream)
        } else {
            data = read_byte(bitstream)
            multibyte = read_multibyte(bitstream)
            temporal_surfaces[planeIdx].size = multibyte
            temporal_surfaces[planeIdx].data_prefix_coding =
                bytestream_current(bitstream)
            bytestream_seek(bitstream, temporal_surfaces[planeIdx].size)
        }
    }
}
```

```

    }
  }
}

```

8.3.3

Delete the following:

— variable `nPlanes` is derived as follows:

```

f (processed_planes_type_flag == 0)
  nPlanes = 1
else
  nPlanes = 3

```

Delete the instruction "`data = read_byte(bitstream)`" from the condition branch below:

```

if (surfaces[planeIdx][levelIdx][layerIdx].rle_only_flag) {
  multibyte = read_multibyte(bitstream)
  surfaces[planeIdx][levelIdx][layerIdx].tiles[tileIdx].size = multibyte
  surfaces[planeIdx][levelIdx][layerIdx].tiles[tileIdx].data_rle =
    bytestream_current(bitstream)
} else {
  data = read_byte(bitstream)
  multibyte = read_multibyte(bitstream)
  surfaces[planeIdx][levelIdx][layerIdx].tiles[tileIdx].size = multibyte
  surfaces[planeIdx][levelIdx][layerIdx].tiles[tileIdx].data_prefix_
    coding = bytestream_current(bitstream)
  bytestream_seek(bitstream,
    surfaces[planeIdx][levelIdx][layerIdx].tiles[tileIdx].size)
}

```

Delete the instruction "`data = read_byte(bitstream)`" from the condition branch below:

```

if (temporal_surfaces[planeIdx].rle_only_flag) {
  multibyte = read_multibyte(bitstream)
  temporal_surfaces[planeIdx].tiles[tileIdx].size = multibyte
  temporal_surfaces[planeIdx].tiles[tileIdx].data_rle =
    bytestream_current(bitstream)
} else {
  data = read_byte(bitstream)
  multibyte = read_multibyte(bitstream)
  temporal_surfaces[planeIdx].tiles[tileIdx].size = multibyte
  temporal_surfaces[planeIdx].tiles[tileIdx].data_prefix_coding =
    bytestream_current(bitstream)
  bytestream_seek(bitstream, temporal_surfaces[planeIdx].
    Tiles[tileIdx].size)
}

```

8.3.4.2

In numbered item 2), replace "If `nTbSs` is equal to 4" with "If `nTbS` is equal to 2".

In numbered item 2), replace "TransformCoeffQ(1)(1)" with "TransformCoeffQ(0)(1)"

8.3.5.2

Replace "(xTb0 >> nTbs, yTb0 >> nTbs)" with "(xTb0 / nTbS, yTb0 / nTbS)"

Replace "((xTb0 % 32) * 32, (yTb0 % 32) * 32)" with:

((xTb0 / 32) * (32 / nTbS), (yTb0 / 32) * (32 / nTbS))

8.4.1

Replace "(xTbP >> nTbS, yTbP >> nTbS)," with "(xTbP / nTbS, yTbP / nTbS),"

Replace "((xTbP % 32) * 32, (yTbP % 32) * 32)" with:

((xTbP / 32) * (32 / nTbS), (yTbP / 32) * (32 / nTbS))

Replace

If variable temporal_tile_intra_signalling is equal to 1 and xTbP >> 5 is equal to 0 and yTbP >> 5 is equal to 0 and TileTempSig is equal to 1

with

If variable temporal_tile_intra_signalling is equal to 1 and xTbP % 32 is equal to 0 and yTbP % 32 is equal to 0 and TileTempSig is equal to 1

Replace

at the position (xTb0 >> nTbs, yTb0 >> nTbs); and if in addition temporal_tile_intra_signalling_enabled_flag is set to 1, a variable TileTempSig corresponding to the value in TempSigSurface (9.3.4) at the position ((xTb0 % 32) * 32, (yTb0 % 32) * 32)

with

at the position (xTbP >> nTbs, yTbP >> nTbs); and if in addition temporal_tile_intra_signalling_enabled_flag is set to 1, a variable TileTempSig corresponding to the value in TempSigSurface (9.3.4) at the position ((xTbP % 32) * 32, (yTbP % 32) * 32)

8.4.2

Replace "tempPredL2Residuals" with "temporalBuffer"

8.5.2 and 8.5.3

Replace "qm[x + (levelIdxSwap * nTbS)][y]" with "qm[x][y]"

8.5.3

Delete the following:

— Where levelIdxSwap is derived as follows:

```
if (levelIdx == 2)
    levelIdxSwap = 0
else
    levelIdxSwap = 1
```

8.6.1.1

Add the following sentence to the end of the subclause

The output of the upscaling processes shall be in the same value range as the input values.

8.7.5

Replace

```
modifier = recLowerResSamples[xSrc][ySrc] - (recUpsampledSamples[xDst][yDst] +
    recUpsampledSamples[xDst + 1][yDst]) >> 1
```

with

```
modifier = recLowerResSamples[xSrc][ySrc] - (recUpsampledSamples[xDst][yDst] +
    recUpsampledSamples[xDst + 1][yDst] + 1) >> 1
```

Replace

```
modifier = recLowerResSamples[xSrc][ySrc] - (recUpsampledSamples[xDst][yDst] +
    recUpsampledSamples[xDst + 1][yDst] + recUpsampledSamples[xDst][yDst + 1] +
    recUpsampledSamples[xDst + 1][yDst + 1]) >> 2
```

with

```
modifier = recLowerResSamples[xSrc][ySrc] - (recUpsampledSamples[xDst][yDst] +
    recUpsampledSamples[xDst + 1][yDst] + recUpsampledSamples[xDst][yDst + 1] +
    recUpsampledSamples[xDst + 1][yDst + 1] + 2) >> 2
```

Replace

```
recModifiedUpsampledSamples[xDst][yDst + 1] = recUpsampledSamples[xDst + 1][yDst] +
    modifier
recModifiedUpsampledSamples[xDst + 1][yDst] = recUpsampledSamples[xDst][yDst + 1] +
    modifier
```

with

```
recModifiedUpsampledSamples[xDst][yDst + 1] = recUpsampledSamples[xDst][yDst + 1] +
    modifier
recModifiedUpsampledSamples[xDst + 1][yDst] = recUpsampledSamples[xDst + 1][yDst] +
    modifier
```

9.2.1

Replace Figure 17 with the following figure:

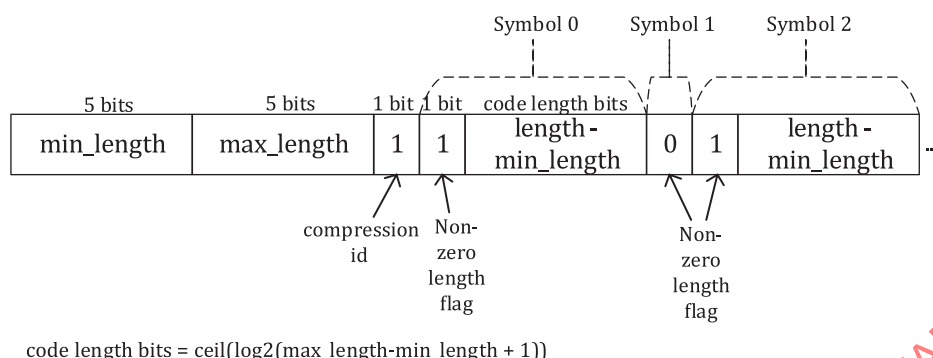


Figure 17 — Prefix coding decoder stream header for more than 31 non-zeros codes

Replace Figure 18 with the following figure:

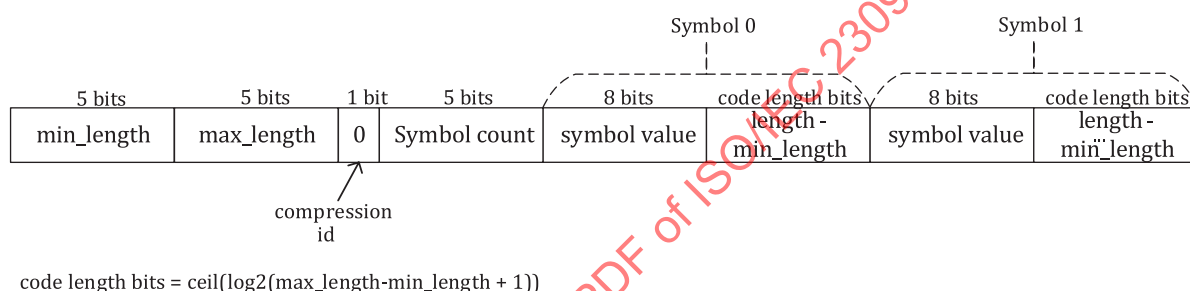


Figure 18 — Prefix coding decoder normal case

9.2.2

Replace

To find a Prefix Coding Code for a given set of symbols a Prefix Coding tree needs to be created using the following steps:

with

The Prefix Coding Code for a given set of symbols is generated at the encoder by building a Prefix Coding tree. The following steps provide an example of such generation:

Replace Figure 25 with the following:

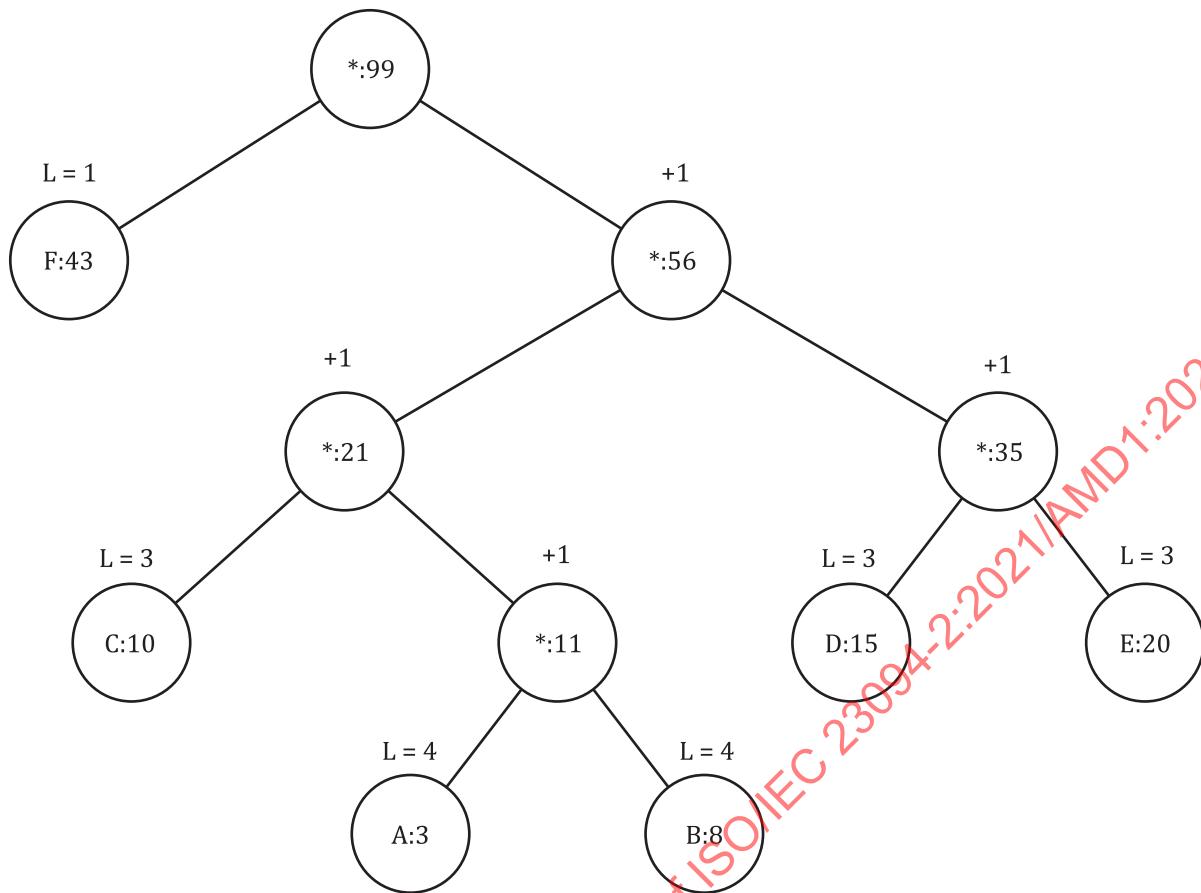


Figure 25 — Loop process completion

Replace list items 5) to 7) with the following list items:

- 5) Once the tree is built, the Prefix Coding length for every symbol is computed by traversing the tree from the root to each symbol, appending one bit each time a left branch or a right branch is taken.
- 6) Starting with a codeword of all zeroes, from the highest to the lowest codeword length, and from the lowest to the highest symbol values, a codeword is assigned, increasing the codeword binary value by 1, and shifting right when going from a higher to a lower codeword length. In the example above, this gives results to the following code in Table 43.
- 7) The decoder, after receiving the symbols and code lengths as described in subclause 9.2.1, repeats the process of step 6 to derive the codewords. Each codeword related to each symbol is then passed to the process 9.3.

9.3.4.1

Replace Figure 33 with the following figure: