ANNEX 1

VAR SYSTEM TECHNOLOGY PROVIDER

Scope of Supply and Technical Requirements

May 2019

1. INTRODUCTION

The present document summarizes the **scope of supply and the minimum requirements** to be fulfilled by the VAR system technology provider.

VAR system will be implemented for the Spanish competitions using an existing **Centralized VOR** in Las Rozas (Madrid), receiving the signals from each stadium through **a redundant fiber optic network**.

From the date of the signature of the Contract, a "**Project Manager" must be appointed** by the provider to be the responsible of all the scope of supply and the contact person between the supplier and the RFEF.

All materials, installations, configurations and services **must satisfy this entire specification and all requirements stablished by FIFA** in the document: "**VAR IAAP – Technology**", annexed to this technical specification which covers the minimum requirements for a VAR installation and information relating to technology tests and the assessment and approval of VAR technology installations.

2. SCOPE OF SUPPLY

A separated quotation must be provided for **each of the three** following chapters:

2.1. UNIVERSITY TOURNAMENT IN BOADILLA DEL MONTE (MADRID)

As part of the training process for the 2nd Division referees to receive the required IFAB certification:

- **Decentralized VAR system (VANs at stadiums) for a University Tournament** to be played in Boadilla del Monte (Madrid) from July 21st to July 27th:

- **40 matches in 2 field of play as follows:**

		Sun 21st	Mon 22nd	Tue 23rd	Wed 24th	Thu 25th	Fri 26th	Sat 27th
Morning	Field 1	10:00	10:00	10:00	10:00	10:00	10:00	09:30
		12:00	12:00	12:00	12:00	12:00	12:00	11.30
Evening	Field 1	17:00	17:00	17:00	17:00	17:00	17:00	13:30
	Field 2	17:00	17:00	17:00	17:00	17:00	17:00	17:30
	Field 1	19:00	19:00	19:00	19:00	19:00	19:00	
	Field 2	19:00	19:00	19:00	19:00	19:00	19:00	

For this Tournament, the provider **must supply the complete solution for implement VAR in 40 matches**. Every field of play will be equipped as follows:

- 7 x **Cameras**:
  - Main
  - Close-up
  - 16 m. right
  - 16 m. left
  - Behind goal right
  - Behind goal left
  - Reverse

All cameras will be **man operated** and similar operation than in an official match.

- **Cabling** from cameras to VAR van.

- **VAR VANs** (equipped with the following positions: VAR, AVAR, 1 x Replay Operator.

- **Referee Review Area**: including monitor, docking station for vokkero system and all the cabling with VAR VAN.

- All required personnel, including Replay Operator and Review assistants for RRA.

- General Technical Responsible for each field of play.

In addition to that, a **VAR simulator system** will be installed **in the hotel** in Las Rozas de Madrid during all the week of the tournament.

Quotation must include this simulator service and the required replay operators, considering sessions 6 days of 3 hours in the morning and 3 hours during the evening.

2.2. PRE- SEASON FRIENDLY MATCHES

Decentralized VAR system (VANs at stadiums) for all friendly matches during pre-season period from July 2019 to mid-August 2019, as part of the IFAB certification process for the second division referees.

For quotation purposes, **60 matches** must be considered and a **unit price for possible "extra" matches must be indicated.**

This quotation must consider:

- **Reception of feeds from all cameras** (from 8 to 16 depending on each stadium).

- **VAR VANs** (equipped with the following positions: VAR, AVAR, 1 x Replay Operator.

- **Referee Review Area**: including monitor, docking station for vokkero system and all the cabling with VAR VAN.

- All required **personnel**, including **Replay Operator and Review assistants** for RRA.

- General Technical Responsible for each field of play.

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2.3. COMPLETE VAR SYSTEM FOR SPANISH COMPETITIONS

2.3.1. FOR 1ST DIVISION AND SPAIN CUP COMPETITIONS

a) **All stadium tests** according to FIFA/IFAB requirements, to be done before starting the official competition at mid-august 2019 (20 stadiums).

b) **Complete VAR system** for the correct implementation of **VAR in the Spanish competitions of 1st Division and Spain Cup, including all scope of supply from every stadium to the Centralized VOR** in Las Rozas (Madrid):

- **1st Division**: 380 matches per season.
- **Spain Cup (from round of 16 up to final)**: 17 matches per season.

2.3.2. FOR 2nd DIVISION AND PLAY OFF COMPETITIONS

a) **All stadium tests** according to FIFA/IFAB requirements, to be done before starting the official competition at mid-august 2019 (22 stadiums).

b) **Complete VAR system** for the correct implementation of **VAR in the Spanish competitions of 2nd Division and Play off from 2nd to 1st Division, including all scope of supply from every stadium to the Centralized VOR** in Las Rozas (Madrid):

- **2nd Division**: 462 matches per season.
- **Play off** from 2nd to 1st Division: 6 matches per season.

The scope of supply for previous 2.3.1. and 2.3.2. should include:

- Reception of **feeds from all cameras** in each stadium from TV OB Truck. **All camera feeds must be synchronized** and provided live to the video match officials.
- **RRA (Referee review area)**: monitor at pitch level (redundant- backup solution).
- **Specification and coordination** with the fiber optic network provider **for the transport of video and audio (Vokkero) signals from every stadium to the centralized VOR** through a **redundant fiber optic network.**
- All **equipment inside VOR**: servers, monitors, pushbuttons, etc. Furniture not included.
- All **software licenses** (virtual offside lines or any other) required for the correct functionality of the system.
- **Technical assistant** for all matches: in the stadium (RA's) and in centralized VOR.
- **Replay Operators and Review Assistants certified by IFAB.**
- **Interconnection with the TV broadcasting** (signals interchanging and information about checks, reviews and their outcomes to trigger the corresponding graphics on TV production)**.**
- Any other need to provide a **complete solution** for the implementation of VAR in competitions.

A general overview of scope of supply is shown in the attached diagram:

NOTE: All in red must be under provider's scope of supply.
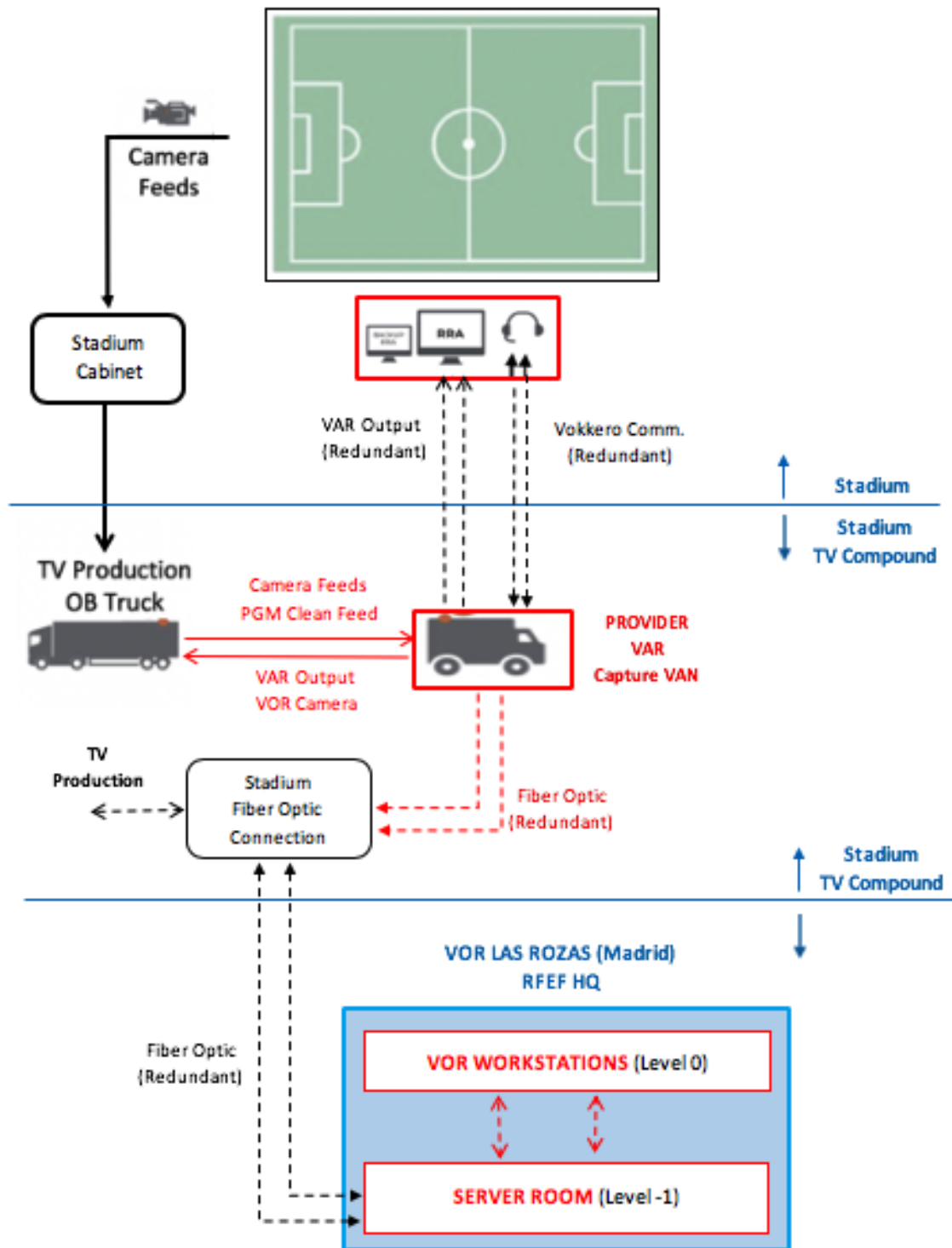
A. PROVISION AT EACH STADIUM

A.1. PROVIDER SCOPE OF SUPPLY

a) VAR CAPTURE VAN

- Supplier will provide a VAR Capture Van onsite in order to capture the camera feeds direct from the OB truck:

    - All pitch facing camera angles, including all phases of SSM cameras
    - 1 x clean program feed (PGM)

- Power Cable up to 10 meters to agreed power source.
- Capture servers located in the VAR Capture Van will stream the feeds to the Centralized VOR.

b) PERSONNEL

- 1 x Onsite Technical responsible will ensure all technical aspects of the system onsite;
- 1 x Review Assistant (RA) at Referee Review Area (RRA) with responsibility also in the integration with Vokkero communication System;

c) BROADCAST FEEDS

- Supplier to provide and run the video signal for "VAR Output" and "VOR camera" feed to TV Broadcasting.

d) REFEREE REVIEW AREA

- 1 x 24" Monitor for "VAR Output" feed, mounted in a suitable structure support.
- 1x Redundant Monitor, fully equipped to be used as backup of the previous one.
- 2 x Vokkero docking stations for referee communication (1 x main, 1 x spare);
- Technical specification and coordination with stadiums for the redundant cabling for referee communication (1 x main, 1 x spare) from RRA to VAN VAR.
- Technical specification and coordination with stadiums for the redundant cabling for "VAR Output "signal from each VAN VAR to RRA.

All solutions must have the following features as standard:

- Waterproof;
- High NIT value (screen must be easily seen in all lighting conditions;

When not in use, the screen must display a privacy graphic to prevent unwanted eyes from seeing the footage. Once an on-field review is initiated, the screen must be activated to show the VAR output.

A.2.   RFEF PROVISION AT EACH STADIUM

a)   FOR THE SUPPLIER'S CAPTURE VAN

- Suitable operational area in TV OB compound for vehicle, no greater than 50 m from the TV OB Truck providing camera feeds;
- Dedicated connection to stable and reliable technical power supply (stadium responsible for installing such connection and supply), three phase Ceeform socket within 10m of the operational area;
- Appropriate security.

b)   INTERNET

- Dedicated 10mb/s (upload and download speed) wired internet connection to the VAR Van.

c)   REFEREE COMMUNICATIONS

- Vokkero communication system will be provided by RFEF as follows: units 2-5 used by main Refereeing team, Unit 1 by VAR, Unit 6 spare at VAR/RRA location.
- 1 Vokkero unit set to Role 1 to establish 2-way communication between VARs and Refereeing team; This unit will be installed in the Vokkero docking stations at Referee Review Area.
- Docking Stations at RRA will be under the provider's scope of supply.

d)   BROADCAST FEEDS

TV Broadcast will provide to supplier the following feeds and the VAR provider will do the cabling from TV OB Truck up to Capture VAN VAR:

- Program output (PGM) with embedded audio
- All phases of all pitch-facing cameras available
- HD feeds
- UHD feeds
- SSM cameras to be presented as individual phases
- UM cameras to be presented as individual phases
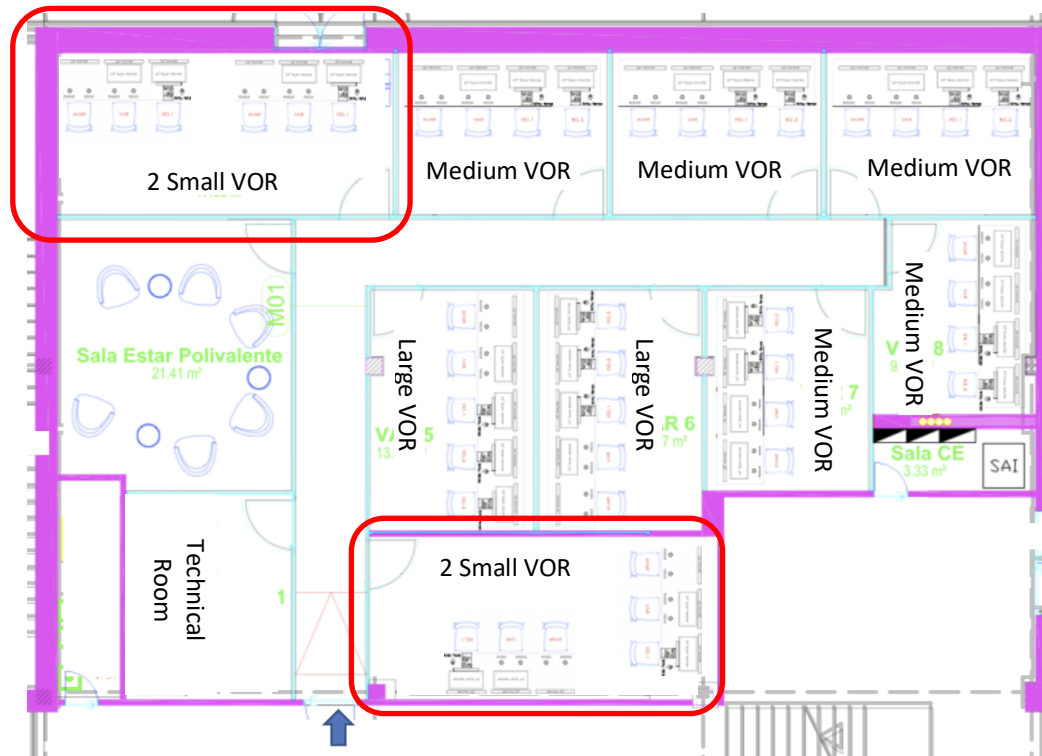
e)   REFEREE REVIEW AREA

- 2 x 220 VAC plugs at the position of the RRA monitor
- Backup power supply for RRA monitor (e.g. UPS)

B. PROVISION AT CENTRALIZED VOR IN LAS ROZAS (MADRID)

Here below is shown the actual centralized VOR layout:
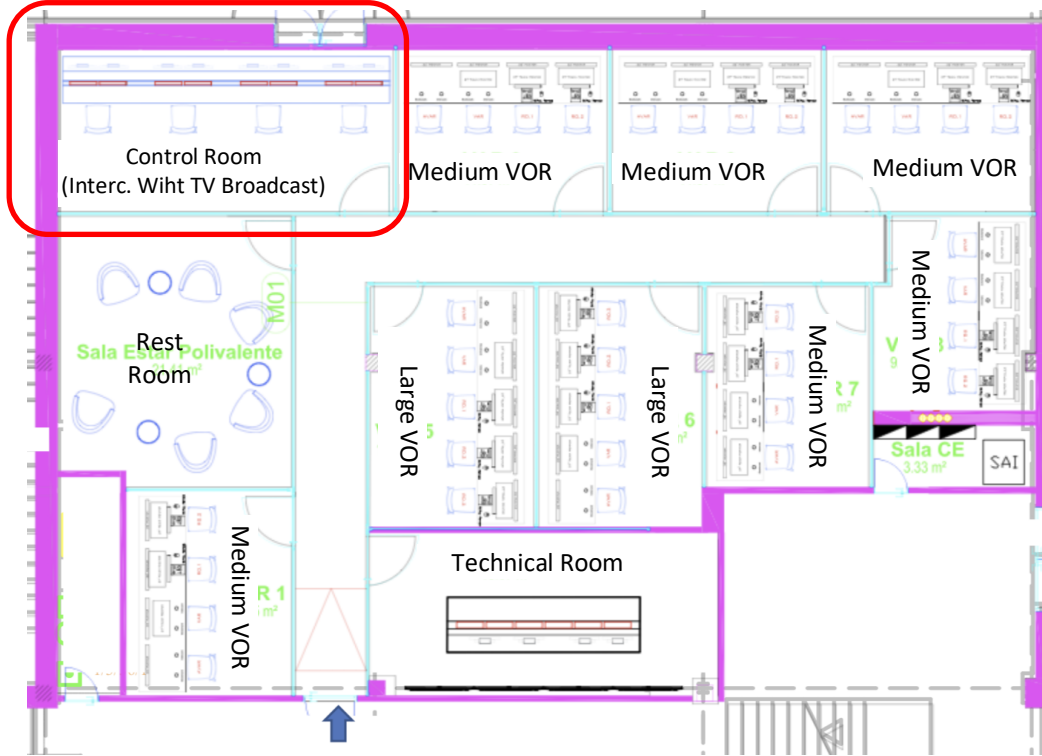
And here the modification to be done for next season 2019-2020:

B.1. PROVIDER SCOPE OF SUPPLY (Centralized VOR)

Proposal should include the equipment and installation of:

- 2 x Large VORs with workstations for 5 persons;
- 6 x Medium VORs with workstations for 4 persons;
- 4 x Small VORs with workstations for 3 persons;

All system will be designed for a possible future extension of two (2) additional medium VOR (rack space, power supply, server's capacity, etc.).

All system should be designed considering than 10 matches could be done simultaneously at same time (provision for last match days of competitions).
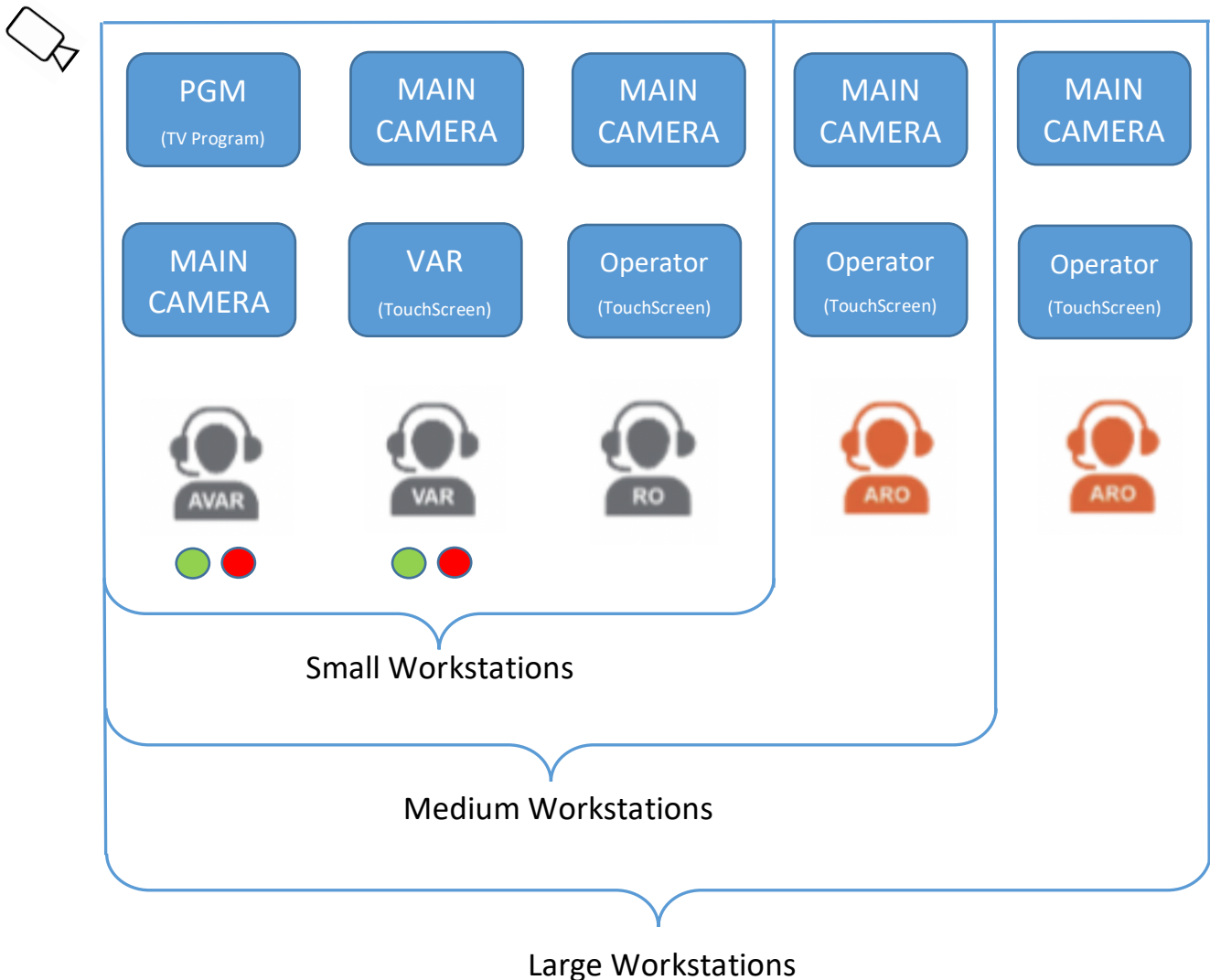
a)   **VOR WORKSTATIONS**

Each workstation must be equipped as follows:

- Replay Servers for Main and Assistant Replay Operators;
- 2 x VAR tagging buttons (VAR + AVAR) – Red Color
- 2 x VAR push-to-talk buttons (VAR + AVAR) – Green Color
- 32" monitors for Main Camera and PGM (program) feeds at each position;
- 27" touchscreen monitors for all Replay Operators and VAR.
- Noise isolating Headsets for Replay Operators, VAR and AVAR.
- Operations camera and microphone for recording VOR activity; Camera inside the VOR filming the video match officials during the match and their communications.

    Camera shot from behind or from the side. All video match officials and the main replay operator must be in shot.

    Regular webcam style camera, which can provide both 1080p SDI and HDMI outputs. As an "extra", the provider can quote a high broadcast quality option.

b)   **REFEREE COMMUNICATIONS**

- Ability for all VARs and Replay Operators to speak freely to each other.
- Ability for all VARs and Replay Operators to listen the referee communications at stadium;
- Ability for the VAR and AVAR to communicate with the on-field referee team.

c)   **SERVER ROOM**

- NAS drive for clip storage
- Networking equipment
- Video routing equipment
- Dedicated 10mb (upload and download) wired internet connection

d)   **CABLING INSIDE CENTRALIZED VOR**

- All cabling between the individual VORs and workstations (level 0) and the Server Room (level -1).
- Any other cabling needed for the correct working of all installation.

e) OFFSIDE LINE FUNCTIONALITY

- Supplier must be able to provide "live" offside lines with **3D capability** on the following cameras, ensuring that all of them are simultaneous synchronized between them and with the rest of cameras (tight, reverse, etc.):

  - 16 metre left
  - 16 metre right
  - Main
  - Goal line left
  - Goal line right

- Offside functionality must be able to draw a **double line**: one for the attacker and one for the defender with different colors.

- Supplier must provide an **official certification of 3D offside line** by an independent body which clearly states the margin of error in different scenarios depending on camera position, place of the field of play, etc.

- Technology must ensure the credibility of offside decisions. **System must check that pitch lines are marked correctly,** ensuring that visuals always match the real pitch lines. The system also **must draw a vertical line** to the infringed body part to help the spectators understand which part of the body is playing an opposition player onside or causing them to be offside.

- **Pitch Camber**: System provided must have an extensive calibration process which takes into consideration the camber of the pitch allowing for the most accurate offside decisions.

- **Lens Distortion**: System provided must consider the lens distortion when calculating and drawing the offside lines.

f) PERSONNEL

- 1 x **Project Manager**, to be nominated from the beginning of the project.
- **IFAB Approved Replay Operators**. Supplier will take care of the selection, provision and continuous training of replay operators.
- **IFAB Approved Assistant Replay Operators** depending on camera plans.
- 1 x **General Responsible** should supervise all the technical aspects of the operations in the Centralized VOR;
- All **required technicians** at the Centralized VOR to ensure a correcting operation of all matches, considering the number of simultaneous matches that will be officiated.

B.2. RFEF'S PROVISION AT CENTRALIZED VOR

a) VOR ROOMS

Current Centralized VOR will be available with the following existing and empty spaces:

- 2 x big rooms
- 5 x medium rooms
- 1 room, currently used as Control Room for Interconnecting with TV broadcasting, to be transformed into 2 small VAR workstations (VAR, AVAR and 1 Replay Operator). These stations will be isolated through mobile panels.

Each existing room is currently equipped with air conditioned and power sockets.

RFEF will provide:

- 3.5 meters desk per workstation;
- Ergonomic chairs for the relevant number of persons;
- Mounts for monitors.

b) SERVER ROOM

Current server room is located below the VOR rooms in the underground level (-1).

This room is equipped with:

- Air-conditioned space;
- 10U rack space for networking and routing connections;
- Power sockets (on UPS) to each rack in the VOR server room.

C. REDUNDANCY

As general philosophy, all VAR system should be designated in a redundant configuration avoiding that a single failure could cause a loss of the system or its malfunctioning.

Redundancy will include: power supply, servers and main equipment, network adapters, switches, communications, cabling, monitors, etc.

D. MATCH INCIDENTS VIDEO CLIPS

Provider will record, upload and storage in a dedicated NAS (accessible to RFEF) all relevant match incidents according to the selection by RFEF VAR responsible.

Clips must be synchronized with the Referee / VAR audio communications, with the VOR operation camera and appropriately logged to ensure easy identification.

All math incidents video clips must be available to RFEF within 24 hours after the final whistle of every match.

E.   INTERCONNECTION WITH TV BROADCASTING AND GIANT SCREENS

Provider should define in the proposal the best solution to interface with TV broadcasting and the public in the stadium at giant screens, in order to provide them the information about when a check is taking place, a review, a possible "On Field Review", etc.

This interface will help to the TV broadcasting and stadium responsible to show the correct graphics indicating the checks, reviews and their outcomes.

Provider must consider that a maximum of 4 matches will be generally played at same time range.

F.   MAINTENANCE

Provider will support and maintain all hardware in the scope of supply.

Throughout the contract term, regular maintenance will be performed on all hardware, including servers, storage and networking to ensure that any potential failure and replacement of any item of concern is anticipated as much as possible.

G.   SPARES

A number of spares of key hardware and components must be provided inside the VAR VAN at stadiums and in the Centralized VOR in Madrid.

A list of these items must be indicated in the proposal.
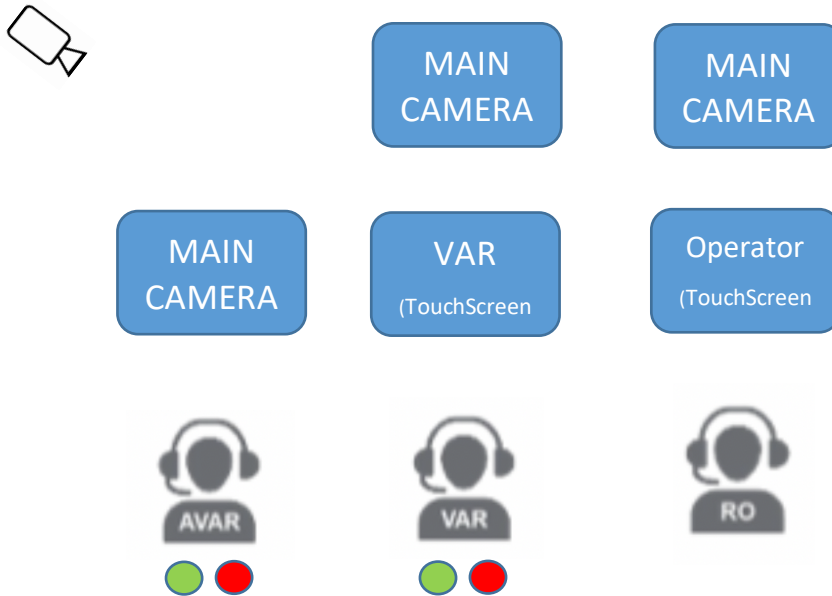
3. PROJECT TIMELINE

	MAY		JUNE		JULY		AUGUST	
	1-15	15-30	1-15	15-30	1-15	15-30	1-15	15-30
Contract Award	███							
University Tournament (36 matches)						███		
RFEF VOR + Server Room Installation			███	███	███	███		
Friendly Matches (decentralized)					███	███	███	
Stadium Tests (42 in total)					███	███	███	
Start of Official Competition								███

With the proposal, provider will submit a detailed tasks program to satisfy the project timeline.

4. ADDITIONAL SERVICES

For referees training purposes, the provider must be able to supply a complete simulation system to play video clips with interesting incidents.

Provider must give a **quotation per day of simulator** with the following equipment:

VAR IAAP – Technology

Contents

1. Minimum requirements

The Implementation Assistance and Approval Programme (IAAP) was approved during the 132nd Annual General Meeting on 3 March 2018. The five step process is mandatory and must be completed by every competition planning to use VAR (as it is regulated by the Laws of the Game). The following is outlining the minimum requirements a VAR technology installation must fulfil to be used in a live competitive match.

For non-competitive matches technology tests and the assessment and approval by FIFA are not mandatory. FIFA, however, strongly recommends applying the same standards and level of testing for non-competitive matches as required for competitive matches.

1.1. Video Operation Room (VOR)

1.1.1. Location and camera feeds

- The VOR can be located near/in the stadium (for example in a vehicle, container or room), or at a centralised replay facility

- The System Technology Provider (STP) must have independent access to isolated camera feeds and the TV programme feed

    - For the use of VAR in any competition the following four basic cameras must be available:

        - A central wide angle camera

        - A central tight angle camera

        - Two 16 meter/18 yard or similar cameras that can be used to assess offside situations

    - If super-slow motion cameras are used, the video match officials must have access to all super-slow motion cameras (all three phases for triple speed cameras)

    - For camera plans with up to eight cameras (including the cameras mentioned above) all cameras must be available to the video match officials

    - For camera plans with more than eight cameras, it is at the competition organiser's discretion to decide how many cameras (in addition to the 8) are made available to the video match officials. However, the basic four cameras and all super-slow motion cameras must always be available to the video match officials. FIFA strongly recommends to make all pitch facing cameras available to the video match officials.

    - The camera feeds must be synchronised and provided live to the video match officials

1.1.2. Equipment

The VAR watches the main camera on the upper monitor and checks or reviews incidents on the lower monitor (capable of showing up to four cameras at the same time). The AVAR watches the main camera and keeps the VAR informed about live play if an incident is being checked or reviewed. The monitors should not be smaller than 24 inch and must have the same aspect ratio as the source signal (for example 16:9).
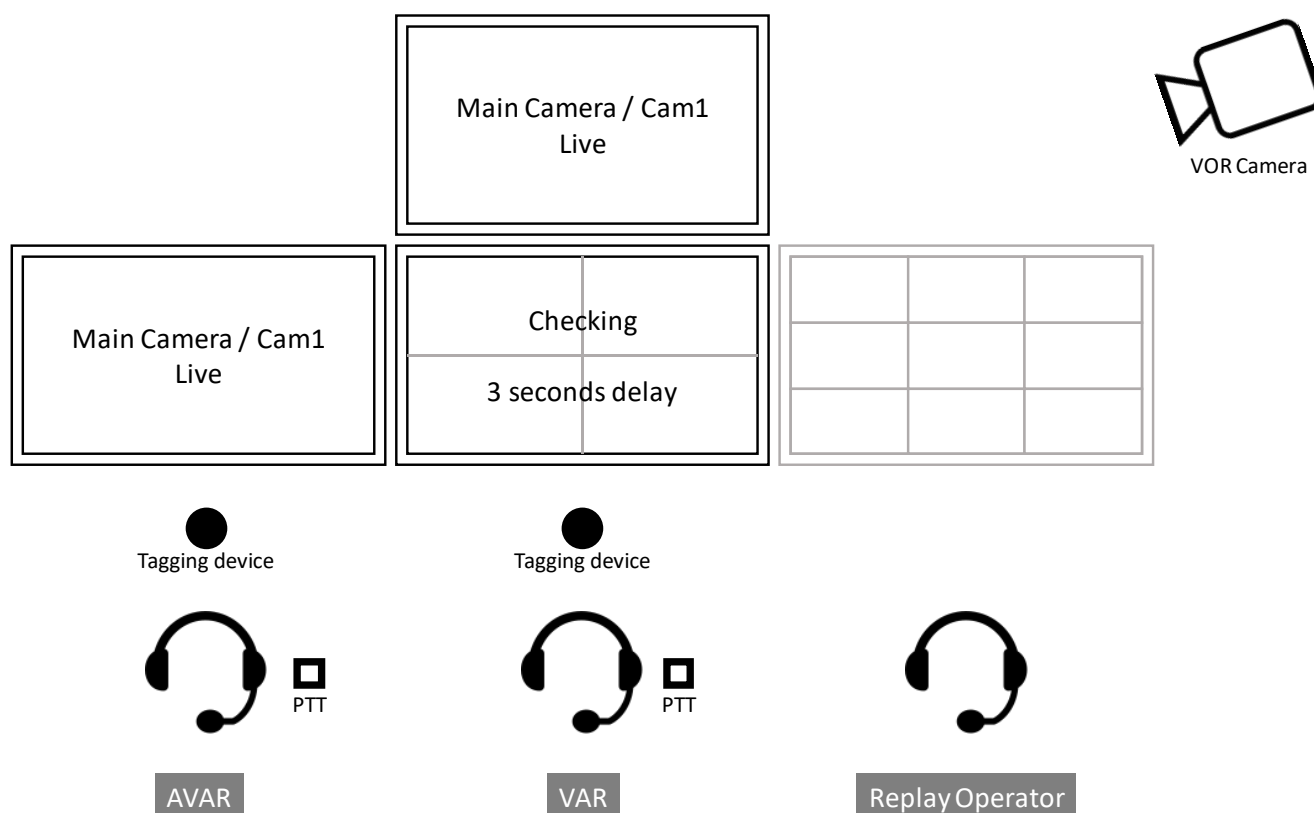
Figure 1: VOR setup

VAR Position

- ☐ Monitor showing the main camera (e.g. Camera 1) live

- ☐ Monitor for checking incidents. Must be capable of showing multiple camera angles at the same time (provided by the replay operator). Feeds should have a delay of minimum three seconds. Touch is optional.

- ☐ Tagging device to mark potential checks and reviews on the timeline (Information for the replay operator)

- ☐ Headset and push-to-talk (PTT) button for communication with the on-field match officials

AVAR Position

- ☐ Monitor showing the main camera (e.g. Camera 1) live

☐ Tagging device to mark potential checks and reviews on the timeline (Information for the Replay Operator)

☐ Headset and push-to-talk (PTT) button for communication with the on-field match officials

Replay Operator Position

☐ System technology provider specific setup

☐ RO must be capable to see and access incidents tagged by the VAR and AVAR

☐ RO must be capable to replay different camera angles (simultaneously and synchronised) for the VAR, play them in different speeds (e.g. 50% or frame by frame), stop the footage at any moment in time and zoom in and out, when required.

☐ Headset for communication with VAR and AVAR. No communication allowed with on-field match officials.

☐ The main RO can monitor a maximum of 12 camera angles. As of camera angle 13, a second RO is mandatory. There is no limit on how many cameras the second RO can monitor.

VOR Camera

☐ Camera inside the VOR filming the video match officials during the match

     o Camera shot from behind or from the side. All video match officials and the main replay operator must be in shot.

1.1.3. Recording and provision of feeds to match broadcaster

☐ The feeds of the VOR camera, and VAR checking monitor and the TV Programme (including sound) must be recorded

     o Feeds can be recorded by the system technology provider, the broadcaster or the competition organiser himself

     o Recording of all isolated camera feeds is recommended for training purposes (VAR simulator)

☐ Live transmission of the VOR camera and the VAR checking monitor feed to the match broadcaster is recommended for communication purposes

1.1.4. Virtual offside lines

☐ The provision of offside lines is not a minimum requirement

☐ Video match officials are not allowed to use virtual offside line provided by the match broadcaster

☐ If virtual offside lines are used the VAR and/or RO must create those lines independently and have control over where the lines are placed. FIFA strongly recommends that these lines be independently tested prior to any live use in match.

1.2. Referee Review Area (RRA)

☐ Cabled outdoor monitor at the side of the field of play for On-Field Reviews (OFR)

☐ Exact (passive) reproduction of the VAR checking monitor's content

☐ Feed should only be visible on the RRA monitor when the referee goes to OFR

☐ The referee cannot control the images shown on the monitor. Only the VAR/RO can control the images. The referee must communicate with the VAR if he wants to see something else than presented by the VAR/RO.

1.3. Referee communication system

☐ All video match officials and the replay operators must be able to listen to the on-field match officials during the full match

☐ The VAR and the AVAR must be able to speak to the on-field match official using a push-to-talk device

☐ The replay operator(s) are not allowed and should not be able to speak to the on-field match officials

☐ All communication (on-field, video match officials and the main replay operator) must be recorded

  o Communication can be recorded by the referee communication provider, the system technology provider, the broadcaster or the competition organiser himself

SPEAKING		LISTENING — Stadium: Referee	Assistant referee 1	Assistant referee 2	4th official	LISTENING — VOR: VAR	AVAR	RO
Stadium	Referee	(self)	Open-mic	Open-mic	Open-mic	Open-mic	Open-mic	Open-mic
Stadium	Assistant referee 1	Open-mic	(self)	Open-mic	Open-mic	Open-mic	Open-mic	Open-mic
Stadium	Assistant referee 2	Open-mic	Open-mic	(self)	Open-mic	Open-mic	Open-mic	Open-mic
Stadium	4th official	Push-to-talk	Push-to-talk	Push-to-talk	(self)	Push-to-talk	Push-to-talk	Push-to-talk
VOR	VAR	Push-to-talk	Push-to-talk	Push-to-talk	Push-to-talk	(self)	Open-mic	Open-mic
VOR	AVAR	Push-to-talk	Push-to-talk	Push-to-talk	Push-to-talk	Open-mic	(self)	Open-mic
VOR	RO	No comms	No comms	No comms	No comms	Open-mic	Open-mic	(self)

Legend: Open-mic, Push-to-talk, No comms

Figure 2: Communication matrix

2. Technology tests and approval

Before a VAR system can be used in a live competitive match, the competition organiser must successfully perform technology tests in all competition stadiums where it will be used. FIFA (or a third party appointed by FIFA) must attend at least one of those tests to assess and approve the VAR technology installation before it can be used live. This final assessment and approval should take place at least 14 days before the first use of VAR technology in any live competitive match. The remaining stadiums can be tested closer to the first match in the respective stadium (at the very latest six hours before kick-off).
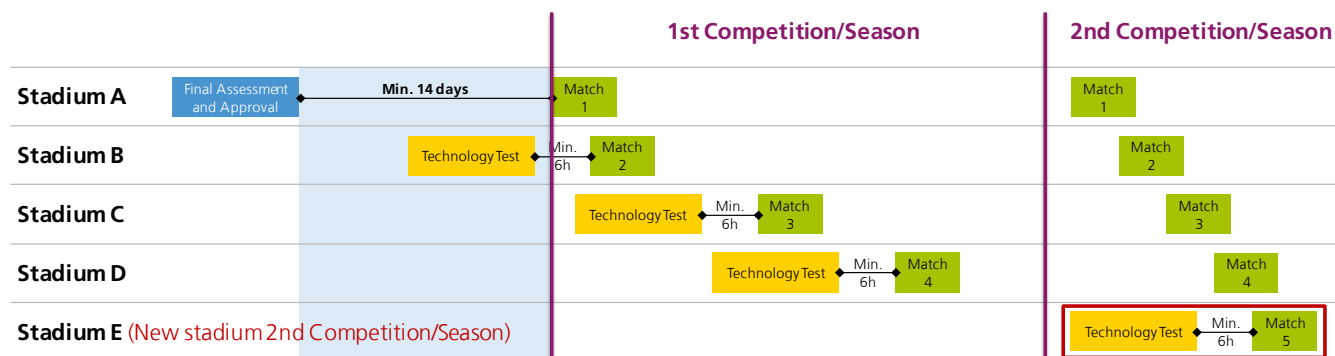

Figure 3: Example of testing schedule for five stadiums

All technology tests (including the test for the final assessment and approval) must be recorded (VAR checking monitor, VOR camera and referee communication) and made available to FIFA upon request.

It is possible to fulfil IAAP referee education requirements and IAAP technology testing requirements during the same event if non-competitive live training (3A, 3B, 3C) takes place in competition stadiums.

	Step	Details	Referee	VAR	AVAR	Replay operator
Theoretical training	1	Principles and practicalities, 4 categories, clear and obviously wrong, communication, etc	continuous	continuous	continuous	continuous
Offline training	2A	Familiarisation	-	1x1 hour	1x1 hour	1x1 hour
	2B	Application of protocol (level1)	-	3x 25 clips (simple situations)	3x 25 clips (simple situations)	3x 25 clips (simple situations)
	2C	Application of protocol (level2)	-	3x 25 clips (complex situations)	3x 25 clips (complex situations)	3x 25 clips (complex situations)
	2D	Live match (Without contact to on-field referee)	-	1x match	1x match	1x match
	2E	Live match (with surrogate referee)	-	1x match	1x match	1x match
Non-competitive live training	3A	Simulated situations	4x session of various incidents	4x session of various incidents	4x session of various incidents	4x session of various incidents
	3B	Short 'staged' matches	2x short match	2x short match	2x short match	2x short match
	3C	Youth, lower leagues or friendly matches	2x full match	2x full match	2x full match	2x full match

Figure 4: IAAP referee education requirements

2.1. Technology tests

The competition organiser is required to carry out technology tests in all competition stadiums (except if the final assessment and approval took place in the stadium) before using a VAR system for the first time in a stadium. The competition organiser has to inform FIFA when and how the tests will be carried out at least two weeks before the test date. FIFA will not be present for those tests, except for the final assessment and approval.

The purpose of the technology tests is to ensure that the different elements of the VAR technology are implemented successfully at each of the competition stadiums. Every stadium where VAR technology will be used must be tested, irrespective of whether another competition organiser has already used VAR technology in the same stadium. Each competition organiser is responsible for its own VAR installations. If, however, a stadium is used for the second time by the same competition organiser, a second test is only required if the system technology provider has changed.

	Technology Test
FIFA involvement	Informed
Where	All competition stadiums
When	Six hours before the first use of VAR in the respective stadium
What	VOR, RRA, Ref Comms, Broadcast and backups
Duration	30 min
Number of players	5
Number of on-field match officials	4
Number of video match officials	2
Number of replay operators	1
Number of cameras	4-8

Figure 5: Minimum requirements for technology tests

Where: all competition stadiums where VAR technology will be used

Every stadium being used for the first time by a competition organiser needs to be tested (except if, the final assessment and approval takes place in the stadium).

Matches where VAR technology is used offline (no communication between on-field and video match officials) can also qualify as technology test if the referee communication system is tested separately (offline), for example, before the match, after the match, or with a surrogate referee communicating with the video match officials during the match.

When: six hours before kick-off at the latest

The test has to be carried out, at the very latest, six hours before kick-off of the first live match at each stadium. It is highly recommended to conduct the test earlier than that in case the technology fails and improvements have to be made.

Areas to be tested: VOR, RRA, Ref Comms, Broadcast and backups

During the test, the VOR and the referee review area must be fully operational and the broadcaster must deliver a minimum number of camera feeds (please refer to the "Number of cameras" section) live to the VOR. In addition, the referee communication system must be working, and communication between the VOR and the field of play must be possible. For the purpose of testing the referee communication system the referees should walk over the whole pitch at least once while testing the communication system. The RRA must be used at least twice during the test. It is recommended to test all backup systems (video and audio) and contingency plans during the test. If applicable, it is also recommended to test how information on reviews (and serious checks) is provided to the broadcaster and/or the giant screen operator in the stadium.

Duration: 30 minutes

For a duration of at least 30 minutes players and referees have to be on the field of play to stage VAR incidents or play a match.

Number of players: 5

A minimum of five players must participate in the test – one goalkeeper, two defenders and two attackers. The level/quality of players is at the discretion of the competition organiser; it is, however, recommended to use players who can stage VAR incidents realistically.

Number of on-field match officials: 4

A full team of match officials, consisting of one referee, two assistant referees and one fourth official, must be present. The level of match officials is at the discretion of the competition organiser. It is possible for staff members of the competition organiser to act as match officials to better assess the quality of the VAR system and especially the referee communication system.

Number of video match officials: 2

A minimum of one VAR and one AVAR have to participate in the test. The level of video match officials is at the discretion of the competition organiser. It is possible for staff members of the competition organiser with VAR experience to act as VARs to better assess the quality of the VAR system, and especially the referee communication system. It is recommended to use the same number of video match officials as in the competition in which VAR technology will be used.

Number of replay operators: 1

At least on replay operator must be present for the stadium test and operate the system as he would during a live match. It is recommended to use the same number of replay operators as in the competition in which VAR technology will be used.

Number of cameras: 4 - 8

The minimum camera setup for the use of VAR technology consists of four cameras: Main Wide, Main Tight and two cameras that can be used to assess offside situation (for example 16m, box camera or GLT camera). Those four cameras must always be available for every stadium test. For camera plans with up to eight cameras, all cameras must be available for the stadium test. For bigger camera plans, a minimum of

eight cameras must be available. If super-slow motion or ultra-slow motion cameras are used, they must also be available for the test. It is recommended to use all cameras that will be used for live matches.

2.2. Final assessment and approval

The aim is to assess the capability of the competition organiser to implement the VAR technology. After the successful assessment and approval no further inspection from FIFA are required. FIFA, however, has the right to perform spot checks to assure the quality of the VAR setup remains high.

After the assessment, FIFA will provide a report and make recommendation for improvements, if necessary. If all requirements are fulfilled, FIFA will approve the use of VAR technology. If minimum requirements are not fulfilled, the competition organiser is expected to make improvements and inform FIFA about the steps taken before the first live match. Based on the information provided FIFA will then decide if another assessment and approval visit is required or approval can be given without a second assessment.

In order to assess and approve the VAR setup, FIFA must see both sides of the installation, the video operation room (VOR) and the field of play. If the VOR is at the stadium (local solution) both parts can be assessed and approved as part of one technology test. Where a centralized solution (replay centre) is used, it might be necessary to attend two technology tests in order to assess the VOR as well as the stadium side.

If more than one system technology provider is used in the same competition, one stadium per system technology provider must be assessed. If different solutions (local and centralised) are used in the same competition one stadium per solution must be assessed.

The final assessment and approval is only required before the first use of VAR technology in any competition. When the same competition organiser uses VAR for the second time, for example, in another competition or the second season of the same competition, the final assessment and approval is not required anymore.

	Final Assessment and Approval
FIFA involvement	Present: Assessment and approval
Where	1-2 competition stadiums
When	14 days before the first use of VAR in any live competitive match
What	VOR, RRA, Ref Comms, Broadcast and backups
Duration	30 min
Number of players	5
Number of on-field match officials	Same as in live competitive match
Number of video match officials	Same as in live competitive match
Number of replay operators	Same as in live competitive match
Number of cameras	Same as in live competitive match

Figure 6: Minimum requirements for the final assessment and approval

STADIUMS INFORMATION
AND
CAMERAS MAP – TV PRODUCTION

1. FIRST DIVISION

First Division League Championship and Cup matches played as home teams by clubs of this category are celebrated in the following 20 stadiums:

|	CITY	CLUB	STADIUM
1	BARCELONA	FC BARCELONA	NOU CAMP
2	BARCELONA	RCD ESPANYOL	RCDE STADIUM
3	BILBAO	ATHLETIC CLUB	SAN MAMES
4	EIBAR	SD EIBAR	IPURUA
5	GRIONA	GIRONA FC	MONTILIVI
6	HUESCA	SD HUESCA	ALCORAZ
7	LEGANÉS (MADRID)	CD LEGANÉS	BUTARQUE
8	MADRID	AT. MADRID	WANDA METROPOLITANO
9	MADRID	GETAFE CF	COLISEUM ALFONSO PEREZ
10	MADRID	RAYO VALLECANO	VALLECAS
11	MADRID	REAL MADRID CF	BERNABEU
12	SAN SEBASTIÁN	REAL SOCIEDAD	ANOETA
13	SEVILLA	REAL BETIS	BENITO VILLAMARIN
14	SEVILLA	SEVILLA FC	SANCHEZ PIZJUAN
15	VALENCIA	LEVANTE UD	CIUDAD DE VALENCIA
16	VALENCIA	VALENCIA CF	MESTALLA
17	VALLADOLID	REAL VALLADOLID	JOSE ZORRILLA
18	VIGO	RC CELTA	BALAIDOS
19	VILLARREAL	VILLARREAL CF	LA CERAMICA
20	VITORIA	DEPORTIVO ALAVÉS	MENDIZORROZA

For TV broadcasting, the match signal is produced based on previously defined standard camera plans for each type of coverage.

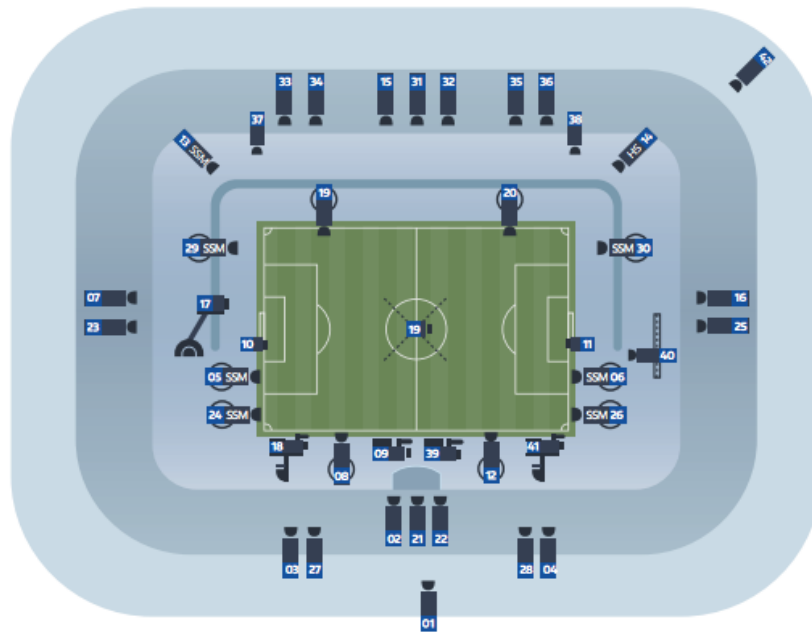The following types of coverage are defined for current season 2018-19:

- **Type A+:** Matches played by Real Madrid CF – FC Barcelona and vice versa.
- **Type A**: Matches played by Real Madrid CF or FC Barcelona with any other club.
- **Type B**: Matches played by At. Madrid, Athletic Club, Sevilla FC y Valencia CF.
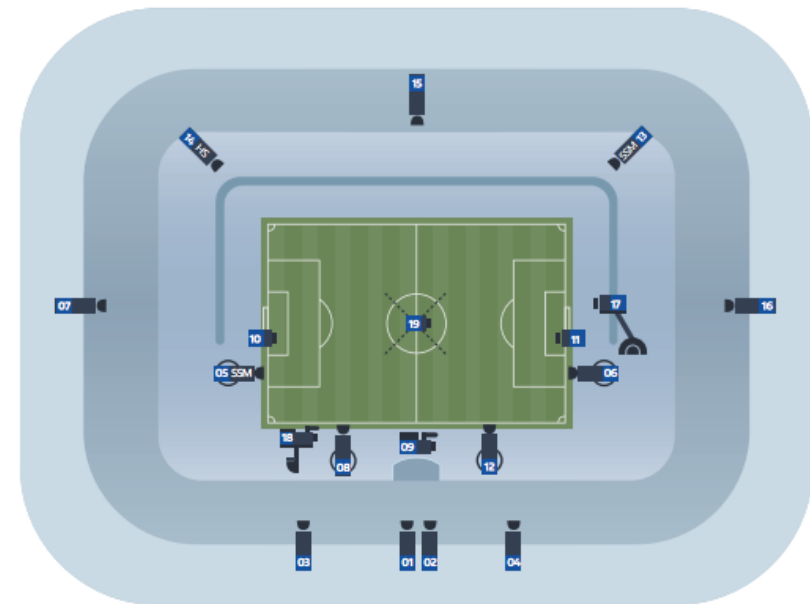- **Type C**: Rest of matches.

Camp Nou - **Type A+ production**
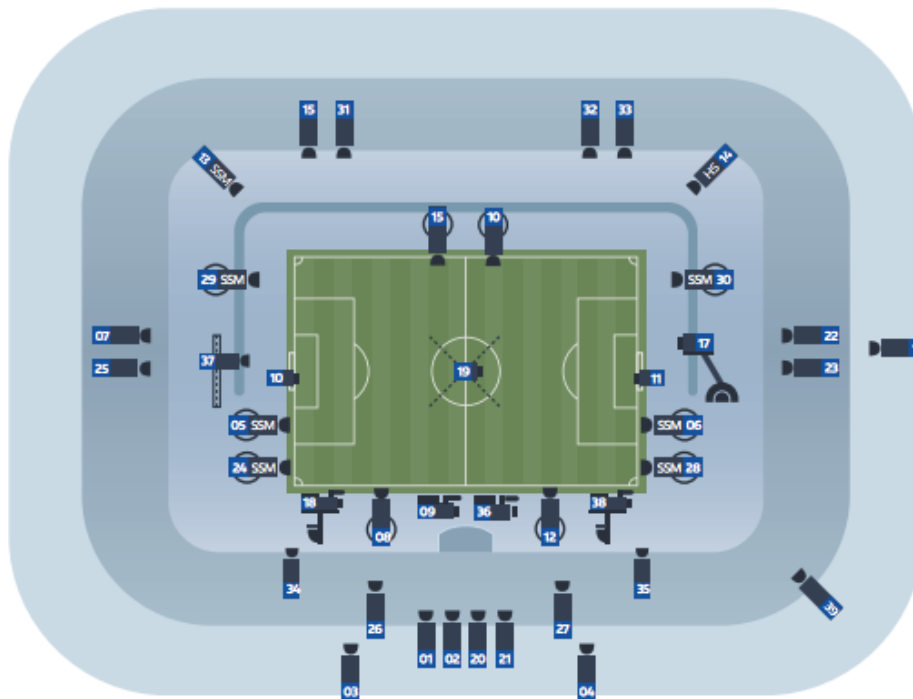
01- Main	22x	20/21- Main 3, 4
02- High close-up	86x	22/23- High end right 2-3
03- Offside Left	22x	24- Goal left SSM 2
04- Offside Right	22x	25- High end left 2
05- Left goal SSM	86x	26/27- Offside low left and right 2-3
06- Right goal SSM	86x	28- Goal right SSM 2
07- High end left	22x	29- North goal, reverse SSM
08- Pitch close ups, left.	86x	30- South goal, reverse SSM
09- Benches/Interviews	22x	31/32/33- Reverse angle, north and south 2, 3, 4
10- Goal mini-camera left	WA	34/35- Goal line
11- Goal mini-camera right	WA	36- Bench 2
12- Pitch close ups right	86x	37- Railcam behind goal
13- Reverse angle corner SSM	86x	38- Steadycam right
14- Reverse angle corner HS	86x	39- Beauty
15- Reverse angle high	22x	
16- High end right	22x	
17- Pole cam	WA	
18- Steadycam	WA	
19- Aerial camera		

Santiago Bernabeu - **Type A+ production**

19 cameras - **Type A production**

01- Main	22x
02- High close-up	86x
03- Offside Left	22x
04- Offside Right	22x
05- Left goal SSM	86x
06- Right goal SSM	86x
07- High end left	22x
08- Pitch close ups, left.	86x
09- Benches/Interviews	22x
10- Goal mini-camera left	WA
11- Goal mini-camera right	WA
12- Pitch close ups right	86x
13- Reverse angle corner SSM	86x
14- Reverse angle corner HS	86x
15- Reverse angle high	22x
16- High end right	22x
17- Pole cam	WA
18- Steadycam	WA
19- Aerial camera	
19/20- Reverse angle pitch 2,3	
21/22- Main 3,4	
23- High end left 2	
24- Goal left SSM 2	
25- High end right 2	
26- Goal right SSM 2	
27- Offside left 2	
28- Offside right 2	
29- South goal, reverse SSM	
30- North goal, reverse SSM	
31/32- Reverse angle high centre 2,3	
33/34- Reverse angle, high south	
35/36- Reverse angle, high north	
37/38- Goal line	
39- Bench 2	
40- Railcam behind goal	
41- Steadycam right	
42- Beauty	

01- Main	22x
02- High close-up	86x
03- Offside Left	22x
04- Offside Right	22x
05- Left goal SSM	86x
06- Right goal	86x
07- High end left	22x
08- Pitch close ups, left	86x
09- Benches/Interviews	22x
10- Goal mini-camera left	WA
11- Goal mini-camera right	WA
12- Pitch close ups right	86x
13- Reverse angle corner SSM	86x
14- Reverse angle corner HS	86x
15- Reverse angle high	22x
16- High end right	22x
17- Pole cam	WA
18- Steadycam	WA
19- Aerial camera	

In addition to those shown in this image, Type A matches also include cameras on each goal line.

14 cameras - Type B production
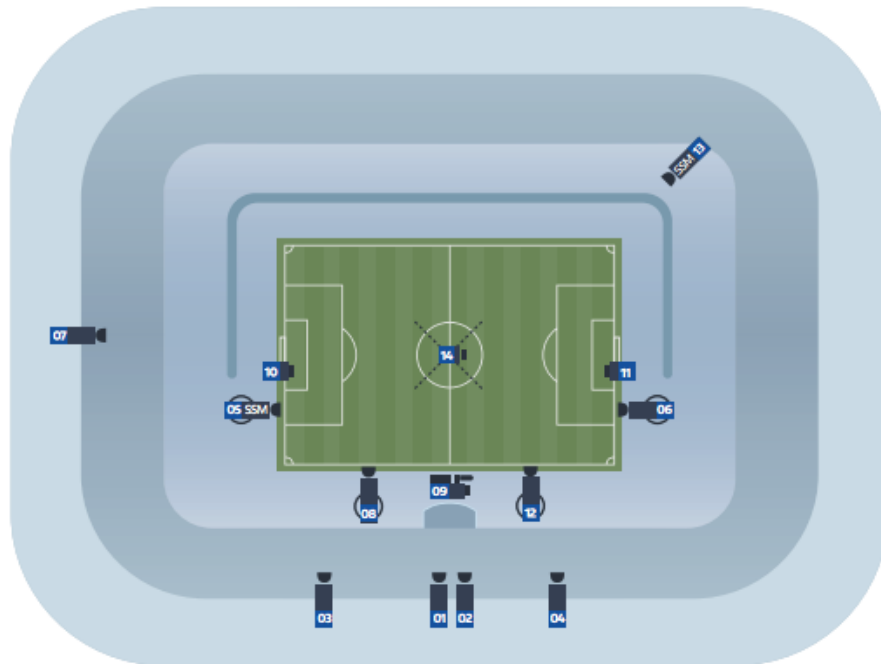
12 cameras - Type C production

Type B		
01- Main	22x
02- High close-up	86x
03- Offside Left	22x
04- Offside Right	22x
05- Left goal SSM	86x
06- Right goal	86x
07- High end left	22x
08- Pitch close ups, left	86x
09- Benches/Interviews	22x
10- Goal mini-camera left	WA
11- Goal mini-camera right	WA
12- Pitch close ups right	86x
13- Reverse angle corner SSM	86x
14- Aerial camera	

In addition to those shown in this image, Type B matches also include cameras on each goal line.

Type C		
01- Main	22x
02- High close-up	86x
03- Offside Left	22x
04- Offside Right	22x
05- Left goal	86x
06- Right goal	86x
07- High end left	22x
08- Pitch close ups, left	86x
09- Benches/Interviews	22x
10- Goal mini-camera left	WA
11- Goal mini-camera right	WA
12- Aerial camera	

In addition to those shown in this image, Type C matches also include cameras on each goal line.

2. SECOND DIVISION

Second Division League Championship and Cup matches played as home teams by clubs of this category are celebrated in the following 22 stadiums:

	CIUDAD	CLUB	ESTADIO
1	A CORUÑA	Deportivo de La Coruña	Riazor
2	ALBACETE	Albacete Balompié	Carlos Belmonte
3	ALMENDRALEJO (BADAJOZ)	Extremadura UD	Francisco de la Hera
4	ALMERIA	UD Almería	Estadio de los Juegos Mediterráneos
5	CÁDIZ	Cádiz CF	Ramón de Carranza
6	CÓRDOBA	Córdoba CF	Nuevo Arcángel
7	ELCHE	Elche CF	Martínez Valero
8	GIJÓN	Sporting de Gijón	El Molinón
9	GRANADA	Granada CF	Nuevo Los Carmenes
10	LAS PALMAS DE G.C.	UD Las Palmas	Estadio de Gran Canaria
11	LUGO	CD Lugo	Anxo Carro
12	ALCORCÓN (MADRID)	AD Alcorcón	Municipal de Santo Domingo
13	MAJADAHONDA (MADRID)	Rayo Majadahonda	Cerro del Espìno
14	MÁLAGA	Málaga CF	La Rosaleda
15	OVIEDO	Real Oviedo	Nuevo Carlos Tartiere
16	PALMA DE MALLORCA	RCD Mallorca	Iberostar Estadi
17	PAMPLONA	CA Osasuna	El Sadar
18	REUS	Club de Futbol Reus Deportiu	Camp Nou Municipal
19	SORIA	CD Numancia	Los Pajaritos
20	TARRAGONA	Gimnàstic de Tarragona	Nou Estadi Municipal
21	TENERIFE	CD Tenerife	Heliodoro Rodríguez López
22	ZARAGOZA	Real Zaragoza	La Romareda

For TV broadcasting, the match signal is produced based on previously defined standard camera plans for each type of coverage.

The following types of coverage are defined for current season 2018-19:

- **Type D**: 3 matches per match day, selected by TV operators.
- **Type E**: Rest of matches (8).

8 Cámaras - **Producción tipo D**
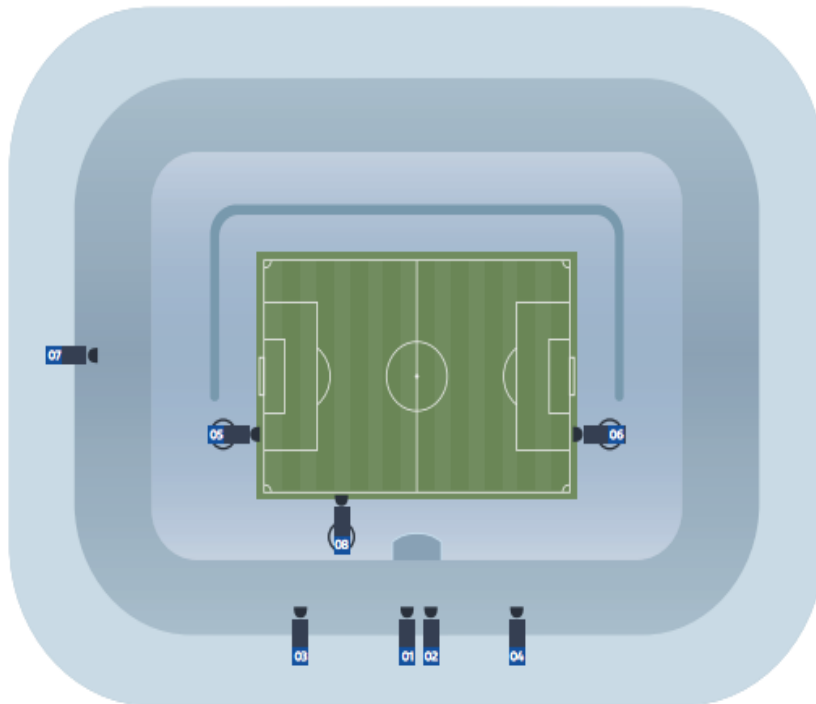
01- Máster	22x
02- Cortos Máster	86x
03- Fuera de Juego Izquierdo	22x
04- Fuera de Juego Derecho	22x
05- Portería izquierda	86x
06- Portería derecha	86x
07- Fondo alto	22x
08- Cortos terreno de juego	86x

6 Cámaras - **Producción tipo E**

01- Máster	22x
02- Cortos Máster	86x
03- Fuera de Juego Izquierdo	22x
04- Fuera de Juego Derecho	22x
05- Cortos terreno de juego	86x
06- Fondo alto	22x

In addition to those shown in this image, from next season 2019/20 all matches Type D or E will also include cameras on each goal line.