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January 21, 2016

**GENERAL DIRECTIVE NO. 1 – 2016
Implementation of Minimum “Race Patrol” and “Photo Finish” Standards and
Requirements
Preamble**

WHEREAS the Ontario Racing Commission (“ORC”) is committed to working with industry stakeholders to ensure that the integrity of the industry and public interest are upheld to the highest standards;

AND WHEREAS the integrity of races is preserved, in part, through the use of Race Patrol and Photo Finish equipment and/or services;

AND WHEREAS the Race Patrol and Photo Finish equipment and/or services used at Ontario Racetracks are vital tools which race officials rely upon while officiating races as such tools include live and retrievable video of the race and photo finish technologies;

AND WHEREAS in August of 2011, the Canadian Pari-Mutuel Agency (“CPMA”) through its amendment of the CPMA Regulations, Section 43, eliminated the requirements of Racetrack Associations to provide video surveillance equipment for race patrol purposes;

AND WHEREAS there are currently no provincial or federal regulatory requirements with respect to race patrol equipment;

AND WHEREAS the division of Racing Operations of the ORC recently developed a comprehensive Service Standard document which provides for minimum standards of equipment used for Race Patrol and Photo Finish used by Racetrack Associations (hereinafter “2016 Standards”), following consultation with industry representatives;

AND WHEREAS the implementation of 2016 Standards allows the Racetrack Associations to:

- a) Preserve usage of the current race patrol equipment for a period of time while urging racetrack operators to plan and negotiate with service providers for upgraded equipment which will meet the new standards;
- b) Convert, update and replace existing equipment used for Race Patrol and Photo Finish Standards by April 1st 2018; and
- c) Benefit from sharing equipment based on non-conflicting race days, or use capital equipment pooling wherever possible if cooperation and logistical analysis is applied, creating potential savings for racetrack operators.

TAKE NOTICE that the Director hereby issues General Directive No. 1 – 2016, as follows:

The ORC Director hereby orders that effective February 1, 2016 all Ontario raceway/racetrack licensed administrators must commence implementing the 2016 Minimum "Race Patrol" and "Photo Finish" Standards Requirements outlined below and further orders that effective April 1, 2018, the 2016 Minimum "Race Patrol" and "Photo Finish" Standards become mandatory.

2016 MINIMUM "RACE PATROL" AND "PHOTO FINISH" STANDARDS:

A. Grouping

For the purpose of sharing equipment or capital equipment pooling, the following racetracks may form a group, subject to appropriate cooperation and logistical analysis performed by the grouped parties:

- 1) Clinton Raceway, Grand River Raceway, Hanover Raceway, and Western Fair Raceway;
- 2) Dresden Raceway and Leamington Raceway;
- 3) Flamboro Downs and Georgian Downs;
- 4) Mohawk Raceway and Woodbine Standardbred.

B. Reference Chart Race Patrol and Photo Finish – Ontario 2016

Track Name	Race days For 2015	Track size	HD Cameras Required	Lens Zoom Ratios	Number of Photo Finish Cameras Required
Ajax Downs "Quarter Horses"	27	5/8 mile	1 Pan 1 L. Pan 1 Tower	30x 30x 30x	1
Clinton Raceway	15	½ mile	1 Pan	20 x	1
Dresden Raceway		½ mile	1 Pan 1 Tower	20 x 20 x	1
Flamboro Downs	134	½ mile	1 Pan 1 L Pan 2 Towers	20 x 30x 22 x	1
Fort Erie	37 T	1 mile	2 Pan & L Pan	50 x	2
"Thoroughbred" Note: two racing surfaces only 5 cameras	5 QH	7/8 turf	1 Apex 2 Front Towers 1 Back Tower	20 x 33 x 33 x	
Georgian Downs	40	5/8 mile	2 Pan 2 Towers	30 x 30 x	1
Grand River Raceway	48	½ mile	1 Pan 1 L Pan 2 Towers	20 x 30x 20x	1
Hanover Raceway	16	½ mile	1 Pan 1 Tower	20 x 20 x	1
Hiawatha Horse Park	21	5/8 mile	1 Pan 2 Towers	30 x 30 x	1
Kawartha Downs	96	5/8 mile	2 Pan 1 Tower	30 x 30 x	1
Leamington	14	½ mile	1 Pan	20 x	1

Mohawk Raceway	118	7/8 mile	2 Pan 1 Apex 2 Towers	55 x 30 x 44 x	2
Rideau Carleton Raceway	90	5/8 mile	2 Pan 2 Towers	33 x 33 x	1
Western Fair Raceway	125	½ mile	1 Pan 1 L Pan 2 Towers	20 x 30 x 20x	1
Woodbine Standardbred	103 S	7/8 mile	2 Pan 1 Apex 2 Towers	55 x 30 x 44 x	2
Woodbine "Thoroughbred" Notes: two racing surfaces: Turf or Poly track.	133 T	*1.5 mile Turf or *1 mile Poly track	2 Pan 1 Apex 2 Towers T 2 Towers P 1 1m +1/4	55 x 30 x 44 x 44 x *20 x	3

C. Race Patrol Equipment Specifications, 2016 Standards:

REQUIREMENT	MINIMUM PERFORMANCE SPECIFICATION – RACE PATROL
(Group "C") 1/3" Camera Examples see: <i>Sony PXW-X160 or JVC GY-HM790U camcorders, (daylight racing only)</i> equivalent or better	1/3" Professional HD 1920x1080 - 3 chip CMOS or CCD array sensors Minimum resolution 800 TV lines both horizontally and vertically in 1080i/60 mode, S/N Ratio 52dB-58db with gain at 0dB Sensitivity (2000 lx/F8, 89.9 reflectance) F8 in 1920x1080/59.94i
(Group "B") ½" Camera Note: Group "B" Tracks may also select 2/3" cameras from Group "A" Example see: Sony PMW 320K equivalent or better	½ " Professional HD 1920x1080 – 3 chip CCD or CMOS array sensors with a minimum HD resolution 1000 TV lines both horizontally and vertically in 1080i/60 mode, S/N Ratio 54dB-58db with gain at 0dB Sensitivity (2000 lx/F10, 89.9 reflectance) F10 in 1920x1080/59.94i
(Group "A") 2/3" Camera Examples see: Hitachi DK-Z50 or Sony HXC-100,DSC-300 equivalent or better	2/3 CCD HD 1920x1080 3 chip CCD or CMOS array sensors HDTV Professional Field Production or Box Camera with a minimum HD Resolution 800-1000TVL 1080/59.94i S/N Ratio 58-60db HD-SDI 1080i output with gain at 0db Sensitivity (2000 lx /F10, 89.9 reflectance) F10 in 1920x1080/59.94i
Camera power supply and battery backup equivalent or better	All cameras specified must be equipped with an AC adaptor power supply sufficient to power the camera viewfinder and lens and a UPS battery backup capable of maintaining power for a minimum of 30 minutes in the event of a power failure at the camera location
Lenses for ½ mile tracks	See site specific requirements listed by track (16x9 aspect ratio)
Lenses for 5/8 mile tracks	See site specific requirements listed by track

	(16x9 aspect ratio)
Lenses required for tracks greater than 5/8 mile	See site specific requirements listed by track (16x9 aspect ratio)
Special Lenses see site specific requirements	See site specific requirements for Woodbine and Mohawk (F.O.V. assumes 16x9 aspect ratio)
Lenses specified as 20x zoom 1/3" Sensor <i>equivalent or better</i>	Lens with a Horizontal Field of View : approx 55.2 ° o 3 0° or better . Note: (wide- to cover width of track, narrow- far track, zoom to 3 horses lengths)
Lenses specified as 30x zoom 1/2"Sensor <i>equivalent or better</i>	Lenses must have a minimum Horizontal Field of View : 32.4° to 1.1° or better continuous with no extender
Lenses specified as 33x zoom 1/2" Sensor <i>equivalent or better</i>	Lenses must have a minimum Horizontal Field of View : 32.4° to 1.0° or better continuous with no extender
Lenses specified as 30x zoom on 2/3 Sensor <i>equivalent or better</i>	Lenses must have a minimum Horizontal Field of View : 47.1° to 1.6° or better continuous with no extender
Lenses specified as 33x zoom on 2/3"Sensor <i>equivalent or better</i>	Lenses must have a minimum Horizontal Field of View : 58.3° to 1.9° or better continuous with no extender
Lenses specified as 44x zoom on 2/3"Sensor <i>equivalent or better</i>	Lenses must have a minimum Horizontal Field of View : 47.5° to 1.14° or better continuous with no extender. Note: In the case of Woodbine the lenses must have a 2 times extender or have a narrower horizontal field of view of 0.60 to accommodate the much longer turf course distances
Special lens requirement 50x zoom on a 1/2" Sensor <i>equivalent or better</i>	Lenses must have a minimum Horizontal Field of View : 40.2° to 0.84° or better continuous with no extender
Special lens requirement 55x zoom on 2/3" sensor <i>equivalent or better</i>	Lenses must have a minimum Horizontal Field of View : 56.4° to 1.1° or better continuous with no extender. Note: In the case of Woodbine the lenses must have a 2 times extender or have a narrower horizontal field of view of 0.60° to accommodate the much larger turf course
Light sensitivity lens & camera equivalent or better	The lens and camera combination must be able to produce 1 volt peak to peak signal level using a light source of 50 foot candles at 3200K on a 60% reflectance chart with the camera set at 0 dB gain detail amp off.
Camera Viewfinders equivalent or better	Each camera must have an attached a 5" high resolution 16 :9 HD Viewfinder/Monitor equipped with sun shade, capable of displaying 100% of the recorded picture area (1024 x 600 or better resolution) with access to camera setup menus.
Camera mounts Example; Custom camera cradle Equivalent or better	Must be capable of interfacing with existing race patrol camera turrets installed at most racetracks. In the absence of camera turret, contractor must supply adequate "weight rated" locking fluid or cam pan tilt head and mount.
Digital Video Recording With video streaming capabilities	Digital Input/output: HD-SDI capable with a HDMI output & SD option. Capable of supporting

<p>See: HVO-1000MD HD Blu-ray Recorder equivalent or better</p> <p>Note: Minimum archival retention period; one year.</p>	<p>a Genlock Input: (1920x1080/60/59.94 Interlace) Audio Input/output: embedded HD-SDI, AES and Analog 600 ohms Video Compression: Motion JPEG2000, MPEG-4/H264 AVC or MPEG-2 Must support the following Portable External Media in HD: optical disc drives DVD disc and USB portable hard drives and must support USB flash memory (thumb drives). Video streaming capable. Must be capable of variable playback speeds including ½ speed, freeze frame and frame by frame playback. Record systems utilizing a single CPU for two or more video streams must provide a backup recording solution.</p>
<p>Recording deliverable medium must include:</p>	<p>Blu-ray discs, DVD discs and portable USB thumb drives must be recorded in HD MPEG-2, H.264/MPEG-4 and SPTE VC-1 video (1080i) quality that is compatible with the playback device for the requested venue</p>
<p>Switching Devices Routing matrix of 8x8 for 2 camera tracks, 16x16 for three camera tracks and 16x32 for four or more camera tracks equivalent or better</p>	<p>A video/audio routing-switcher device capable of switching any specified camera, video title device or other available video signals to any recorder so as to allow adding any camera angle with titling to a single record in an assembled edited sequence.</p>
<p>Judges monitor(s)</p>	<p>Minimum 32" LED backlit, matte screen, LCD 1080x1920, 2 HDMI inputs,</p>
<p>Control room Video Monitor Preview/Program Minimum 15 " widescreen equivalent or better</p>	<p>Professional Video Production monitor capable of supporting HD-SDI and HDMI inputs for 1080/60i signal support with audio monitoring</p>
<p>Backup systems: Next race day repair/ready</p>	<p>Readily available complete backup equipment and support for all system components including: Cameras, Lenses, power supplies, Recording devices, switching, titling and supporting systems must be made available at all times for immediate onsite swapping or next racing day replacement/repair.</p>
<p>Down Converter HD to SD equivalent or better</p>	<p>A signal down-converter that supports HD-SDI to Analog SD to convert HD signals in letterbox, anamorphic 16:9 and center cut 4:3 as required for distribution</p>
<p>Intercom Requirements Full Duplex communication systems are required.</p>	<p>All camera operators must have hands-free communication with the race patrol operator location during live races and setup. Note: The Track is to provide this as part of their infrastructure requirements. Intercom remediation may be necessary in some locations. Hands free Telephones, or duplex intercoms may already be provided by the track however the contractor(s) must conduct site surveys and pretesting for each track/location to determine proper function of the communication system well in advance of racing to allow</p>

	arrangements/coordination when required.
All necessary cables, equipment, accessories, portable media and tools	All necessary interconnecting cables, equipment racks, equipment shelves, power bars, preview/program monitors, signal distribution devices, audio mixing and monitoring devices, controls and accessories to insure complete system function and seamless operation.
Photo Finish Systems Please see detailed specification document for Photo Finish in Ontario	Detailed specifications are outlined in a separate Photo Finish document attached.
Backup Photo Finish Systems	Backup photo finish camera equipment must be installed and made available in the event of failure buy the next race card.

Camera Selection and Performance Specification:

Each camera grouping A, B or C must ultimately meet the minimum specification (equivalent or better) indicated for that group. Camera locations indicated for B or C may also select cameras of the next higher class i.e. Group C can install B or A Group Cameras. Similarly, locations identified in the “B” Group may also select Cameras from the “A” Group.

2016 Adherence Requirements:

All equipment replacements, upgrades or changes must meet or exceed these new standards during the conversion period of February 1, 2016 to the adherence date of April 1, 2018. Conversion to the 2016 minimum standards can be made at any time prior to the adherence requirement date of April 1, 2018.

Existing Race Patrol/Photo Finish service levels (quantity/quality of equipment) used during the 2015 racing season for adjudication must be maintained during the standards conversion period including access to Low Pan cameras where applicable.

D. Camera / Lens Groupings, Listed by Track Name in Alphabetical Order

Track Name	Number of Cameras Specifications for Camera Groups “Equivalent or better”	Lens Zoom Ratio Requirements Refer to ‘F.O.V.’ in detailed specs.	HD Cameras Required	Down converter required to SD for Broadcast
Ajax Downs “Quarter Horses”	3 Cameras: Group “B”	1- 30x 1- 33x 1 - 30x	1 Pan 1 L. Pan 1 Tower	Yes
Clinton Raceway	1 Camera: Group “C”	1 - 20 x	1 Pan	No
Dresden Raceway	2 Cameras: Group “C”	1 – 20x 1 - 20 x	1 Pan 1 Tower	No
Flamboro Downs	4 Cameras: 3 Group “B” 1* Group “A”^	1 - 20 x 1 - 30 x^ 2 - 22 x	1 Pan^ 1 L. Pan 2 Towers	Yes
Fort Erie “Thoroughbred” Note: two racing	5 Cameras: 2 Group “A” Pans 1 Group “C”	2- 50 x 1- 20 x* 2- 33 x	2 Pan 1 Apex* 2 Front towers	Yes

surfaces *Only 5 cameras are required for any race distance on either race surface	Apex* 2 Group "B" Towers 1 Group "B" Tower	1- 33 x	1 Back tower	
Georgian Downs	4 Cameras: 1 Group "A" ^ 3 Group "B"	1 - 30x 1 - 33x 2 - 30 x	1 Pan^ 1 L. Pan 2 Towers	Yes
Grand River Raceway	4 Cameras: 3 Group "C" 1* Group "B" ^	1- 20x 1- 30x^ 2- 20x	1 Pan^ 1 L. Pan 2 Towers	Yes
Hanover Raceway	2 Cameras: Group "C"	1 - 20x 1 - 20 x	1 Pan 1 Tower	Yes
Hiawatha Horse Park	3 Cameras: Group "B"	1 - 30 x 2 - 30 x	1 Pan 2 Towers	No
Kawartha Downs	3 Cameras: Group "B"	1 - 30 x 1 - 33 x 1 - 30 x	1 Pan 1 L. Pan 1 Tower	Yes
Leamington Raceway	1 Camera Group "C"	1 - 20 x	1 Pan	No
Mohawk Raceway	5 Cameras: 2 Group "A" 2 Group "A" 1 Group "B" Apex	1-55 x 1- 55 x 2- 44 x 1-30 x	1 Pan 1 L. Pan 2 Towers 1 Apex	Yes
Rideau Carleton Raceway	4 Cameras: 3 Group "A" 1 Group "B" ^	1- 30x 1- 33 x 2- 33 x	1 Pan 1 L. Pan^ 2 Towers	Yes
Sudbury Downs	2 Cameras: Group "C"	1 - 20x 1 - 20 x	1 Pan 1 Tower	No
Western Fair Raceway	4 Cameras: 1 Group "B" ^ 3 Group "C"	1- 20 x 1- 30 x 2- 20 x	1 Pan^ 1 L Pan 2 Towers	Yes
Woodbine Standardbred	5 Cameras: 2 Group "A" 2 Group "A" 1 Group "B" Apex^	1 - 55x 1 - 55 x 2- 44 x 1-30 x	1 Pan 1 L. Pan 2 Towers 1 Apex^	Yes
Woodbine "Thoroughbred" Notes: two racing surfaces: Turf or Poly track. *Only 5 cameras are required for any race distance on either race surface	8 Cameras: 2 Group "A" Pan 1 Group "B" Apex, 1 Group "C" 1.1/4* 2 Group "A" Towers 2 Group "A" Towers	2- 55 x 1- 30 x 1- *20 x 2- 44 x 2 -44x	1 Pan 1 L. Pan 1 Apex 1 1m +1/4* 2 Towers Poly 2 Towers Turf	Yes

E. Provisions for Race Patrol Required of the Track/Association:

Pan Cameras (grandstand location) requirements:

- 1) Access to unobstructed view of the entire race course from the grandstand above the finish line near the Judges' Room location.
- 2) Weather protection for equipment and operator (maintain an office environment).

- 3) Condensation control provisions for both lenses and windows for high humidity periods.
- 4) Camera turret where the temperature could fall below 12C when races are conducted. Note: Smooth operating camera turrets are deemed "essential" to race patrol adjudication; On-going turret maintenance & repair is required.
- 5) 2 AC outlets of Isolated Power; 117-120VAC 15Amp for the equipment.
- 6) Appropriate cable/signal-delivery connection or ST terminating single or multimode Fiber from race patrol room to all camera locations as well as the Judges Room.
- 7) Communication system/device to control room (hands free speaker phone) and access to emergency services.

Camera Towers- infrastructure requirements:

- 8) Camera towers (structure ladders and booth) are to be safety checked and inspected annually (inspection reports documented and available upon request)
- 9) Camera turrets required where the temperature could fall below 12C when races are conducted.
Note: Smooth- operating camera turrets are deemed "essential" to race patrol adjudication; On-going turret maintenance & repair is required.
- 10) 2 AC outlets of Isolated Power; 117-120VAC 15Amp for the equipment.
- 11) Appropriate cable/signal-delivery connection or ST terminating single or multimode Fiber from race patrol room to all camera locations as well as Judges Room when required.
- 12) Heater sufficient to maintain 21C room temperature.
- 13) Switchable light source inside the tower and on the ladder.
- 14) Safety provisions from the ground to the tower booth must meet current building code(s).
- 15) Intercom/Communication device in the tower to control room (hands free speaker phone) and access to emergency services.

Race Patrol Control room (Recording Location) requirements:

- 16) Camera mounting location as per ORC approved drawings.
- 17) Temperature control provisions for both operators & equipment to maintain 21C.
- 18) Weather protection for equipment and operator (maintain an office environment).
- 19) Adequate uninterrupted power circuits; 117-120VAC power at 15Amp - 4 AC outlets. Power outlets to be located at base of camera mounting base and at recording location.
- 20) Track must provide and install appropriate signal cables as required to judges, tote, photo finish, timing system, CCTV system locations from the operator's position in the Grandstand (Judges' Stand) to the camera positions in the Towers, Photo Finish Room etc. Contractor to terminate cables provided at both ends.
- 21) Provide all cable runs from the Pan Camera operator's position in the Judges' Area to all necessary System locations (check for direction of system requirements).
- 22) Internet connectivity that meets or exceeds "conditions of license" specification requirements to video stream signals to the ORC (Central Adjudication Room).
- 23) Telephone access to outside line (emergency services) and judges.
- 24) Duplex Intercom communications to all camera locations with hands-free operation.

F. Minimum Performance Specifications – Photo Finish/Timing

Digital Photo Finish line-scan sensor camera system guidance:

The Number of Cameras required is provided above in Chart B: “Reference Chart Race Patrol and Photo Finish – Ontario 2016,” listed by track.

Hardware & Software:

- 25) Minimum of one (1) Digital line scan sensor Color Camera per track (preferably two (2), with Automatic Gain control and Automatic Iris. Cameras must be capable of providing scan rate(s) selected between: 1500 to 5000 (Pixel Density). The minimum goal setting for Ontario is 1728 other settings deemed suitable for the actual site circumstances must be approved. Equipment selected and internal settings must be individually approved based on site testing for each track. Each camera connects to a computer through Ethernet topology to allow non-proprietary cabling and maximum flexibility in camera distance from computer. Reverse angle camera positioned trackside is recommended as a supplement but optional.
- 26) Lens selection requires site specific analysis to achieve maximum light transmission, focal length, depth of field and optimum zoom ratio. Lenses selected must therefore be selected using detailed analysis of site specific challenges and approval by site.
- 27) Contractor must provide visible alignment targets on the inside and outside of each track surface aligned with available survey markers at the finish line.
- 28) An electronic start beam must be made available to start the camera/timer or feed providing a pulse from any existing electronic timer beam must be made available to start the camera.
- 29) Timer Enabling Option, which allows events to be timed on any number of cameras connected across the network. The number of cameras capable of being connected, unlimited. Multiple camera angles are to be displayed on one computer screen (main, back-up and mirror cameras).
- 30) Fully digital output, capable of being connected to any computer running Windows, including notebooks, without the use of any intermediate proprietary hardware.
- 31) Camera capable of combining of adjacent pixels on the CCD for purposes of increasing light sensitivity and allowing a digital zooming effect.
- 32) Camera capable of being positioned up to 2 km from computer to allow for remote reverse angle shot to replace mirror where applicable. System must have an option for camera to be powered remotely and used in wireless topology.
- 33) Camera Control Software, which allows operation on computers running Windows, with Database Integration. “Results” can be printed or sent to another computer, Internet, Display Board, Television or any Media Network seconds after race finishes. Running Time capable of being paused or stopped and sent to such external devices during the race.
- 34) Software must be robust, secure and allow for a pre-emptive multitasking operating system.
- 35) Software must allow the option to exchange the start list and results data with a variety of event management database packages as well as off-the-shelf software such as Excel, Access, etc.

- 36) Software must be language independent, allowing menu customization and localization. The user must be able to choose their preferred breed terminology and create their own, according to the type of racing and preference of the Regulator.
- 37) Electronic data processing minimizes the risk of human error or unauthorized data manipulation. To that effect, the image evaluation software must be capable of producing charts automatically related to the time result of each participant. Timing resolution is to be adjustable to seconds, fifth, tenth, hundredth, thousandth, ten thousandth as needed. Rounding of time fraction is to be field definable by site.
- 38) Measure of "length" must be field definable to match governing bodies' definition. Software must allow variable measure, based on a definable horses' speed in any given race, regardless of race distance, track condition, type of racing or any other variable that may affect the value of this measure and be changeable to match visual reference.
- 39) Capture duration is to be limited only by hard drive size (virtually unlimited, with a minimum of 320 gig hard drive) across the full spectrum of scan rates and image densities. The capture rate must not be limited by RAM in the computer.
- 40) Simultaneous capture and evaluation must be possible on a single computer. The operator must be able to capture the race on one screen, while the race is being evaluated, or even capture a race picture, while evaluating a prior race. Capture on one computer with evaluation of same race on another computer must be possible while in capture state.
- 41) Multiple open events must be possible.
- 42) Easy serial port and/or network connection to other PC based data programs must be possible.
- 43) Connection to message centers and displays boards through serial port and TCP ports possible.
- 44) Even if the Manufacturer or Supplier provides free 24 hour/day 365 days/year technical support, and maintains "Hot Swap" cameras in stock to support eventual failures in the field with immediate response, a backup system arrangement must be made available for immediate dispatch at all times.
- 45) Note: some manufacturers may also offer a One-year Instant Replacement warranty with optionally extendable warranties up to 5 years.
- 46) Cameras must accept Lens mounts compatible with Nikon or Canon lenses (or lenses with equivalent light transmission) and be equipped with a thru-the-lens viewer and remote Iris controller.
- 47) Cameras must be equipped with Digital Zoom to allow use of higher quality fixed focal length lenses.
- 48) Four axis mounting apparatus (such as manfrotto or equivalent) as to assure proper mounting and alignment of camera in vertical plane of finish line.
- 49) TCP network controllable AC power switch possible.
- 50) At least one (1) Windows PC, with one (1) NIC for communication with camera(s), and one (1) optional NIC for communication with Governing Body's network and the Internet. Up to three (3) DVI display outputs, for judges, operator, and TV Scan Converter. At least one (1) 24"1920 by 1080 DVI display for Judges. One (1) high quality Keyboard and Mouse.
- 51) One (1) Genlockable Scan Converter with DVI input, SD/HD SDI output, NTSC Composite Video output. Capable of automatic upscale and downscale with Anti-Flicker, Zoom and Freeze functionalities. Each system must have at least (1) one 1920 by 1080 DVI display for scan converter monitoring.

- 52) Optional software must be available to transmit Running Time and Results to TV Control Room for further display on track CCTV where applicable.

G. Photo Finish Camera Must be Capable to Meet the Following Minimum Technical Specifications:

53) Sensor Type	Single Line CCD
54) Acquired Image Height	1200 to 4000 pixels
55) Pixel Density	Minimum sensor capacity of 1728
56) Line-Scan Rate	1500 to 5000 lines/sec.
57) Digital Zoom	25% to 200%-300%
58) Image Compression	Real-Time Lossless
59) Time Resolution	Up to 1/3000th of a second
60) Pixel Rate	Up to 20M pixels/sec
61) Maximum Pixel Depth	2M colors
62) Exposure Control	Automatic
63) Gamma Correction	Real-Time in camera hardware
64) Phase Light Compensation	Adjustable (Option)
65) Capture Method	Manual, Automatic, Timed, Photo Eye
66) Standard Lens Mount	F-mount w/ Reflex Viewer and Auto Iris control
67) Minimum Lighting	1000lux at 1000 lines/sec subject to object reflectivity and background
68) Recommended Lighting	>2500lux or better preferably non-pulsing type
69) Connection to Computer	Cat5 (100BT) or Fiber
70) Distance from Computer	100m to 2000m max. based on cabling topology
71) Remote Control Options	Iris
72) Time Base	±1ppm from 0 - 50° C
73) Computer Interface	Wired or Wireless Ethernet
74) External Power Source	12 V DC or 90-264 V AC, 47-63Hz
75) Cooling	Forced Air
76) Operating Temperature	0 to 50°C
77) Storage Temperature	-25 to 80°C

H. Photo Finish Control Software Minimum Specifications:

- 78) PC Platform Windows compatible.
- 79) Multiple Simultaneous Camera Views with TimeTracking between cameras.
- 80) Native Virtual Memory for Continuous Imaging.
- 81) Secure File System with enhanced file sharing permissions.
- 82) Real-Time Serial or Network Display Interface for Running Time & Results.
- 83) Generic Database Interface (Network, File or Serial based).
- 84) Manual or Automatic Lane Identification capable.

- 85) Image/Results Printing with Automatic Start Indication.
- 86) Intelligent Continuous Image Zoom and Rolling Scroll.
- 87) Live Video Mode for Accurate Camera Alignment.
- 88) Brightness, Contrast and Gamma Post-Processing of multiple regions of image independently.
- 89) Start logging and retrieval capability.
- 90) Fully Automatic Split Timing Capability.
- 91) Object Finder and Automatic Dead-Space Elimination.
- 92) Automatic capture capability.
- 93) Allow use of camera as virtual photo eye.
- 94) Lap & Split time recording.
- 95) Measure of "length" field definable to match governing bodies' definition.
- 96) Language independent, allowing user to choose their preferred terminology language or even terminology set, as well as creating new terms as to match governing bodies' definition.
- 97) Result fields to simultaneously display Horse #, Start Position, Finish Position, Horse's Name, Driver or Jockey, Trainer, Owner, Finish Time, Lengths, Delta Time, Cumulative Lengths. Option to display any combination of these fields as an overlay on the image to aid judges or to display to public. At a minimum each finish display to the public must include the track name, date, race number, and Win, Place or Show overlays.
- 98) Customizable User Interface to ease operation.

I. Provisions for Photo Finish That is Required of the Track/Association:

Winning post mirror (for thoroughbred):

- 99) Mirror and mounting base at the winning post.
- 100) Reverse angle camera mounting base at the winning post (optional provision).
- 101) A slot in the running rail in front of the mirror.
- 102) Power to the camera base post for a reverse angle camera system, 117-120VAC power at 15Amp.
- 103) 2 AC outlets in NEMA enclosure of sufficient size to host camera IP remote power outlet (12 X 15X 8 cm) and Fiber Transceiver (3 X 10 X 15 cm).
- 104) Supplementary artificial lighting where necessary to enhance mirror images.
- 105) One (1) ST terminating single or multimode Fiber from NEMA enclosure to Photo Finish control apparatus in Judges' Room.

Survey must be provided and confirmed at all tracks:

- 106) Surveyor to align the finish line to the track and mark the sight line for the cameras.
- 107) Six Finish line indicators at the following locations as confirmed by the surveyor:
 - a. Finish post or Mirror post base;
 - b. Outer running rail ground;
 - c. Judges' room railing or countertop;
 - d. Judges' rear wall;
 - e. Photo Finish Room window railing;
 - f. Photo Finish Room rear wall.

Photo Finish Room (Camera Location) Minimum Requirements:

- 108) One (1) Camera mounting pedestal for 2 cameras, as per ORC approved drawings.
- 109) One (1) uninterrupted power circuits 117-120VAC power at 15Amp - 4 AC outlets. Power outlets to be located at base of camera pedestal.
- 110) Supplementary artificial lighting where necessary to enhance pictures.
- 111) Two (2) Timer Start Signal solenoids which shall close the N/O voltage free contacts and start the camera timers when the race starts or the starting gate opens. Client will provide one (1) cable with a single twisted pair (22 AWG stranded), connected to the N/O voltage free contacts of each of the two solenoids.
- 112) Track must provide two (2) cables with a single twisted pair (22 AWG stranded), to be run from the Photo Finish operator's position in the Judges' Room to the camera positions in the Photo Finish Room; Contractor to terminate cables at both ends. In the case of non-availability of the start gate signal (thoroughbred/quarter horses only) then a means to manually start the internal timing is to be provided.
- 113) Three (3) Cat 5 cables to be run from the Photo Finish operator's position in the Judges Room to the camera positions in the Photo Finish Room.
- 114) A direct view of the track. The cameras cannot view the track through a window. If this is difficult then an opening window shall be provided that can be slid open for the duration of each race. A slit window to enable both cameras to view the track need only be 150mm wide and the height of the 2 cameras.
- 115) Care needs to be taken with condensation control for both lenses and windows for high humidity periods.

Photo Finish operator's position in Judges Room:

- 116) Counter Space or Desk along back and/or side wall of Placing Judges' Room of sufficient size (± 2400 mm long) to support:
 - a. Two (2) Computers with mice and One Laser Printer when required;
 - b. DVI peripherals and SDI Scan Converters;
 - c. (Judges' and SDI displays will be wall mounted (± 1800 mm high) with VESA supports;
 - d. Power and 3KVA UPS with power distribution (12 sockets) for the PCs and associated equipment;
 - e. Power outlets on back wall, above counter (or under as to hide AC cords, as long as easily accessible);
 - f. Ethernet Access to house LAN to access Start Lists and to disseminate Results and Photos where applicable;
 - g. One (1) ST terminating single or multimode Fiber shall run from Judges Room to TV Control Room if more than 100 ft distance;
 - h. One (1) operators' chair.

System check list for a Typical One-Camera Photo Finish System:

- 117) Any Camera Photo Finish System must contain or have the following features:
 - a. Colour Line scan Camera (site survey required to determine optimal model);
 - b. Fixed focal length Lens with a 35mm type mount (specific to track);
 - c. Manfrotto camera mount (models change call for guidance) ;
 - d. Iris Control Interface (recommended for most sites) ;

- e. Camera start Switch;
- f. Start switch interface;
- g. Camera stand (customized according to setup);
- h. UPS Backup Power Supply;
- i. Power bar;
- j. Computer with Windows Software (see detailed configuration details);
- k. Ethernet and TCIP Ports;
- l. Cat 5 cable (customized according to camera computer location);
- m. Hi Res Computer Monitor;
- n. Matrox or other Video Scan Converter;
- o. Output Monitor 1980 x 1080 with DVI input.

J. Fiber Optics guidance information:

Most of the existing cables that transmit the video to the Judges and Stewards from the race patrol cameras in Ontario may not be suitable for transmission of the more “data rich” HD content required by current model equipment. In most cases this issue will require re-cabling to deliver the HD content from camera positions to the race patrol recording location and then on to the Judges’ Stand. Some tracks have fiber optic cables in place. However, transitioning to HD will require advice and guidance in adapting to new site-specific Transmit and Receive boxes that connect to the terminals at each end of the cable.

Alternatively a wireless solution may be more suitable under certain situations to transmit the signals back from remote cameras particularly for those looking for a temporary solution.

The licensed racetrack administrators should use the following information related to this transmission of race patrol camera signals that may be helpful in upgrading the Photo Finish and Video Patrol Systems.

For tracks without fiber optic cables in place:

- 118) **Single mode fiber** is recommended to transmit up to 1.5 Gigabytes data rate.
 - a. Single mode may actually be less expensive than multi mode fiber and will handle higher data rates over longer distances than multi mode. It is also more adaptable to possible higher data rates in the future;
 - b. The transmitters and receivers for single mode fiber may cost more than the units used for multi mode.
- 119) **Multi mode fiber** is “data limiting” but may be adaptable for applications in the building.
- 120) For cost efficiency Lay at least six strands of 8-10 micron fiber in one cable.
- 121) Cost per meter of cable vary depending on application variables i.e.: number of glass strands, (armored, direct burial or aerial) micron size, distance, type of data, if used for audio as well, communications applications, control circuits etc. (consult a knowledgeable fiber optics contractor familiar with HD TV transmissions).
- 122) **The Flex** (bidirectional TX and RX units utilizing 2 fibers) can cost up to \$1,600 each, your application may cost less.

For tracks that have fiber optic cables in place:

- 123) Most legacy fiber installations are 50 micron or the older 62.5 micron cables used in **multi-mode**. The older SD composite video TX and RX fiber boxes are not suitable for HD-SDI transmissions that now require higher data rates.
- 124) 50 micron MM fiber is typically used for up to 1.3 km applications.
- 125) 62.5 micron MM fiber is typically used for up to 1km applications.
- 126) **Legacy (older multi-mode fiber)** installations require upgraded TX and RX boxes to adapt to current HD-SDI requirements. Note: legacy fiber installations may not adapt to future data rate requirements or may not be adaptable to current standards due to distance limitations.
- 127) An upgrade to multi-mode TX and RX boxes may cost \$1,000.00 each end or more depending on your application and communication needs. It may also be necessary to add repeaters if your application exceeds the distance limitations. Be sure to get expert advice and a site visit to determine the adaptability to your situation.

For a good cross section of available fiber optic hardware options the ORC recommends visiting Communication Specialties Inc. web site www.commspecial.com to learn more or call Paul Seiden at (813) 653-1686.

In Canada, SS Marketing Distribution handles fiber optic hardware (514) 780-2070 or contact Rob DeSlaulier (416) 832-8025 or other vendors to obtain more information.

For information on fiber installations and cable it is recommended to contact Com Cabling (800) 331-3069 or other installation vendors.

Wireless transmission option:

Wireless HD transmitters are relatively new for applications that require the distances required at most race tracks. New high gain antennae are being developed and customized to allow for wireless point to point transmission such as those that would be required to transmit from the camera towers at the tracks with good results of up to 2,500ft.

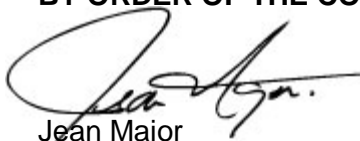
These low powered transmitters are required to be operated below the 100 m-watts maximum in the 5 to 6 Gig band spectrum to be unlicensed. Since the transmitters are low-powered they require high gain fixed antenna precisely pointed to be effective.

Transmitters of this category will also transmit imbedded HD audio or one channel of stereo analogue audio when connected to its built-in XLR 5 inputs.

The cost of a suitably configured system with specialized antenna to transmit wirelessly from a typical camera tower could cost in the range of \$30,000.00 (+/-)

For more information about wireless the ORC recommends to contact Peter Crevier at (416) 399-0528 or other HD wireless vendors.

BY ORDER OF THE COMMISSION


Jean Major
Executive Director