

# **BASIC GUIDE TO INSTALLATION AND PREPARATION OF FOOTBALL FIELDS**

MODULE 3

**- CONMEBOL -  
EVOLUCIÓN**

## Unit 1

### Marking of the court according to official measurements

When the field has already received all the necessary preparations for the tournaments, we begin a very important stage, which is the marking of the game lines.

#### Purpose

This activity is an essential part of the court preparation. This marking will ensure that the lines are correctly located according to the court specifications. It is important in the presentation of the course that the lines are clear and well defined. It is recommended that this evaluation be done by a surveyor at least once a year.

As soon as the official assessment is made, provision should be made for the placement of reference points to be fixed in the field. These can be made of materials such as metal pins or wooden sticks, among others. It is common to use plastic or metallic tubes, cut and buried between 0.5 and 1 cm from the soil surface, which, in addition to marking the key points, can serve as a support to stretch the ropes to paint the lines.

It is important to place reference points at the main intersections of the field paint lines, such as the four corners of the field, the ends of the midfield lines, the small and large areas, the center of the penalties and the center of the center circle. In this way, future mistakes can be avoided when painting the field lines.

In any case, these measurements should be checked annually. Handling operations, such as aeration, vertical cuts, sand, change of plates, can displace the reference points or even cover them.

#### Materials

There are a variety of compounds (inks) available that are used for marking. It is essential that they are approved for use on sports fields, with player safety in mind. The long-term effects of any marking material on the turf must also be considered, so that yellowing and turf death does not occur. Any new product (paint) to be used should be thoroughly tested before being approved for use on the playing field.

#### Equipment

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The most recommended is to use a line marker, the most common types being wheel transfer markers, wheel combinations and spray markers. When no other equipment is available, the lines can be painted manually using a brush or roller, but it is necessary to make a very precise marking with the help of cords.

The marking should be done for scheduled on-court surveys and for matches. It needs to be fully executed up to three hours before any use of the court to allow the strips to be completely dry. In shaded conditions, in roofed stadiums, this period can be much longer, so this variable must be taken into account so that the paint can dry properly.

Experienced personnel should be available, always confirming the recommended sash widths. Work with at least two people performing this task, with one person in charge of painting and an assistant stretching the strings and collecting them. Be very careful not to allow wet strings to stain grass blades.

It is mandatory to use new and clean marking ropes, without any kind of knots. Knots can disturb and stain the paint. Before starting work, the main measurements should be checked with a tape measure.

In case of rain forecast for the date of the event, it is important to review the work schedule, anticipating all the handling.

### **Tools**

Some materials should be provided, which should be available to be used in the field line painting operation, such as:

- Suitable painting equipment, preferably transfer or spray;
- Set of metal piles for fixing the ropes during painting;
- 500 meters of good quality, knotless rope of approximately 4 mm thickness;
- Special paint, of good quality, previously tested and approved;
- Buckets with warm water to accompany the painting operation, to be used for the necessary corrections;
- Sponges or rags, to be used in corrections together with buckets of warm water;
- Templates with fixed hollow measurements, such as a measure of the circumference of the center circle center, penalty mark, corner quarter circle, technical area painting;

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- Special green dye for use on sports turf to correct any paint errors observed after the paint has dried;
- Roller and/or brush, to paint finishes such as a corner circumference using stencils;

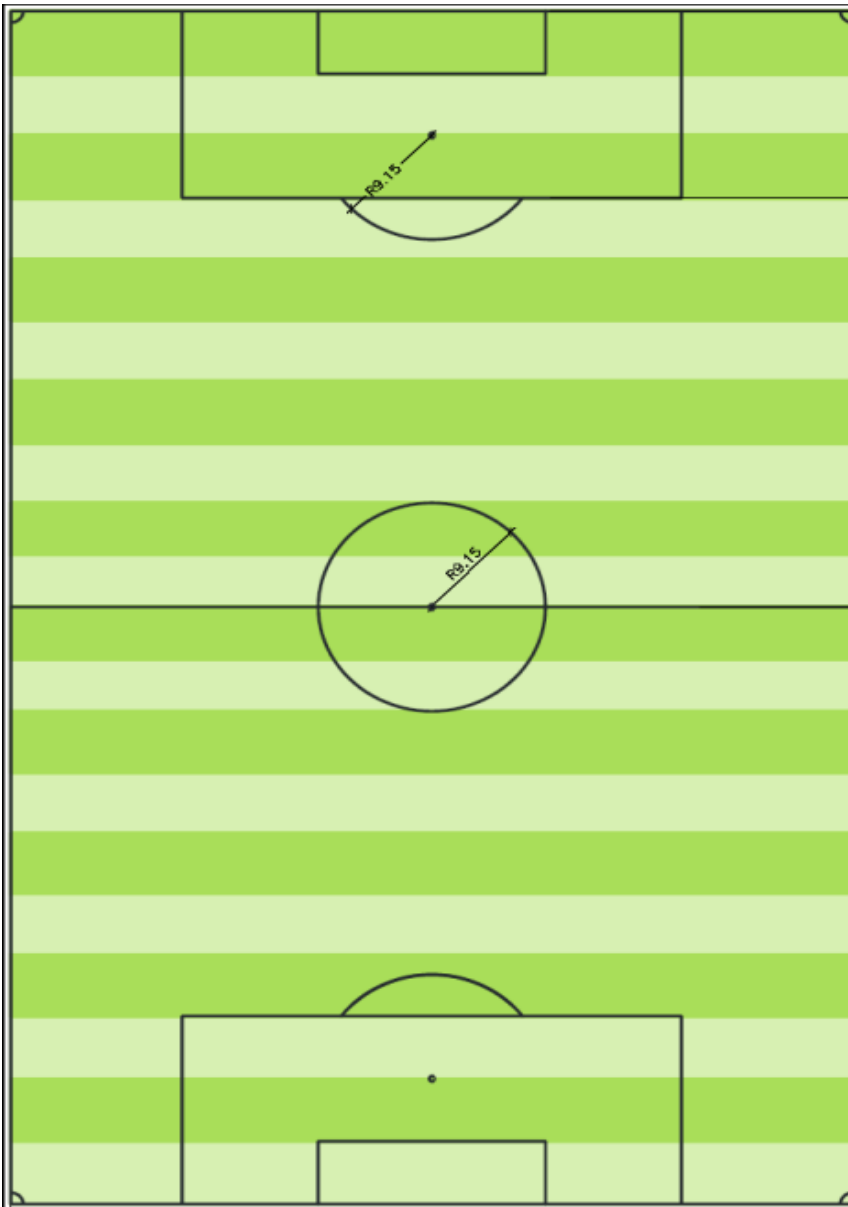
Full details of the field markings and correct measurements are given below.

*It is recommended that employees have access to field marking detail drawings. For this purpose, it is suggested that they be placed in the workroom or provided with an easily accessible digital file for reference in case of doubt during the turf marking operation.*

### Cutting standards

The cutting standards are illustrated below.

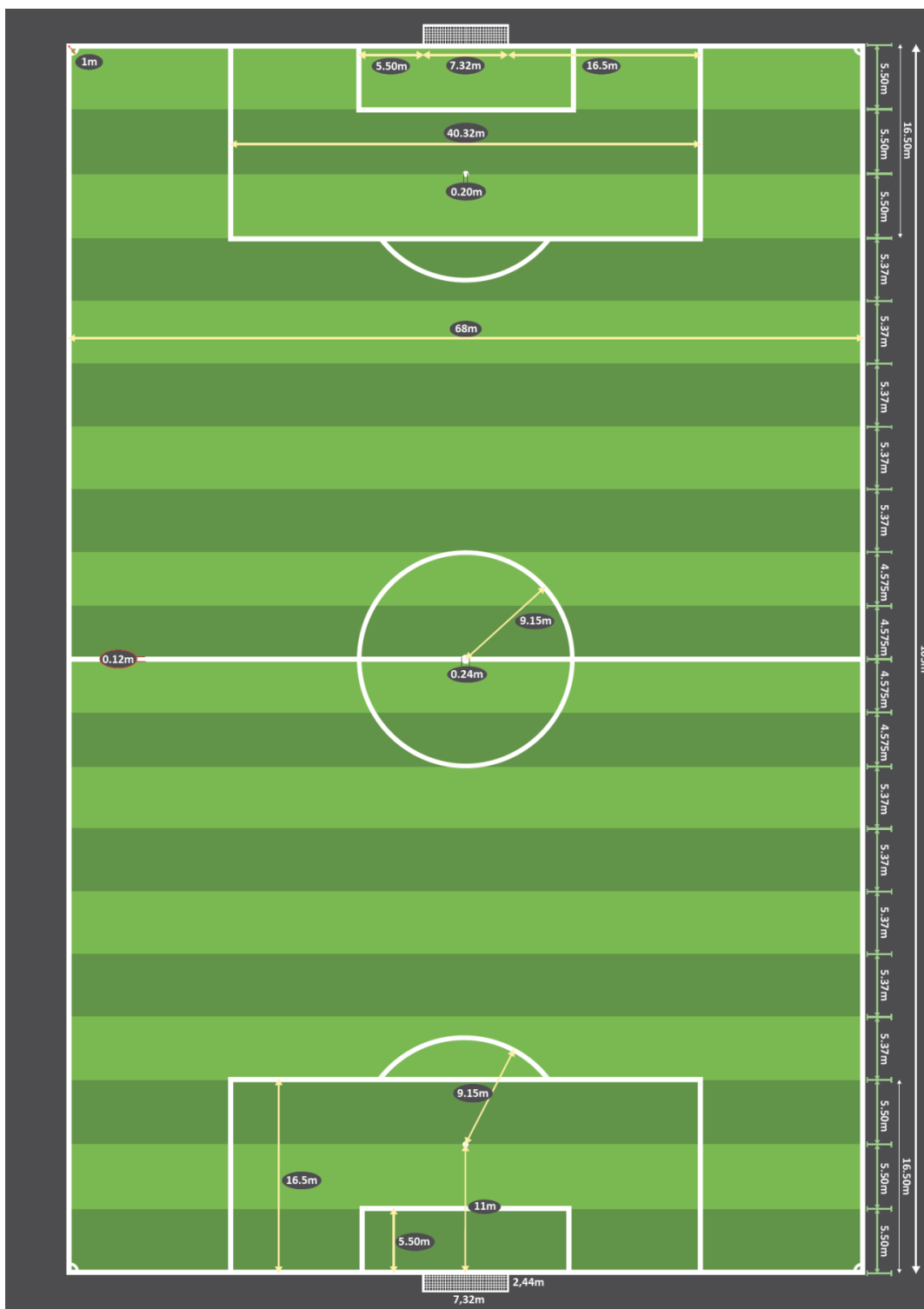
Figure 1: Cross section



Source: CONMEBOL, own elaboration.

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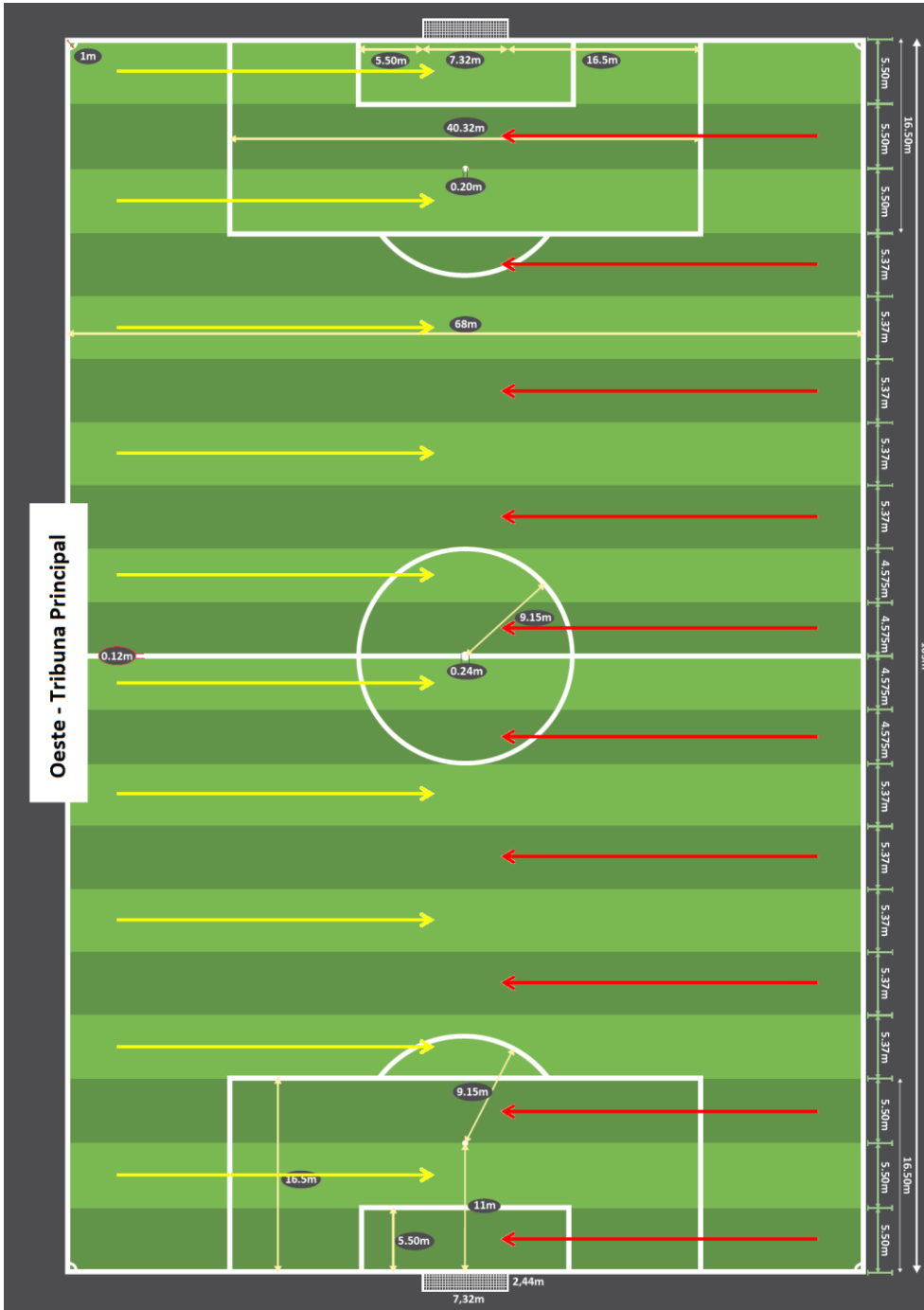
Figure 2: Cross-sectional standard



Source: CONMEBOL, own elaboration.

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Figure 3: Grass cutting direction



Source: CONMEBOL, own elaboration.

## Unit 2

### Court management during playing season

After the completion of the renovation period, it is important to plan for the operation of the stadium during the tournament season. The club or stadium operator needs to clearly define who will be the professionals responsible for planning and executing the necessary tasks and maintenance.

There are several essential operations that need to be performed on a pitch to maintain the quality of the turf surface and to ensure that the substrate in which the turf is planted supports the development of the root system and provides a well-drained and stable playing surface.

#### Work planning

- Personnel work planning should be carried out with the coordination of the agronomist. The forecast of the reserve of inputs and the definition of the management throughout the season should be made, which should include:
  - Annual soil analysis, followed by fertilizer calculation, always based on technical recommendations for sports fields, and using suitable and accredited laboratories.
  - Plan to stock products, liquid and granular fertilizers, agricultural defensives, field marking inks, dyes, seeds, equipment parts storage, to be used throughout the tournament season. To avoid problems, products that have never been used, such as field paints from other manufacturers, should be thoroughly tested off the field at this stage prior to the start of tournaments.
  - Overhaul all equipment for weekly field use, which should undergo a complete overhaul in the non-game period at the end of the season. Perform operations such as changing blades, changing and adjusting bearings, rectifying cutting cylinders, etc. as we saw in Unit 3 of Module 2.

#### Preparation of the turf for training and matches

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After making sure that all annual refurbishment work has been carried out, it is necessary to plan the services to be performed during the game season:

- Weekly or biweekly fertilization plan (granular and liquid fertilizers), to be carried out and revised according to climatic conditions, increased use load, occurrence of diseases, etc.
- Define frequency of cuts: Considering the schedule of matches, foresee cleaning and brushing cuts after training and matches, and helical cuts before events, always with sharp equipment and in perfect working conditions, to achieve the best results.
- Application plan of agricultural defensives: within the work planning, it is important to foresee the preventive control of fungal diseases, which can damage the performance and recovery of the turf. By knowing the main diseases that generally occur, it is possible to plan the application in advance.

### **Details of the processes to be performed**

- **Mowing:** this is the most important handling of sports turf and the most frequently performed. Without a proper mowing we will not have a quality floor to practice professional football.

Its purpose is to ensure that the turf is at a suitable height for games. Only frequent mowing will maintain the density of the grass, otherwise the court will look sparse. The mowing height will depend on the species chosen and the time of year, but, in general, we work with mowing heights between 20 and 25mm.

The height variation should be defined by the professional in charge of the turf, who can modify it throughout the season, depending on the use load and weather conditions, such as the occurrence of frost, periods of excessive humidity or drought.

Helical mowing gives a better finish to the pitch and is the most important task to be performed before a match. Considering that professional turf is maintained with high levels of fertilization, there is a daily increase in the height of the grass; therefore, the closer the mowing is to the start of the game, the more uniform the grass will be at the time of the game. The cut must be very precise, measured with a caliper along the helical cylinder and on the cutting blade, so that it has a uniform height.

It is strongly recommended that double cuts be made for the day of the match for a better finish.

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*The cut-off lines are very important in the presentation of the courts and assist the referees in the definition of penalties. Annex I details the cut-off pattern to be adopted for CONMEBOL competitions.*

Types of cutting equipment:

- Helical mowers (*reel mowers*) trim the turf using sharp blades that rotate at high speed. In these machines, the helical cylinder rotates against a fixed lower blade called a *breadknife*, giving a higher quality cut. This type of equipment is the only one recommended for professional courts. There are machines mounted with a single cylinder (self-propelled), or with three or more cutting cylinders, the latter coupled to wheeled and motorized equipment, where the operator controls the equipment. The choice of cutting equipment must take into account the conditions of the stadium. In places subject to heavy shading, perhaps the best option is wheelless, self-propelled equipment, which will not leave traces on the turf. It is recommended to have at least two cutting cylinders for a field of official dimensions. Sharpening of the cutting cylinders should occur every three cuts at the most, and should always be planned to be done before the last cut prior to a match for best aesthetic results.
- Rotary mowers (*rotary mowers*) that use a horizontal rotating blade, recommended for cleaning thatch and grass waste after games. If this is the equipment used to mow the lawn on game days, it must have new and perfectly sharp blades, with no gaps that can give different heights to the lawn. In addition, it is necessary to have collection boxes to collect all the thatch resulting from the cuts. For different types of mowing machines there are various sizes, self-propelled or mounted on tractors.

It is essential that the cutting blades are properly adjusted to provide a good quality cut and that they are sharpened frequently.

It is necessary to remove grass clippings immediately after mowing, with the use of collection boxes. If *clippings* are left on the lawn, they will decompose, leaving the playing surface slippery and favoring the development of fungal problems.

Examples of cutting machines can be found in Annex II.

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Before performing the mowing of the lawn, it is necessary to note the following:

- Only start mowing with dry blades of grass, without the presence of dew.
- Check the cutter oil level and for leaks before connecting the cutter.
- Check on the cutter the height of cut and the quality, on the whole cylinder. This is done by the HOC (*height of cut*) bar. The cut should be tested on a sheet of newspaper before starting the operation.
- Adjust the cut using cords to ensure even straight lines. Always work with cords in all cutting ranges to be performed. It is necessary that the cuts are visually very straight.
- First, cut the girdle located next to the cordon, always with the equipment being operated by the most experienced officer, and the other operators cutting the central girdle of the cutting lines.
- Cut straight lines at a comfortable walking pace; do not run too much with the cutter; check for faults.
- Always empty the box when it reaches  $\frac{3}{4}$ ; keep a record of volume of cuttings removed because that will confirm the growth rate and determine nutrient applications.
- Stop the cutter in case of cutting defects and define the necessary adjustments.
- Try not to turn the mower sharply on the turf as this will damage the blades of grass. Make turns outside the four lines of the playing field.
- Do not run the cutter over hard surfaces with the front pawl lowered as this may affect the height of cut.
- Do not mow for 48 hours after applying granular fertilizers, thus avoiding collecting fertilizer granules, which would decrease the efficiency of fertilization.

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*Remember that mowing is the most important handling of sports turf and the most frequently performed. Without a proper mowing we will not have a quality floor to practice professional football.*

- Irrigation

Purpose: to provide water for the grass to grow, to reduce stiffness or firmness of the surface, to influence the rolling speed of the ball on the playing surface, to dilute granular fertilizers and other materials applied on the court, to promote the dissolution of salts from the soil, through heavy irrigation.

Fully automated irrigation and pop-up sprinklers are recommended. In stadiums with a roof, it is essential to have a system with individual valve control, so that different areas of the field, more or less subject to shade, can be irrigated individually.

All sprinklers should be 25 mm below the soil surface and should not be detectable on the surface. The irrigated area should be uniform around the sprinklers and no erosion should occur.

In Annex II you will find illustrative images that exemplify the irrigation operation.

Irrigation operation:

- If the water supply is provided by an artesian well, lakes or rivers, it is necessary to periodically check the quality of the water, which may contain contaminants and influence the quality of the turf.
- Monitor daily (1) reservoir and volume of water available, (2) irrigation system pressure, (3) leaks and pressure drop, and (4) sprinkler status and safety.
- When the system is in operation, each court manager should know the volume of water applied per minute and per operation in millimeters (mm).
- All water application should be determined after evaluation of the moisture content of the court. A simple moisture meter should be available at each site for use by the manager.
- It is important, especially in fields with a sandy profile, to adequately wet the field before use to ensure stability and good fixation of the root zone. If it is applied in excess, the turf will become heavy.

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-During court use, all irrigation systems must be disconnected and isolated. The court attendant must ensure that the irrigation system does not go through the risk of actuation during training and matches.

-Irrigations before and during matches will be defined between the match delegate and the agronomist responsible for the field, in common agreement, always considering the weather conditions at the time of the match. In general, it is considered that up to 3 hours before the start of the match, the definition of irrigation is the responsibility of the agronomist, who will carry it out according to the agronomic demands of the plant. At this time, the field will be delivered in perfect conditions, with the soil in ideal humidity conditions. From this moment on, the match delegate will determine the irrigations for the game.

-It is also essential that the irrigation can be activated quickly and efficiently in the previous use, without delaying the start of games. For this, the actuation should be with individually controlled valves (*valve-in-head*), or have sectors that allow irrigation of the playing area only.

-There are irrigation systems that have moisture sensors installed below the surface at some points on the turf. The data collected will help the technician responsible for the field to make a decision on the amount of water to be applied, but will never replace the evaluation made in person.

-It is also recommended to have a rain sensor, to avoid starting the irrigation cycle after heavy rains, and remote activation or monitoring of the system, which can help in the daily management of the field.

-Correct irrigation management is very important to obtain a healthy lawn, free from disease attacks that can be triggered by excessive moisture.

- Fertilizer application

Purpose: to provide a selection of essential nutrients to enable growth, which ensures a strong and resilient turf, as well as to aid in recovery after uses, and to maintain good turf coloration throughout the tournament.

To define which products to apply and the quantities, a chemical analysis of the soil must be carried out in a specialized laboratory. For this purpose, samples of the turf are collected at different points of the field with a soil profile of 0 to 20 cm. The collection methodology is important to ensure a real sample of the situation in the field, and should be guided by an agronomist.

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With this analysis in mind, an agronomist specializing in sports turf will be able to calculate the needs of each particular field. This calculation will take into account several factors, such as the type of turf, the climate of the region, the usage load that will be sent to the field (training fields versus stadiums with few games) and the time of year.

Certain nutrients, such as nitrogen, can be responsible for the appearance of diseases when applied in excess or in very low doses. Therefore, it is very important to apply the recommended amounts for each period of the year.

This analysis should be repeated at least every six months.

Materials and equipment: there are many types of fertilizers, the most important nutrients being nitrogen, phosphorus and potassium, with other elements and micronutrients also needed in small quantities.

There is a wide range of products, with different granulometries and modes of action. They range from more economical, agricultural products with formulations that can be used, to products developed specifically for use on sports turf. Try to opt for fertilizers that have all the nutrients within the same fertilizer grain, which will promote a more uniform coloration of the turf after application. Also, if possible, invest in controlled-release products, especially during tournament times.

Accurate and uniform application is essential, as applications can greatly change the color and vigor of the turf.

It is recommended to always work with the help of cords or foam markers to obtain the best result in terms of coloring.

The technician must be well acquainted with the product to be applied, plan the application dates and know in how many days he will obtain the planned result.

The main methods of application are sprayed or granular materials; for example, using a rotary spreader or with the product in liquid form with a sprayer.

- Application of granular fertilizer

Granular fertilizer is applied using a tractor-mounted spreader or a portable hand spreader. The uniformity of the application is fundamental to avoid girdles on the field or burnt grass stains, which can be very negative.

- Test out of the field before spreading.

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- Adjust the machine and gauge out of the field. Verify that the fertilizer application is being done by testing the machine on a clean concrete floor.
- Do not overfill the spreader.
- Maintain the spreader at a constant rate and level during operation.
- Always stretch reference lines when spreading fertilizer.
- Do not apply extra fertilizer near or at the end of turns.
- Plan the operation carefully before application.
- Maintain product and production records.
- Check and repeat all verification of the product being used to verify if it is the recommended product.
- The court may need to be watered after application to avoid burns. Always check product recommendation.
- All fertilizer applications should be made over the entire width and length of the field to obtain homogeneous results.
- Do not apply in the presence of dew.
- Topic 1 of Unit 3 of Module 2 described how to calibrate a fertilizer spreader.

- Application of liquid fertilizers

Sprayers are used to apply agricultural defensives and fertilizers. Foliar fertilization offers more control over the turf compared to granular products. Depending on the product used, the color of the turf will change a lot; then, you can schedule applications to occur a few days before important overlaps to improve color in a positive way, provided the product is well known and the timing for results.

Any liquid application should be confirmed with the turf consultant (agronomist) to ensure the correct application and rates. It is important to note the following:

- Mark the court well before starting.
- Adjust the machine and calibrate out of the field. Check (1) if the correct nozzles were used, (2) if the correct pressure was reached, (3) if the machine was thoroughly flushed after the previous material application, (4) if there are no

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leaks, and (5) if all nozzles are performing correctly. The nozzle flow rate can be easily measured using a pitcher and a stopwatch. In Topic 1 of Unit 3 of Module 2, it was described how to calibrate a sprayer.

- Do not overfill the sprayer.
- Use PPE (personal protective equipment) in all applications.
- All applications and products used must be in accordance with state and federal legislation.
- Applications should only be made by trained personnel.
- Keep the sprayer at a constant rate and speed.
- Stretch lines when applying.
- Do not apply extra doses near or at the end of turns.
- Plan the operation carefully before application.
- Maintain product and ratio records.
- In case of iron or other fertilizer application, the court may be marked with footprints and traces of the equipment; do not walk on the freshly applied material.
- Most products need at least four hours to dry.
- In general, applications should not be made in direct sunlight. Dusk or early morning are more recommended.
- Check and repeat the review of the product being used, if it is really recommended.

*The calculations and the choice of the type of fertilizer selected must be made by the specialized technical consultant, who will coordinate the necessary tests.*

- Winter sowing (*overseeding*)

Many fields will have a period during the winter months when summer turf is weak, with reduced development and recovery and even dormancy. In these cases, seeding with

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*ryegrass* will be beneficial to provide a denser turf cover while maintaining the warm weather turf base.

In South America, winter seeding of lawns is usually carried out from March 30 onwards. As long as there are mild nights and lower soil temperature it is possible to carry out this management. It is considered that the earlier it is carried out in the fall, the more it will be used. The seeds will last until spring, leaving an excellent surface for professional football practice, resistant to trampling and with a very positive aesthetic effect.

Unfortunately, this management ends up occurring during the playing season. It is necessary to coordinate this activity with the football department, find the best date and avoid any training on the field during the seed germination period.

It is important to note the following items:

- Before sowing, it is mandatory to lower the cutting height and weed the base grass density, with vertical cutting, removing the clippings and thatch well.
- Adjust the machine on a tractor that is narrower than the planter.
- If seeding is done with *spreaders*, it is important to have robust and well calibrated equipment.
- Calibrate the machine out of the field.
- It is important to sow longitudinally and transversely. It is recommended to sow at least in two directions.
- Always sow in straight lines.
- Accuracy and attention to detail are very important to avoid seeding defects.
- Check if there is no oil leakage in the machinery.
- All tractors must have soft, turf-specific tires.
- Do not sow at dawn, with the presence of dew, because there will be loss of seeds that will remain stuck in the tires.
- The only species to be used must be perennial ryegrass (varieties adapted for use in lawns) and at a rate of not less than 500 kg/ha.
- Cleaning and removal of waste after use of the fields

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Purpose: to remove grass clippings and other debris from the playing surface after a game or training session.

Ensure that the turf is vertical, allowing for a more uniform and efficient cut.

Disperse dew that may form on the lawn at dawn.

Equipment: Equipment can range from drag brushes to motorized suction units. Sprayers are also often used to lift debris from the surface and make the lawn more vertical.

- Suction/rotary cutting:

Purpose: Suction/rotary mowing will be used in clean-up operations after games or training and, in some cases, for initial mowing to leave the turf standing. If the fields become soggy, suction mowers will also be used in mowing to avoid surface compaction with the rolls of the helical equipment. However, they would be a temporary measure and would not make a good mowing finish or prepare the turf for matches.

It is necessary to observe the following:

- Check the cutter oil level and for leaks before connecting the cutter.
  - Verify the cut height and quality on the cutter.
  - Adjust the court girdles using cords to ensure equal straight lines; check if the cutter fits in the intended cutting girdle.
  - First cut the girdle positioned next to the chord, always with the equipment being operated by the most experienced officer and the other operators cutting the center girdle of the cutting lines.
  - Cut straight lines at a comfortable walking pace; do not run too much with the cutter and check for faults.
  - Do not turn the sprayer off in the middle of a line; this may scrape the blades of grass.
  - Always empty the box when it reaches  $\frac{3}{4}$  of its capacity. Keep a record of the volume of cuttings removed as this will determine nutrient applications.
- 
- Lawn brushing

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Purpose: a brush pass for dew removal should be made early in the morning to reduce the risk of disease attack to the turf. There are several brush models, but the most recommended is the drag brush, moved exactly on the lines (the marking lines of the field) and which ends up slightly removing moisture from the leaves.

More aggressive brushing may be necessary to leave the turf standing for a cleaner cut or for debris removal after matches. These types of brush are usually moved by tractor, although a portable version has been created, which can be pulled manually, with the official walking.

- Perform all brushing operations within the mowing strips of the turf and always using the field marking cords.
- Do not adjust the brushes so that they work too aggressively.
- Hole correction:

Damage caused during use, which produces deformity in the floor (holes or splits), in addition to causing irregularities in the playing surface, is a source of risk of twisting in the players. This type of damage, if not properly corrected, is cumulative and compromises the quality and safety of the surface. When there is a delay in its correction, there is a tendency for the turf to grow laterally, covering the surface, but camouflaging the hole, which continues to put the player at risk.

There should be a damage correction routine after every use of the turf, be it training or games. The first handling operation after use should always consist of correcting holes, even before mowing. Employees should be organized to cover the entire field by checking and correcting the damage.

Also at the interval of the matches, it is important to provide a trained team to enter the field, correcting the main damage caused in the first half.

Although holes can be corrected with sand, this operation should be avoided as much as possible. The ideal is the use of special equipment adapted for this purpose, such as forks or toothed blades, made of resistant material. With this equipment, the soil should be raised (leveled) and the sides approached with grass to close the holes. In this way, it is possible to correct the problem and restore the closed grass appearance again. Simple correction with sand leaves marks in the turf, until natural closure occurs with subsequent turf growth. The use of sand should be limited to finishing when the holes are too large to be completely closed with forks. In Annex II you will find illustrative images of these tools.

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For sand corrections, good quality sand must be available (it cannot be soil) and it is recommended to mix it with peat to obtain a darker color and better moisture retention. Sifted natural peat is an excellent quality substrate that will not bring pathogens (diseases) or weed seeds to the field.

For lawns with ryegrass seed planting, either at the base of the field or during the winter period, spare seed should be used to mix with the sand.

*For a faster result of this correction, pre-germinated seeds can be used, soaking them in warm water for 2 to 3 days before planting, changing the water several times a day.*

- Weed, disease and insect control

The most intense control should be done at the end of the season, as already discussed in Topic 1 of Unit 2 of Module 2. During this period, only the problems that appear, such as insects, are combated, and preventive management of diseases that will be opportunistic in regions with humid and shady climates is carried out.

Knowing the history of the field, a preventive management plan can be made.

Always be careful with the term of field isolation, and also possible allergies in the players, due to the active ingredient of the products.

During the playing season, it is normal to use the field two or three times a week, with championships taking place simultaneously. This makes it very difficult to apply products, which differ among the different modes of action, and sometimes it is necessary to keep the field unbroken or uncut for a few hours or days, so that the efficiency of the product is achieved. Hence the importance of contacting a professional agronomist specialized in sports turf, who will be able to recommend the product and define the correct application window.

### Maintenance operations and routine management during the season

As the championship progresses, it is necessary to carry out some steps already taken during the summer, so that the course continues to maintain its best characteristics and performance.

- Scarification/Verticutting: It is expected that this management will be carried out very aggressively in the summer period at the end of the season, but in tropical regions, where bermudagrass hybrids are being worked, it is often necessary to carry out a gentler management during the summer-playing season. The objective is to

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maintain the entire field with the same density and thickness of the mat, to promote the same ball roll.

The field should be evaluated weekly, and you may choose to make light vertical cuts only on the sides of the court, for example, which are areas of less wear and where more cushion will form.

In partially shaded turfgrasses, it is common to carry out this management in only one area of the field, which receives more sunlight throughout the season.

This management is done in a less aggressive way, not leaving the field yellow, allowing the games to continue in sequence, without aesthetic compromise.

- Surface or localized aerations: Aeration/des-compaction of the surface can be done during the playing season, using appropriate equipment. In general, small and solid pines are used, which will not alter the final leveling of the field. Equipment for use during the season should be lighter, avoiding the use of heavy tractors.

This management serves to alleviate compaction of heavy soils, aid in disease control in periods of high humidity, and also in algae control in fields subject to shade. Localized aeration is also often performed at points that receive more trampling during the season, for example, to unpack goal and penalty areas, or the entire center strip of the field, along the width of small areas, longitudinally.

One should choose to carry out the management on the date furthest away from the next game, in order to have time to correct any inequality problems that may occur.

- Application of sand in coating - *Topdressing*

Sometimes it is necessary to apply sand in small quantities during the playing season to correct holes or unevenness. Dry material of the correct grain size should be used. Also, the date furthest away from the next game should be chosen for sand application so that it is fully incorporated into the turf profile before the next game. Spread well with metal screens, brushes or heavy mats.

### Routine lawn maintenance equipment

Renovation equipment for end-of-season periods can be rented from third parties and does not need to be available at the stadium year-round.

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Equipment for routine use, on the other hand, must be available in the field, easily accessible and preferably not shared with other facilities. Often problems arise, such as diseases, which must be controlled urgently, or even climatic conditions that change rapidly and need to be anticipated and handled very quickly.

This equipment should be stored in a dry place, kept clean after each use and regulated and sharpened for use. Sharpening and preventive maintenance of equipment was discussed in Topic 1 of Unit 3 of Module 2.

The type of equipment needed will vary and, especially in stages with adverse environments, it may be necessary to have smaller, self-propelled equipment to avoid damage that can occur with tractor-mounted equipment when there are adverse growing conditions, such as shade, or regions that have extremely rainy weather during some times of the year.

In general, it is recommended:

Table 1

Equipment for routine use	
Cutting machines	<ul style="list-style-type: none"><li>● Portable helical cutters with 1 cutting body, minimum 2 units for match preparation, to be used preferably in stadiums with shading problems (typical of more closed stadiums).</li><li>● Portable rotary cutters to lift debris after use and keep the turf upright after the game.</li><li>● Triple helical cutters, self-propelled</li></ul>
Aeration equipment	<ul style="list-style-type: none"><li>● Surface aerator - portable self-propelled drilling equipment (e.g., with 8-10 mm solid punch and 12 mm hollow punch). To be used for management throughout the season and in fields with high percentage of sand.</li><li>● Tractor mounted deep hole aerator. Puncher capable of reaching depths of 200 mm or more. Usually rented from subcontractors.</li></ul>
Vertical cutting equipment	<ul style="list-style-type: none"><li>● Self-propelled or coupled to a tractor, for the removal of the grass mattress.</li></ul>

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Sprayer	<ul style="list-style-type: none"> <li>● Tractor-mounted sprayer or stand-alone unit for application of liquid fertilizer or lawn protection products. Minimum width of 5 meters.</li> </ul>
Fertilizer spreader	<ul style="list-style-type: none"> <li>● Portable (wheeled and manually pushed).</li> </ul>
Seeder for winter sowing	<ul style="list-style-type: none"> <li>● Tractor coupled or manual equipment.</li> </ul>
Sand spreader	<ul style="list-style-type: none"> <li>● Self-propelled equipment or coupled to a tractor, with gravitational spreading, with brush or rotating disc.</li> </ul>
Line marker	<ul style="list-style-type: none"> <li>● Marker with wheel-to-wheel transfer</li> <li>● Line marker with high pressure jet.</li> </ul>
Various tools	<ul style="list-style-type: none"> <li>● Forks, rakes, hand rakes, instruments, grass grafting cups, wheelbarrows, for affiliates.</li> </ul>
Motorized unit for accessories	<ul style="list-style-type: none"> <li>● Tractor with lawn tires</li> </ul>
Brush and rake units	<ul style="list-style-type: none"> <li>● Drag brush</li> <li>● Tractor mounted brush</li> <li>● Tractor mounted rake</li> <li>● Metallic dragging grid</li> </ul>
1m <sup>3</sup> of substrate	<ul style="list-style-type: none"> <li>● Mixture of sand and organic matter, the same used to build the base of the lawn. This material should be dry and stored for hole correction.</li> </ul>
Two spare sprinklers	<ul style="list-style-type: none"> <li>● Of the same make and model, in addition to the corresponding nozzles used during the installation of the irrigation system.</li> </ul>
Granular fertilizer	<ul style="list-style-type: none"> <li>● With a formulation recommended by the technician (agronomist) responsible for the field, in sufficient quantity to make applications throughout the tournament.</li> </ul>

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Liquid fertilizers	<ul style="list-style-type: none"><li>• For liquid application, recommended by the agronomist in charge of the field, in sufficient quantity to make applications throughout the tournament.</li></ul>
<i>Lolium perenne</i> seed bags	<ul style="list-style-type: none"><li>• For fields that have been winter seeded, in sufficient quantity for re-seeding after matches and for use in the correction of holes.</li></ul>
Dyes	<ul style="list-style-type: none"><li>• Producer certified for use on sports turf, in sufficient quantity to correct incidents that may occur during the tournament.</li></ul>
Agricultural defensives	<ul style="list-style-type: none"><li>• For preventive and curative management of the lawn, always with the recommendation of the agronomist.</li></ul>

Source: own elaboration.

### Machinery and fertilizer warehouse

For equipment that must remain in the stadium during the playing season, it is important to have adequate storage space. These places should be close to the field, with easy access by ramps, without steps. Ideally, there should be:

- Machine room: where all equipment in use will be stored, with ample access to facilitate maneuvering of the wider equipment. There should be a well leveled and lighted table for equipment adjustments and minor mechanical repairs. There should be a faucet for washing parts and a cabinet for storing spare parts. It should have supports or hooks to hold shovels, forks, brooms and other tools. In Annex II you will find illustrative images of what these rooms should look like.
- Fertilizer room: well ventilated and dry, with a very wide access door. It should have wooden or plastic shelves, where the bags of products will be deposited, avoiding contact with the floor and walls, which can have humidity and damage the fertilizer.
- Agrochemical room: with cabinets made of impermeable material, with forced ventilation and locked. An isolated location must be chosen and must comply with the specific legislation of each country for the storage and disposal of

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containers of these products. There must be precision scales and measuring cups for the correct dosage of the product.

- Meeting room: small place with table, chairs and blackboard to carry out work planning together with the field staff.

### **Court personnel**

It is important that a sufficient number of staff are available to maintain the facility and that the staff have the necessary training to do the job effectively. Overall cash will be influenced by the value and quality of the equipment available for court maintenance and also whether some of the services will be outsourced. It will also be influenced by the nature of the work performed on site, for example, whether field staff have responsibilities for maintaining locker rooms or local infrastructure.

These personnel need to have the guidance of an agronomist specialized in sports fields, who will define all management, product doses and make fertilization calculations based on soil analysis.

For night games, it is necessary to always foresee two working groups, one that will operate early in the morning, making arrangements for the game, and another that will work during the game.

- The team must be retrained every season, either by adding new employees to the working group, joining new agronomic administrations, or even to reinforce and standardize the administrations already adopted in previous years. The agronomist is responsible for the work, and for this he must always count on a well-trained team, which will carry out the management in the right way. This activity includes the application of products that, even in very small doses, can damage or even kill the turf, hence the importance of a thorough knowledge of the fractionation of doses and the method of application.
- Turf Operations Staff
  - Turf manager: manages the daily operational activities on the field and executes the recommendations of the responsible agronomist, consultant or subcontractor. The importance of the job cannot be underestimated, as their skill will be shown to the world through the presentation and performance of the turf. The main functions of the turf manager are:

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- Ensure that all equipment is calibrated and working properly.
- Ensure that all personnel are doing their best work.
- Manage and coordinate the personnel that will perform the different tasks on the court.
- Perform mowing, fertilizing, spraying and other tasks.
- Maintain notes and records.
- Relate court disruptions/problems/issues immediately.
- Ensure the impeccable presentation of the court.

The pitch manager must keep a log of all turf maintenance operations performed daily by the staff. This log is a working document that must be available for review by CONMEBOL and its consultants and the stadium manager.

The course manager also coordinates equipment operators and hole correction personnel. It is his responsibility to ensure that these personnel receive adequate training and supervision.

- o Other specialized professionals:

It is the field manager's task to identify the individual skills of his or her team, so that he or she can invest in training and have qualified and specialized people for each of the tasks. Therefore, it is recommended that staff be trained in more than one task, but always provide a minimum number of people who know how to perform each of the activities, as described below:

- Have at least three employees who know how to mow the lawn in a very neat and efficient manner;
- Two people must know how to make all field marks accurately;
- One of the employees needs to be more specialized in preventive maintenance services for equipment, oil changes, filters, cylinder adjustment, equipment sharpening;
- Two employees must be familiar with and perform preventive maintenance on the irrigation system, and interchange sprinklers, cleaning the system when necessary;

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- Two employees must be qualified and legally registered to apply crop protection products in the field. These persons must receive additional payment for unhealthy work, in accordance with the legislation of each country, and receive personal protective equipment on a regular basis. They are obliged to use this equipment for each application to be carried out.

### **Intensity of court use**

The usage load is highly dependent on the quality of construction, the species of turf used and the standard of maintenance. The intensity of use that a pitch can receive will also vary at different times of the year, depending on temperatures, rainfall and turf growth rates.

-The allowable levels will depend very much on the quality of the turf desired and it is essential to recognize that the load of use will increase maintenance demands and costs, as well as reduce the quality of the playing surface.

For pre-game warm-ups and turf recognition training, it is advisable to use portable poles, installed on the sides of the field, to reduce wear and tear mainly in the goal areas.

-It is important that there is a policy in place to determine when a match or training session may occur under adverse weather conditions. If training sessions are conducted with unsatisfactory field conditions, irreversible damage can often be caused to the field that will receive a match scheduled to take place the day after the training session.

-When planning the use schedule for a field, it is important that sufficient time is available to complete essential maintenance operations. Some maintenance operations are best spread over two to three days, for example, to allow for aeration and scarification recovery, to allow time for fertilizer to be absorbed after application, and to allow for recovery after seeding. There should be sufficient space in the use schedule to allow for more intensive maintenance operations.

- The team responsible for the field should maintain a channel of communication with the Pro Football Department throughout the season so that they can quickly discuss any changes to the schedule that may be necessary. The occurrence of a serious illness, or days with a high incidence of rain, for example, may make it necessary to swap jobs, cancel training or previously scheduled field reconnaissance.

## **Unit 3**

### **Match day**

General match day arrangements from the start of the match day and previous match days

It is considered that the field will arrive on the day of the competition in the best possible condition, provided that the premises already mentioned in this document are met, which include both the reforms carried out during the off-season, the installation of infrastructure elements and the routine management during the playing season.

The CONMEBOL match delegate will arrive at the stadium approximately 48 hours in advance and must check the entire field.

Checks to be performed by the delegate

- a) General conditions of the turf;
- b) Cutting height;
- c) Presence of holes, imperfections, significant unevenness, areas without grass.
- d) Activation of the irrigation system;
- e) Verification of all field measurements and markings, as well as the correct installation of nets and flags.

After this inspection, he will communicate with the court manager about the possible interventions that are necessary before the match, and will also discuss the time of execution.

Protocols to follow according to the countdown of the match

In possession of the countdown document, prepared by CONMEBOL, the person in charge of the field will plan all the operations to be carried out, which will include:

- MD - 2 (*Match day - 2*, or, two days before the match): review of the field by the CONMEBOL Match Official.
  - a) Field with correct markings, in bright color;
  - b) Cutting height equal to that which will be practiced on the day of the game;

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- c) All damage repairs from previous games already completed.
- MD - 1 (*Match day - 1*, or, one day before the match): Preparation of the field for the recognition of the teams.
  - a) Cuts in the bands recommended by CONMEBOL, prior to the scheduled time for the recognition;
  - b) Field marking already finished and dry before the arrival of the teams.
- MD - 1 (*Match day - 1*, or, one day before the match): Management after the field reconnaissance:
  - a) Clean the lawn, brush and repeat the mowing;
  - b) Correction of all damages, general overhaul of the field by bands;
  - c) Irrigation for turf recovery.
- MD (*Match day*): list of activities to be performed, in sequence:
  - a) Removal of dew to dry the field, preparing for handling.
  - b) Mow the lawn, preferably double cuts, with precise mowing strips, using strings. After finishing the cut, avoid stepping on the lawn as much as possible, so as not to erase the cut strips;
  - c) Field marking. The most experienced employee, with the help of his assistant, will walk alone in the direction of the cutting strips, to make the marking of the field, thus avoiding erasing the drawings formed on the field;
  - d) Installation of nets, arches and flags, to be carried out before opening the doors to the public. Check also the correct fixation of the nets, with buried screws.
  - e) Application of dyes. If necessary, it should be done before the opening of the doors. Preferably, do not apply colorants in direct sunlight.
  - f) Agronomic irrigation to be carried out throughout the day, up to 3 hours before departure, under the responsibility of the agronomist.
  - g) Irrigation in the three hours prior to the match and at halftime: to be defined by the match delegate, evaluating the weather conditions and advised by the agronomist. If the delegate authorizes, sprinklers must only be activated within the four lines of the field, without wetting the professionals working around the

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turf. The total number of minutes will be defined and must be divided by the number of sectors on the field.

### **Operation during the match**

- Uniformed and accredited officials during the match: have 4 trained and uniformed officials, who are part of the court staff, who will work during the match and will remain attending the match in strategic locations (generally positioned in the aisles, out of sight of the public, being 2 people in the north and two in the south). They must have 4 spare flags, ropes to repair nets that may break, ladders to change the moving beams, forks and shovels to correct holes, individual bags to collect grass waste. In Annex II you will find illustrative images of this operation.
- They will perform the following tasks:
  - irrigations prior to warm-up and match. This management allows to obtain a better ball roll/slide. Irrigation can also be requested at halftime of the match with a maximum of 8 minutes of operation.
  - Correction of holes: to be done at halftime of the match, with special equipment for this handling (forks and bags to collect waste). Officials must follow the match, observing the occurrence of major damages caused by the boots, which will be corrected as a priority. They will only enter the field after the departure of all players (2 people for the north and two for the south) and will remain for 12 minutes, observing for major wear and tear and checking the goal and penalty areas as a priority. In Annex II you will find illustrative images of these tools.
  - Spare flagpoles and poles: have 4 spare flagpoles, leaving 2 with the staff in the north and 2 in the south, in case of a broken flagpole, which will be immediately replaced by the staff member. Have a spare pole with nets and a ladder for emergency change. Train the court staff to quickly perform this replacement.

### **Repair after the games**

As soon as the match is over, it is important to start the recovery work for the next event, which should include the following items:

- a) Removal of poles and nets to facilitate management.

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b) Rotary cutting, brushing and waste collection.

c) In case of matches the following day, in addition to the rotary cut, it is important to make the helical cut, even immediately after use, to mark the bands.

d) Correction of the holes: with the use of special forks, closing the damage done by the heels of the boots and removing the material (grass residues). In the case of a field with winter seed sowing, a mixture of seed + sand + organic matter should also be used, placing a small amount in the holes to be filled.

e) Irrigation: to stimulate grass recovery.

### **Information Flow**

The CONMEBOL Match delegate, after consultation with the pitch maintenance manager and/or Stadium Manager, is the decision maker. The turf managers, subordinate to the Stadium Manager, will receive, within the normal course of operations, guidance on how to proceed.

The match delegate must be informed about all maintenance deadlines and turf maintenance operations on a regular and continuous basis. It is essential that the club presents to the delegate the person responsible for turf operations (foreman) to guide the officials to perform the operations.

### **Pre-match work planning**

The courts interact with many other operations and activities within the stadium in terms of preparations and cleaning. A table should be formulated for each day, and shared with those responsible, so that all stakeholders know what is going on in terms of court operations.

The recommended handling for training is as follows:

Teams must receive the turf for training and field reconnaissance on the eve of matches, with preparations identical to those made for an official match.

The height and mowing quality of the grass should be the same, the lines should be marked, with vivid coloration, the humidity of the grass blades should be adequate. If necessary, perform soft irrigation before the equipment enters the field.

In case of two training sessions on the same day, it is necessary for the maintenance team to make repairs between sessions, delivering the field for the second team in the best



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possible condition. Prioritize the correction of holes and, at intervals longer than two hours, perform mowing with triple equipment, to collect grass residues and clean the field.

At the end of the training sessions, on the eve of the match, it is advisable to carry out a cleaning cut, correction of holes and irrigation to aid in the recovery of the turf.