Report of Professional Baseball Existing Subsurface and Surface Playing Field Conditions

Project:
Hsinchu Municipal Baseball Stadium
Hsinchu City, Taiwan

Presented to:

Erik Chang – Bros Sports Marketing

August 10, 2023

BrightView SportsTurf
7431 Montevideo Road
Jessup, MD 20794

Mr. Erik Chang
Bros Sports Marketing
Hsinchu, Taiwan

Subject: Final Report of Playing Field Existing Subsurface and Surface Evaluation
At Hsinchu Municipal Stadium

Dear Erik:

Brightview SportsTurf has completed the authorized subsurface and surface field assessment and Laboratory testing (completed by A. McNitt & SerenSoil Testing). These services were performed in general accordance with the scope of services outlined in our Proposal and phone discussions.

The purpose of this study was to determine general subsurface conditions at widely spaced test hole locations, and to better understand the existing field conditions, design intent and materials used during construction of the field on which to base our recommendations for improvements relative to professional baseball industry standards.

We appreciate the opportunity to work with you and we look forward to assisting you through the recommendation and modification phases of this project.

If you have any questions or need any additional information, please feel free to call us.

Respectfully Submitted,

Murray Cook
SportsTurf Executive
BrightView

Chad Olsen
General Manager
BrightView

SCOPE OF SERVICES

The objective of this review is to provide playing field recommendations addressing playing field performance and playability concerns with the field of play.

PLAYING FIELD ISSUES:

1. Field Drainage Concerns
2. Infield Skin Material Review
3. Warning Track Material Review
4. Irrigation Rotor Layout and Review
5. Overall Playing Surface Review

The following on site review activities were conducted on July 13, 2023:

1. Field Reconnaissance: Field observation walk, test hole layout and excavation completed. These holes were completed using a mini excavator provided and operated by others. The materials were separated into piles for sample collection and review.

2. Test Holes: Eight (8) test hole locations were located randomly within the playing field. The depth of each test hole varied based on the underlying and existing conditions.
    a. Test Holes 1,2,3,8, were located above the existing parking garage located underneath the playing field (approximately 20" below the surface).
    b. Test Hole 5 was located on the interface of the parking garage and full field column in the outfield.
    c. Test Holes 4 and 7 were located in the outfield beyond the limits of the parking garage and within the full field soil column.
    d. Test Hole 6 was located in the centerfield warning track.

Figure 1: Approximate Test Hole Locations

e. Soil samples were collected from varying soil and aggregate layers observed within the soil column at each test hole location, exception hole #2.
f. Onsite flood testing of each test hole was completed.
g. Test hole 2 - a flood test and visual observation was completed (no soil samples collected).

3. Laboratory Soil Classification Testing: Laboratory testing completed focused on the general characteristics of the soils located within the soil column with an emphasis on athletic field rootzone design in comparison to USGA specifications and industry standards for professional baseball bulk materials.
    a. USGA Specifications is the accepted industry standard for athletic field rootzone design and construction methodology for high performance athletic fields in the USA.
    b. Laboratory Testing included the following testing information:
        i. Particle Size Analysis
        ii. Sand Sieve Size Analysis (ASTM F 1632)
        iii. Physical Properties (ASTM F-1815-11)
        iv. Soil textural Class
        v. Silt/Clay Ratio
        vi. Color (Munsell Soil Color Chart)

TESTING RESULTS AND RECOMMENDATIONS:

4. Top Soil Layer Comments:

    The soil composition of the top layer of the field contains more fine soil particles than recommended by USGA specifications and/or any athletic field rootzone specification that is designed to drain water quickly through the soil profile and drainage system. The soil materials selected for this project do not provide adequate drainage performance.

    This layer of soil is problematic for the following reasons:
    a. This layer will be slow to drain after a rain event and water ponding at the surface of field.
    b. This layer makes it difficult for staff to maintain high quality turfgrass needed for professional baseball because of the intense management practice and equipment needed to keep the turf healthy and safe to play on.

Figure 2: Top Layer of soil profile tested at each hole location

c. The use of fine textured soils is extremely prone to soil compaction and is a primary cause for many athletic field problems and failures.
d. When the surface layer becomes compact and dry it becomes excessively hard. This condition creates an increased risk for player to field contact injuries.
e. Grass root development is often not as dense in these soil types and provides a weakened plant that is not able to recover from foot traffic and mechanical stresses associated with maintaining natural turf.
f. This layer prevents rainwater from draining through quickly and holds water up at the surface making the field slow to drain and unplayable during wet periods.

RECOMMENDATION: Reconstruction of this layer with a rootzone material capable of resisting compaction and allowing for enhanced drainage performance is recommended. We have had good results at one professional baseball field in Taiwan by blending two local sands together with an organic material to create a sand based rootzone mix that meets USGA specifications. The rootzone mix resists compaction, provides improved drainage performance, and can sustain healthy plant growth.

❖ Top Soil Layer Laboratory Testing Results – *See link attachment in email / Exhibit A*

- Test Hole 1 – Does not meet USGA Specification
- Test Hole 3 – Does not meet USGA Specification
- Test Hole 4 – Does not meet USGA Specification
- Test Hole 5 – Does not meet USGA Specification
- Test Hole 6 – Does not meet USGA Specification
- Test Hole 7 – Does not meet USGA Specification

5. <u>Middle Stone Layer Comments</u> (located below the top layer):

This layer of aggregate stone is problematic for the following reasons:

a. The stone contains fine stone dust particles that lock up and compact, preventing water from entering the drainage system which is located below this layer.
b. This material is not typically used in athletic field construction as an approved growing media or drainage material.

RECOMMENDATION: Removal of this layer is necessary to provide field drainage.

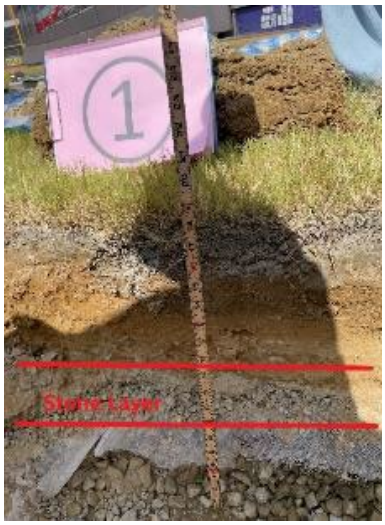


Figure 3: Middle Stone Layer

6. Bottom Stone Layer Comments (located below the middle layer):

   a. Flood tests were completed with this layer installed and the above layers removed. This layer allowed water to flow out of the test hole.
   b. The poorly draining top soil layer and underlying middle layer of the field profile do not meet performance specification for athletic field construction and remain a drainage concern.
   c. We completed flood testing at each test hole location, and it appears once the top two layers of the field are removed, water does drain in the bottom stone layer and discharges through a network of floor style area drains installed on top of the parking garage located at the field and garage interface (bottom stone layer). These area drains are installed on a 30' grid pattern and transitions to 6" pvc pipe beyond the limits of the parking garage structure and discharging behind outfield wall.

Figure 4: Bottom Stone Layer

   d. We recommend having a licensed civil engineer review and confirm drainage calculations and system design parameters are adequate for the field of play. The drainage system is not a traditional system and additional due diligence is recommended.

7. IRRIGATION ROTOR AND VALVE LOCATION REVIEW:

   The irrigation rotor layout is inadequate for professional baseball and proper turf management care. The rotor spacing installed in the field does not allow for head-to-head coverage which is a critical design element that is needed in order for the field to be irrigated adequately.

   The irrigation layout is problematic for many reasons:

   a. Rotors are spaced too far apart. The spacing is further than manufacturer recommendations for the products.

Figure 5: Irrigation Rotors

b. Rotors are not sized and nozzled correctly allowing water overthrow onto baselines and infield dirt areas which makes it extremely difficult to effectively manage proper moisture content in turf and dirt areas.
c. Observed irrigation electronic and gate valves located in turf areas in fair territory and some boxes were missing lids. These locations present an increased risk for player contact injuries.
d. The system does not provide uniform precipitation rates and areas are being overwatered and other areas are being underwatered.
e. Proper irrigation design methodology provides precise and zoned system design for both turf and dirt areas. It is not an industry best practice to have rotors watering both dirt and turf with the same rotors and should be avoided as much as possible.

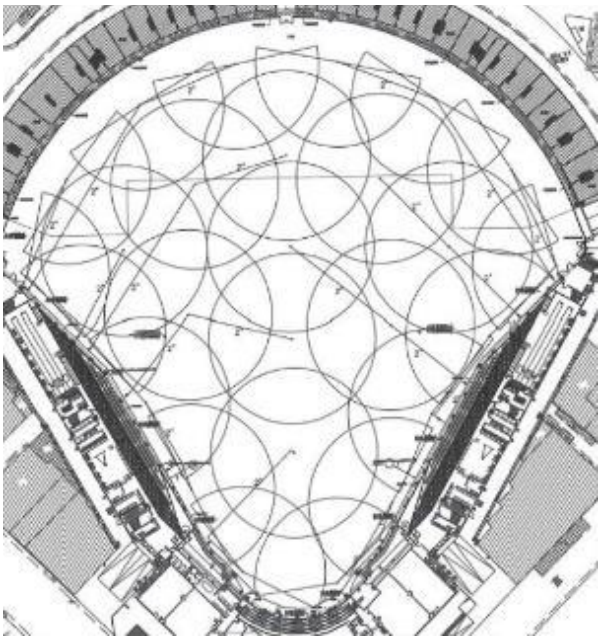


Figure 6: Irrigation Rotor Layout

RECOMMENDATION: Irrigation system reconfiguration will be required in foul territory, infield, and outfield turf areas. Irrigation valves and rotors need to be properly located and spaced. The existing electronic valves, and rotors may be preserved (if determined they are in good working order) and reconfigured to allow for head-to-head coverage with valves located below grade in the warning track or behind outfield wall. A new irrigation design is recommended in order improve and evenly distribute water across all turf areas and to determine the full extent of the modifications. The irrigation pumps and control panels all appear to be designed and sufficiently sized, so irrigation issues are isolated to the field of play.

8. <u>INFIELD DIRT (SKIN) MATERIAL AND PLANARITY REVIEW</u>:

a. The composition of this material does not meet general standards for professional, high school or parks and recreational infield mix design. The ratio of sand, silt and clay does not comply with industry standards for baseball infield mix.

RECOMMENDATION: The installation of a soil amendment is recommended to improve the composition of this material to change the sand, silt, and clay values within acceptable standards for professional play.

b. The grade of the infield is within compliance standards for infield skin areas. The slope percentage on the infield skin is approximately .3% and does allow for surface water shed into the outfield. However, it's necessary for an infield tarp to be deployed to protect this

area during a rain event. This is standard practice for this area of the field as it is not designed to drain vertically like turf areas.

9. PLAYING FIELD GRADING AND MEASUREMENTS:

   a. The playing field does not comply with rules and regulations for professional baseball. Both the mound height and distance were incorrect at 60' 7.5" and height was 12.25". The correct measurements are 60' 6" and 10". The 95' arc measured 96'.

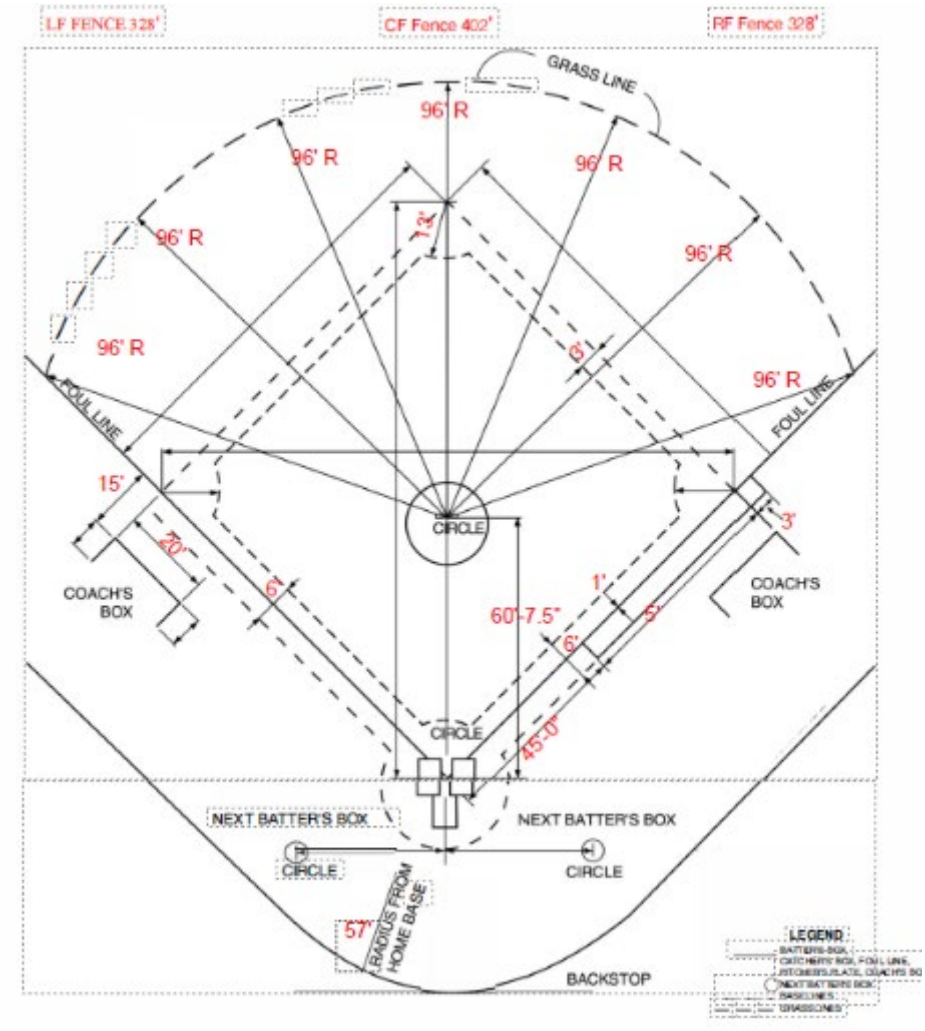


Figure 7: Playing Field Measurements

   b. The infield grass area does not meet standards for professional play in the following areas:
      i. Slope Percentage Mound to 3rd base - .81%
      ii. Slope Percentage Mound to 2nd base - acceptable

iii. Slope Percentage Mound to 1st base - .71%
iv. Slope Percentage Mound to HP - acceptable

c. Warning track in foul territory does not minimum width requirements. The warning track needs to have a minimum distance of 15' from all walls and fences around the entire field.
d. Surface drain located at field perimeter and in foul territory is not an approved fixture.
e. Surface drain located at field perimeter in fair territory is not an approved fixture.
f. Increased turf maintenance standards and supporting budget
    - Professsional Field Equipment
    - Professional Field Staff
    - Material budget including an agronomic and ipm program

RECOMMENDATION – Include these modifications in any future field improvement plans.

10. PROPOSED FULL FIELD REPLACEMENT AND ALTERNATE OPTIONS:

a. Option #1 Natural Turf Field Replacement:
This option would be an extensive project that would require removing the top two layers of the soil profile and replacing these with approved sand and aggregate materials that will allow for improved drainage performance. The turf would need to be replaced and grow in prior to any games being played. This requires overnight temperatures to be above 18 degrees Celsius until the field is fully established. There are two drawbacks to this option:
    i. The availability of sands in Taiwan for this use are scarce and expensive and would require blending multiple sands together which adds a complexity to the process and build. This issue coupled with the lack of specialized blending equipment and companies familiar with engineered soils makes this a very slow and high-risk process to accomplish correctly.
    ii. I have visited a few sod farms in Taiwan over the years and the quality of the sod is not game ready sod, so any attempt to resod the field needs to be allowed for in the construction schedule ensuring adequate time is available to properly establish and grow in sod.
    iii. Infield dirt area would be amended.
    iv. Requires extensive modifications to irrigation system.
    v. Replace existing perimeter surface drain with approved fixtures.

    Also, it is important to note field access is restricted and the use of full-size dump trucks is not available which adds complexity and time to any large-scale field improvement. There is only one access point located in centerfield for the field.

b. Option #2 Synthetic Turf Field Replacement
    i. This option would be an extensive project that would also require removing the top two layers of the soil profile and turf and replacing these with specified stone materials and installing new synthetic turf. One advantage of this system is the aggregate materials are available in Taiwan and much easier to source locally.

This project requires installing concrete curbs around dirt areas and outfield fence so the turf can be properly secured to a nailer board.

ii. This option requires less time for installation over option #1 because it eliminates the time needed for turf grow in and establishment and engineered soil processes. One drawback of this option is surface temperatures during the summer months can be extremely hot, so its critical to look at manufacturers that offer cooler infill materials. These materials can significantly reduce surface temperatures when compared to the more commonly used crumb rubber infills.
iii. Infield dirt area would be amended.
iv. Replace existing surface drain with approved fixtures.
v. Irrigation requirements are less and not as many modifications to the existing system would be required.

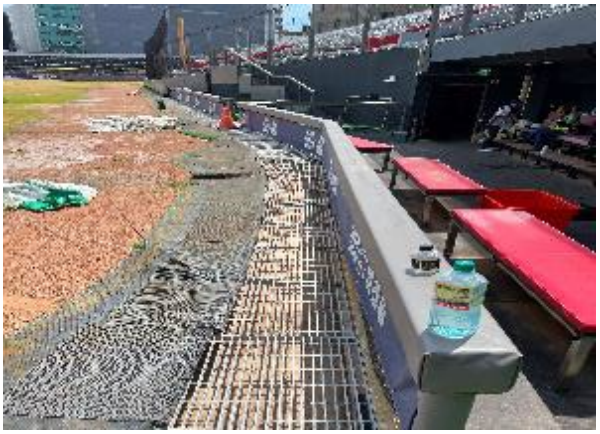
11. PROPOSED ALTERNATE MODIFICATIONS TO REPAIR EXISTING FIELD – SAND CHANNEL DRAIN OPTION:

a. This option offers increase drainage performance over current field conditions, but not as high as the full field replacement options. This option uses a 6" trenching machine to remove the upper layers of the field profile, replacing this material with an engineered sand.
b. The spacing of drains are typically installed on 7' – 10' spacing depending on the sand testing results.
c. The volume of sand required for this option is significantly reduced over full field replacement options.
d. Infield dirt area would be amended.
e. Requires extensive modifications to existing irrigation system.
f. Additional sand would be needed to heavily topdress the field to improve surface conditions.
g. Repairing open trench scars would require sod and time for grass to establish.
h. Ongoing maintenance of trench lines is likely as trench lines settle.
i. Its important to note that in the hot summer months trench lines may become visible when turf becomes heat stressed from draughty or nutrient deprived conditions.

FIELD OVERVIEW

TURF PROFILE ABOVE GARAGE

FIELD ACCESS



PERIMETER DRAIN GRATE

TEST HOLE

BOTTOM STONE LAYER

FLOOD TEST


INFIELD MIX PROFILE


MIDDLE STONE LAYER

INFIELD MIX


BOTTOM STONE LAYER


FLOOD TEST

WARNING TRACK FLOOD TEST