



## Technical Requirements for High Definition Programming (No. HD-6.1)

### 1. VIDEO SPECIFICATIONS

Video program material shall be produced using current industry standards and accepted norms.

#### 1.1 Production Formats

Video signals from cameras or telecine equipment shall be produced with an aspect ratio of 16:9 and must comply with one of the 1920 x 1080 standards specified by SMPTE-274M or with one of the 1280 x 720 standards specified by SMPTE-296M-1997.

#### 1.2 Program Delivery Format

Tapes delivered to BellMedia must be HDCAM or HDCAM-SR in the 1080i format (1080 lines interlaced 2:1 at a field rate of 59.94 Hz) and signal parameters must conform to SMPTE 274M with no visible video impairment such as blocking errors or pixelization artifacts. Delivery on XDCam HD 4:2:2 in the 50Mb, 1080i/ 59.94 format is also permissible. Luminance and color difference signals must not exceed the bounds of legal gamut.

BellMedia will accept programming via electronic file delivery using accelerated ftp or physical media. Files should be in the Sony XD-HD 422 format as outlined in the following document.

#### 1.3 Accompanying Program Delivery

If the HDCAM (or HDCAM-SR) master is not delivered complete (with closed captioning and described video) then these elements must be provided separately, preferably in the form of an SD Digital Betacam down convert with matching time codes. Descriptive Video is to be placed on Channels 3 & 4.

#### 1.4 Reference Signals

Program content shall be preceded with a minimum of one minute of color bars (75% or 100% chroma amplitude) and audio tone of 1000 Hz, followed by 10 seconds of slate and 10 seconds of black before start of program. Program material must be representative of bars and tone.

#### 1.5 Time Code

HD programs must be recorded with drop frame time code. Program start time code must read either 01:00:00:00 or 10:00:00:00. Time code should be continuous, without error, and contain the appropriate flagging information in adherence with SMPTE specification 12 M.

All time code references, i.e. vertical interval time code, (VITC), longitudinal time code. (LTC) or audio sector time code on Digital formats (ATSC) must match exactly.

#### 1.6 Start Time

Program content shall commence at either 01:00:00:00 or 10:00:00:00 TC. There must be a minimum of 30 seconds of black following the last program picture and audio before any textless elements or added material.

#### 1.7 Closed Captioning

Program content shall be closed captioned as defined in EIA-708-B and EIA-608B.

#### 1.8 Described Video

Narrated description of visual action for the vision impaired should be provided and recorded as per Section 2.3. Described video for High Definition should be delivered in stereo.

## Technical Requirements for High Definition Programming (No. HD-6.0)

### 1.8 Acquisition Formats

Video footage should be acquired using formats acceptable to BellMedia on professional-quality media. Productions may be photographed using any of the following formats:

High Definition Formats	Acceptable Up conversion Formats	Film Formats
Sony HDCAM	Sony Digital Betacam	35 mm Film (2k and/or 4k electronic equivalent)
Sony HDCAM SR	Sony Betacam SP	70 mm Film (IMAX)
Sony XDCAM HD422 (50 Mbps) and XDCAM HD HQ (35 Mbps)	Sony MPEG IMX 50 Mb (tape)	
Panasonic P2 HD (AVC Intra 100)	Sony MPEG IMX 50 Mb (XDCAM)	
Panasonic DVC PRO 100 Mb (HD)	Panasonic DVC PRO 50 (tape)	
Panasonic HD-D5 (Film Transfers)	Super 16 mm film	Super 16 mm film
HDV at 1080i (With Restrictions)		
HVX-200 DVC PRO HD 100 (with HDV restrictions)		
XDCAM HD-EX (using an external HD-SDI recording device only).		

Material not acquired in one of the acceptable formats must be approved by the Production Manager prior to the commencement of production. No more than 25% of an HD production's final content may be material up-converted from standard definition, and no more than 15% of the final content may be originated in the HDV 1080 format. When both HDV and unconverted materials are used in a program, the combined total of HDV and unconverted footage cannot exceed 30% of the final program material.

### 1.9 Editing Codecs

Video program material shall be produced using industry standards and professional workmanship. BellMedia requires that its production partners use only approved codecs and media types when working in nonlinear editing systems.

#### Acceptable Editing Codecs

#### Unacceptable Editing Codecs

Codec	Bit rate or Ratio
Uncompressed SMPTE 292	1200 Mbps
AVID DNxHD 8 and 10 bit	220 or 145 Mbps
Sony HDCAM codec	140 Mbps
DVCPRO HD	100 Mbps
XDCam HD422	50 Mbps
DVCPRO HD 1280 X 1080	
Apple Pro Res HQ	

Codec	Bit rate or Ratio
HDV (exclusive use)	25 Mbps
Any Exclusively Standard Definition Codec	Various

## **Technical Requirements for High Definition Programming (No. HD-6.0)**

### **2. AUDIO SPECIFICATIONS**

Audio program material shall be produced using current industry standards and accepted norms. The audio portion of the master and source audio and videotapes must be produced so that no noise, static, dropouts or extraneous distortion is recorded in the audio.

Program audio must reflect reference tone level. Audio levels must be consistent throughout the program.

#### **2.1 Stereo (LPCM) Programs**

##### **2.1.1 Phasing**

Stereo audio must be fully mono compatible, i.e. the audio channels must be in the proper phase. NOTE: Full Mono compatibility means that when the left and right stereo channels are actively combined to mono there is no discernible change in audio level or fidelity.

Full mix and M & E audio tracks should be phase coherent (synchronized) and level matched to prevent difficulty editing between these tracks, as necessary.

##### **2.1.2 Sound to Video Synchronization (Lip-synchronization)**

The relative timing of sound to video should not exhibit any perceptible error. Sound should not lead or lag the vision by more than 10ms. This synchronization must be achieved at the last point at which the program supplier, or their facility provider, has control of the signal.

##### **2.1.3 Headroom**

Although the major stations have been converted to digital transmission, there are still analogue transmitters within the BellMedia chain. For broadcast stereo tracks, transient audio peaks must not exceed +8 dB above reference tone when measured on an audio meter using the "True-peak" ballistic set (0 ms rise, 200 ms fall). For 5.1 surround mixes, audio peaks may rise as high as +21 dBm (-3 dBfs). When mastering to a digital format and/or using an Absolute Scale or Peak meter, where "0" is at the top of the scale and reference tone is at -20 dBfs, broadcast stereo tracks should peak at no more than -12 dBfs.

##### **2.1.4 Audio compression:**

Program audio should have good dynamic range, within the parameters listed above, but not be overly dynamic. While some compression may be needed to control the dynamic range of the program audio, excessive audio compression of the final mix should be avoided as this reduces the perception of audio quality by the listener.

#### **2.2 Surround Programs**

##### **2.2.1 Formats**

5.1, 5.0 or LCRS mixes are permitted. Surround English Fullmix (regardless of configuration (5.1, 5.0, etc)) will ideally be presented as discrete audio channels as per Sect. 2.3 and shall be balanced such that the discrete mix properly folds down to a valid stereo signal. If the delivery media format does not support discrete audio, then the surround mix shall be expressed as Dolby 'E' on ch3/4 of the HDCam master or XDCam master.

##### **2.2.2 Documentation**

An Audio Program Data Sheet shall be delivered with the master disk or tape. (See accompanying example)



## **Technical Requirements for High Definition Programming (No. HD-6.0)**

### **2.2.3 20bit Dolby E (6 channel)**

Valid metadata in the Dolby 'E' stream for all contribution/transmission parameters is mandatory (including all Extended Bitstream Information parameters (e.g. Preferred Downmix))

Timecode shall be present in the bit stream, reflecting picture master.

#### **2.2.3.1 Sync**

The Dolby E stream shall be formatted such that the program is in sync following Dolby 'E' decoding using a DP572 or equivalent. One frame of audio delay is incurred for both Dolby E encoding and decoding. Program audio that is advanced two frames relative to picture prior to Dolby E encoding will therefore be advanced one frame as it is recorded to the HD master. Following normal playback, the Dolby E decode cycle will delay one additional frame, bringing the program back into sync.

#### **2.2.3.2 Peak Program**

Maximum permissible audio peaks in a 5.1 or 5.0 soundtrack shall be -3dBFS (+21dBm)

Although the Max dynamic range (max. peaks) for 5.1 channel mixes is considerably higher than for Stereo-only LPCM mixes, it is understood that many 5.1 mixes will have a dynamics structure which more closely resembles a -12dBFS stereo mix in order to facilitate the simple creation of an Lo/Ro fold-down mix.

#### **2.2.3.3 Target Loudness**

In consideration of ATSC A/85, BellMedia has adopted a Target Loudness of -24LKFS for all content.

Program material will be evaluated using an 'all channels' LKFS measurement consistent with ATSC A/85 section 5.1 and 5.2. For long-form content, this evaluation will typically be based on taking a measurement of the second segment of a show. For short-form content (less than 3 minutes duration), the item will be measured in its entirety.

Following this measurement and immediately prior to ingesting the material into our on-air servers, linear gain scaling will be applied (no compression/limiting or expansion) so that the measured LKFS of the program segment now agrees with -24LKFS.

During Transmission, program material is subject to the handling of an automatic loudness control device which will attempt to ensure that all program material falls within the acceptable loudness limits set forth by ATSC A/85 (-24LKFS +/-2dB)



## **Technical Requirements for High Definition Programming (No. HD-6.0)**

### **2.2.4 Stereo English Full-mix (LPCM, conventional stereo digital)**

This shall be recorded on channels 1 and 2 of an HDCam and/or channels 9 and 10 of an HDCam SR master. This audio may be used for screening and/or Standard Definition Transmission. This mix shall be derived from the 5.x channel surround mix. i.e. "Fold-down" of the 5.1 or 5.0 mix to LCRS or Stereo (L/R).

Stereo program material will be up-mixed to 5.1 upon transmission, therefore, it is requested that the stereo track not be Dolby Stereo encoded. The LPCM stereo Full-mix shall obey the conventional specifications for audio delivery (e.g. Max peaks to 8dB over ref.).

### **2.3 Channel Allocations**

All XDCam-HD masters should have the following audio channel allocations:

#### **(A) ENCODED AUDIO**

Channel 1 - Program left (Lo)  
Channel 2 - Program right (Ro)  
Channel 3 - Dolby E  
Channel 4 - Dolby E  
Channel 5 - Silence  
Channel 6 - Silence  
Channel 7 - Described Video Left  
Channel 8 - Described Video Right

#### **(B) STEREO PROGRAM**

Channel 1 - Program left (Lo)  
Channel 2 - Program right (Ro)  
Channel 3 - Silence  
Channel 4 - Silence  
Channel 5 - Silence  
Channel 6 - Silence  
Channel 7 - Described Video Left  
Channel 8 - Described Video Right

#### **(A) DISCRETE AUDIO**

Channel 1 - Left Front  
Channel 2 - Right Front  
Channel 3 - Centre  
Channel 4 - LFE  
Channel 5 - Left Surround  
Channel 6 - Right Surround  
Channel 7 - Described Video Left  
Channel 8 - Described Video Right

## Technical Requirements for High Definition Programming (No. HD-6.0)

### 2.3 Channel Allocations (cont).

All HDCAM masters should have the following audio channel allocations:

#### (A) ENCODED AUDIO

Channel 1 - Program left (Lo)  
Channel 2 - Program right (Ro)  
Channel 3 - Dolby E  
Channel 4 - Dolby E  
Address Track - SMPTE drop frame time code

#### (B) STEREO PROGRAM

Channel 1 - Program left (Lo)  
Channel 2 - Program right (Ro)  
Channel 3 - Described Video Left  
Channel 4 - Described Video Right  
Address Track - SMPTE drop frame time code

All HDCAM **SR** masters should have the following audio channel allocations:

#### (A) DISCRETE AUDIO

Channel 1 - Left Front  
Channel 2 - Right Front  
Channel 3 - Centre  
Channel 4 - LFE  
Channel 5 - Left Surround  
Channel 6 - Right Surround  
Channel 7 - Described Video Left  
Channel 8 - Described Video Right  
Channel 9 - Stereo Left (Lo)  
Channel 10 - Stereo Right (Ro)  
Channel 11 - Dolby E (if available)  
Channel 12 - Dolby E (if available)

#### (B) ENCODED AUDIO

Channel 1 - Program left (Lo)  
Channel 2 - Program right (Ro)  
Channel 3 - Dolby E  
Channel 4 - Dolby E  
Channel 5 - Silence  
Channel 6 - Silence  
Channel 7 - Described Video Left  
Channel 8 - Described Video Right



## Technical Requirements for High Definition Programming (No. HD-6.0)

### MUSIC AND EFFECTS TRACKS TECHNICAL FORMAT

#### 2.4 Accompanying Audio Multi-track Format (if required)

Accepted formats are **DTRS (DA-88, DA-98, etc)** or **Broadcast Wave File(s) (BWF)** on CD-R or DVD-R.

##### 2.4.1 TRACK ALLOCATION

###### 8 Track Digital Audio (DA-98 or DA-88 or BWF)

Track 1 - English Fullmix Left		(Lt if available)
Track 2 - English Fullmix Right		(Rt if available)
Track 3 - undipped (preferred, dipped acceptable)	BG/FX Left	(Lt if available)
Track 4 - undipped (preferred, dipped acceptable)	BG/FX Right	(Rt if available)
Track 5 - undipped (preferred, dipped acceptable)	Music Left	(Lt if available)
Track 6 - undipped (preferred, dipped acceptable)	Music Right	(Rt if available)
Track 7 - Narration/VO dialogue		
Track 8 - On-camera/Actuality dialogue		

29.97 Drop Frame SMPTE Time Code on the Time Code Track to be synchronous with picture.

*\*NOTE: For BWF delivery – same track content as above, delivered as Stereo Interleaved 16bit, 48kHz BWF files, with synchronous timestamps.*

*For Programs finishing in Multi-Channel formats up to and including 5.1 Surround – the audio deliverable structure above applies, but should be provided in both “original” (i.e. 5.1) and “2-channel” configurations.*

*e.g. For a program finishing in 5.1 – the Music Stem shall be delivered as both a 5.1 undipped Music stems, and as a 2-channel (Lt/Rt, or Lo/Ro) stem.*

##### 2.4.2 Mix reference

Reference on all Masters shall be -20dBFS (or equivalent) and peak program level shall be restricted to 8dB above reference (or -12dBFS)

##### 2.4.3 Timecode

On a DA-88 Master, timecode shall match picture Masters (i.e. 01:00:00:00 or 10:00:00:00 program start, drop-frame). For BWF delivery – the timestamps in each file shall match picture Masters.

##### 2.4.4 Sample Rates

On DA-88 Master, sampling rate shall be 48kHz (16bit) and noise shaping (where applicable) shall not be used on Mix Stems (tracks 3 through 8). If noise shaping is employed on stereo full mix, this shall be noted on tape labels.

##### 2.4.5 Audio Compression and Limiting

Mix Stems shall NOT be dynamically buss-limited (i.e. stems are not restricted to the 12dB over ref. peak limit). Stems summed at unity gain shall result in an unlimited version of the stereo full mix.

##### 2.4.6 Reference Signals

Test tones for all Multi-track Masters shall be 1kHz tone @ -20dBFS.





## Technical Requirements for High Definition Programming (No. HD-6.0)

### Digital Delivery Specifications

**Bell Media's 4K specs is outlined herein, however we acknowledge that there are other 4K delivery formats available and will work with Producer, if requested.**

#### Notes:

- XML files (suggested sample below) are requested to accompany Primary HD/UHD file types. These files will contain descriptive information about video codecs and audio channel mapping, plus content segmentation. This will be a requirement used for importation into asset management and editing systems.
- The file formats of choice are noted below, the preferred formats are noted in the left most columns, with MPEG-2 encoded content preferred. MP4 will be considered, only if MPEG-2 content is not available.
- The \*\*HD Primary delivery is the Sony XDCAM specification following the SMPTE 377M standard, the Apple XDCAM file format is not accepted.
- Currently only one UHD non-HDR format is accepted, Sony 4K XAVC – I.

### SD\* - Standard Definition Formats (\* indicated if anamorphic)

MPG (primary choice)	MXF (secondary)	MP4 (third)
Stream Type: MPEG-2 Transport Stream	Stream Type: XDCAM / D-10	Stream Type: H.264
Frame Size: 720x480	Frame Size: 720x512	Frame Size: 720x486
Frame Rate: 29.97	Frame Rate: 29.97	Frame Rate: 29.97
Bit Rate/Type: 15 Mbps CBR	Bit Rate/Type: 50 Mbps CBR	Bit Rate/Type: 10 Mbps VBR
Profile: MP@ML	Profile: 4:2:2	Profile: n/a
Closed Captions: EIA608 + SCTE20	Closed Captions: EIA608 + Line21	Closed Captions: As available; *.scc file
Audio Stream Type: MPEG-1 Audio Layer-2	Audio Stream Type: PCM	Audio Stream Type: AAC-LC
Audio Bitrate: 192 - 384kbps	Audio Bits: 24bit	Audio Bits: 16bit Audio Bitrate: 192 - 320kbps
Audio Sample Rate: 48kHz	Audio Sample Rate: 48kHz	Audio Sample Rate: 48kHz
Audio Channels: 4 Channels	Audio Channels: 4 Channels	Audio Channels: 4 Channels
Ch.1 – Lo	Ch.1 – Lo	Ch.1 – Lo (not Lt)
Ch.2 – Ro	Ch.2 – Ro	Ch.2 – Ro (not Rt)
Ch.3 – Descriptive Video	Ch.3 – Descriptive Video	Ch.3 – Descriptive Video
Ch.4 - Silence	Ch.4 - Silence	Ch.4 - Silence

### HD - High Definition Formats

MXF (primary choice)**	MPG (secondary)	MP4 (third)
Stream Type: MPEG-2 Transport Stream	Stream Type: MPEG-2 Transport Stream	Stream Type: H.264
Wrapper: MXF – XDCAM HD422	Wrapper: MPEG HD	Wrapper: MPEG
Essence Format: MPEG HD	Essence Format: MPEG HD	Essence Format:H.264
Video Codec:Sony XDCAM 422	Video Codec: MPEG-2	Video Codec:H.264
Video Format: MPEG-2 Long GOP	Video Format: MPEG-2 Long GOP 15	Video Format: Long GOP
Frame Size : 1920 X 1080	Frame Size : 1920 X 1080	Frame Size : 1920 X 1080
Aspect Ratio: 16 X 9	Aspect Ratio: 16 X 9	Aspect Ratio: 16 X 9
Frame Rate: 29.97i	Frame Rate: 29.97i	Frame Rate: 29.97
Bit Rate/Type: 50 Mbps CBR	Bit Rate/Type: 45 Mbps CBR	Bit Rate/Type: 17 Mbps VBR
Profile: 4:2:2	Profile: 4:2:2	Profile:4:2:2
Closed Captions: EIA708/608 + SCTE20	Closed Captions: EIA708/608 + SCTE20	Closed Captions: As available; *.scc file
Audio Stream Type: AES	Audio Stream Type: AES	Audio Stream Type: AAC-LC
Audio Bits: 24bit	Audio Bits: 24bit	Audio Bits: 16bit Audio Bitrate: 192 - 320kbps
Audio Sample Rate: 48kHz	Audio Sample Rate: 48kHz	Audio Sample Rate: 48kHz
Audio Channels: 8 Channels	Audio Channels: 8 Channels	Audio Channels: 8 Channels (preferred)
Ch.1 – Left	Ch.1 – Left	Ch.1 – Left
Ch.2 – Right	Ch.2 – Right	Ch.2 – Right
Ch.3 – Center	Ch.3 – Center	Ch.3 – Center
Ch.4 – LFE	Ch.4 – LFE	Ch.4 – LFE
Ch.5 – Left Surround	Ch.5 – Left Surround	Ch.5 – Left Surround
Ch.6 – Right Surround	Ch.6 – Right Surround	Ch.6 – Right Surround
Ch.7 – Descriptive Video Left	Ch.7 – Descriptive Video Left	Ch.7 – Descriptive Video Left
Ch.8 – Descriptive Video Right	Ch.8 – Descriptive Video Right	Ch.8 – Descriptive Video Right

## 4K UHD – Ultra High Definition Format

### XAVC

Wrapper: MXF  
Format Profile: OP-1a  
Video Format: AVC  
Video Codec: H.264 MPEG-4 Part 10  
Video Profile: XAVC 4K – Intra  
Video Compression Method: VBR **\*not CBG**  
Frame Size : 3840 X 2160  
Aspect Ratio: 16 X 9 (1.78:1)  
Frame Rate: 23.976p, 25p, 29.97p, 50p, 59.94p  
(Native frame rate preferred)  
Bit Rate: 200+ Mbps  
Bit Rate Depth: 10bits  
Profile: 4:2:2 chroma sub sampling  
ITU-R BT.709 colour Space (ITU-R BT.2020)  
Closed Captions: EIA708/608 + SCTE20  
Audio Stream Type: PCM  
Audio Bits: 24bit  
Audio Sample Rate: 48kHz  
Audio Channels: 8 Channels  
Ch.1 – Left  
Ch.2 – Right  
Ch.3 – Center  
Ch.4 – LFE  
Ch.5 – Left Surround  
Ch.6 – Right Surround  
Ch.7 – Descriptive Video Left  
Ch.8 – Descriptive Video Right

#### Notes:

- 1 The **\*\*HD** Primary delivery is the Sony XDCAM specification following the SMPTE 377M standard, the Apple XDCAM file format is not accepted.
- 2 The file formats of choice are noted above, the preferred formats are noted in the left most columns, with MPEG-2 encoded content preferred. MP4 will be considered, only if MPEG-2 content is not available.
- 3 XML files (suggested sample below) are requested to accompany Primary HD file types as well as UHD. These files will contain descriptive information about video codecs and audio channel mapping, plus content segmentation. This will be a requirement used for importation into asset management and editing systems.
- 4 For sidecar caption files .scc / .cap timecode is to be locked.
- 5 Audio loudness set at -24 LKFS as per CRTC regulations and or ATSC recommended practice A85 compliant.

## Technical Requirements for High Definition Programming (No. HD-6.0)

### .XML Submission Example

```

<?xml version="1.0" encoding="utf-8" ?>
<Video>
  <BELLMEDIAID>1234567</BELLMEDIAID>
  <ISRCCode>N/A</ISRCCode>
  <UPC>N/A</UPC>
  <Version>0</Version>
  <Title>SHOW NAME</Title>
  <CopyRightDate>2011</CopyRightDate>
  <ReleaseYear>2011</ReleaseYear>
  <Genre>COMEDY</Genre>
  <Language>English</Language>
  <Length>xx:xx</Length>
  <PrincipalCast>HOST NAME</SongWriter>
  <ProductionCompany>//</ProductionCompany>
  <Producer>//</Producer>
  <Director>//</Director>
  <Cinematographer>N/A</Cinematographer>
  <ProductionHouse>//</ProductionHouse>
  <Distributor>//</Distributor>
  <Nationality>Canadian</Nationality>
  <Format>0</Format>
  <DownloadFormatID>-1</DownloadFormatID>
  <Aspect>16:9</Aspect>
  <FrameRate>29.970</FrameRate>
  <CloseCaption>1</CloseCaption>
  <AudioConfig>Stereo</AudioConfig>
  <DescribedAudio>1</DescribedAudio > 1-YES 0-NO
  <GridNumber>N/A</GridNumber>
  <MediaDescription>1080i</MediaDescription>
<CanadianContent>
  <Music>None</Music>
  <Artist>None</Artist>
  <Production>None</Production>
  <Lyrics>None</Lyrics>
</CanadianContent>
  <Direction>0</Direction>
  <Facilities>0</Facilities>
  <SubmittedBy />
  <FileLocation>//</FileLocation>
</Video>

```