Construction of the Turf Pitches in Tseung Kwan O Sports Grounds - A Case Study

個案研究 - 將軍澳草地球場的建造

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I am also grateful to Mr. Leo Overmann of Vista Co Ltd, my partner in this project for designing and overseeing the installation works drainage and rootzone layers of the two turf pitches.

Mr. Leo Overmann of Vista Co Ltd,是我在這工程的拍檔,他負責有兩個草地球場疏水層及根系層的設計及監管其建造,謹此致謝.

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Several photos showing operation on turfing are credited to Mr. Leo Yeung, Project Manager of this Work under Pegasus Greenland Co Ltd

數張工程進行之照片由當時千里馬綠化有限公司之項目經理楊建業先生供給,謹此致謝.

Parties involved in the Turf Pitch Construction (Part)

Client 場地屬主**: Leisure and Cultural Services Department** 康民署

Project Management 場地建築監管**: Architectural Services Department** 建築署

Main Contractor 總承建公司 **: China State Construction Engrg. (HK) Ltd** 中國建築(香港)有限公司

D. Sub-contractor (Turf) 特別承建公司(草地)**:Pegasus Greenland Ltd**千里馬綠化有限公司

Turf Pitch Consultants 草地球場顧問**: Eric YT Lee & Leo Overmann**

MISSION 使命

To build the First Sports Ground in Hong Kong to fulfill FIFA & IAAF Standard

建造第一個符合國際足協 **(FIFA)**及國際運動聯會 **(IAAF)**標準的體育場地

FIFA : Federation Internationale de Football Association (國際足協**)**

IAAF : International Association of Athletics Federations (國際田徑協聯會**)**

Tseung Kwan O Sports Grounds Project
將軍澳運動場工程

This is a Design and Build Project by the Main Contractor Yet Had To Abide to Employer's Requirements (ER) and be Responsible for them!

這是一由總承建商設計及建造的工程但要跟從一些預定的規限 **(ER – Specification)**

1. Turfing and Rootzone Construction
草地及根系層的建造

Employer's Requirement (ER) for Turfing

- **The Turf shall be high quality and shall be the species of *Axonopus compressus*, *Cynodon* "Hybrid/Cultivars", *Zoysia sinica*, *Chrysopogon aciculatus* and *Paspalum conjuga*tum as specified in a mix ratio or single species. Each pieces of turf shall be rectangular …… (See ER/AR/A3/178 (10.7.2 (2) g)**
- 草地用草必須是高質素的大葉草,或雜交/栽培種的狗牙根、中華結縷草 、粘人草及雙耳草之單一草種或依一定比例的上列草種的混合草. 所用的 "草皮"必須為長方形 **……. (See ER/AR/A3/178 (10.7.2 (2) g)**

Employer's Requirement (ER) for Rootzone Construction

1. **Drainage of the site can fend of the once every 50 years rainfall (See ER/AR/1), i.e. 200 mm/hour.**
   場地排水量足以應付抵禦香港-50年的重現期 一遇的下降雨水量 (見ER/AR/1) - 即每小時排水200毫米
2. **Ratio of the soil mix is: Sand: Soil: Conditioner = 50:30:20 (See ER/AR.A3/54).**
   土壤混合泥比例指定為: 沙:黏質土:土壤改良劑為 50:30:20 (見ER/AR.A3/54)
3. **Minimum thickness of the soil mix, i.e. rootzone layer = 500 mm. (See ER/AR.A3/179 (3)(a).**
   場地最小要求 500毫米 深的土壤混合泥。(見 ER/AR.A3/179 (3)(a)

Test Result on Infiltration Rate and Depth of the Soil Mix Layer
泥/沙/土壤改良劑混合土之滲透率及厚度

Lab test result for such fabricated soil mix of Sand:Soil:Conditioner = 50:30:20 at 500 mm thickness of the soil mix layer could not meet drainage requirement as required by ER.

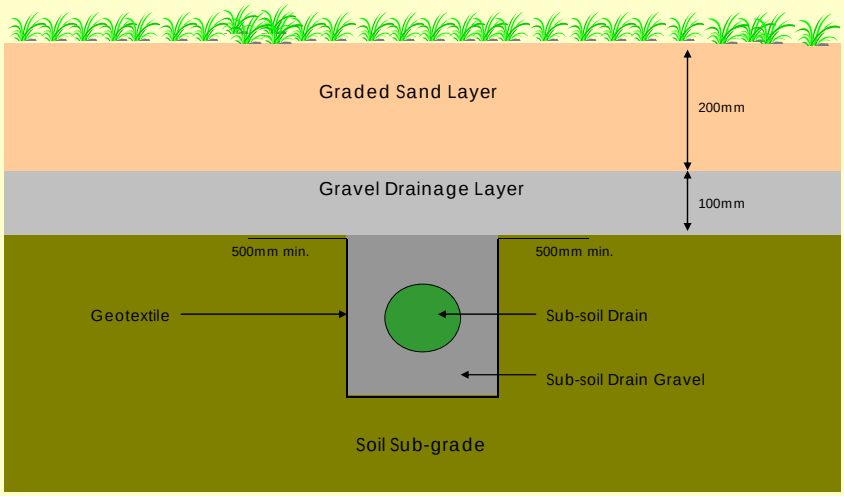
檢測報告確認500 mm 厚度及50:30:20 組成之泥/沙/土壤改良劑之混合土不可以達到ER的標準的滲透率.

What to Do next?

1. **Perform tests confirmed that the ER for Rootzone construction will not meet the requirement.**
   進行測試以確認現行的ER可行性.
2. **Seek professional opinion from third party and look for alternative design on rootzone construction and turfing to meet the specific ER!**
   尋求第三者專業意見及新的根系層設計以符合ER的要求.
3. **Set up mock up to show that the new design is workable!**
   建立"實物模型"以証實新設計的可行性.
4. **Seek approval for changing the design.**
   尋求批準以改變原本的設計.

- **An all-sand-based rootzone profile was recommended.**
  採用全沙性的根系層設計.
- **Details of the specification of the composing layers proposed.**
  提出全沙性的根系層的規格及分層.
- **Mock-Up established for testing the infiltration & turfing method and to confirm compliance to the ER by the new design.**
  建立"實物模型"以証實新設計可以滿足**ER**的要求.

Alternative Rootzone medium Proposed & Adopted
Vertical Profile of the All-sand-based Rootzone
新採納的全沙型根系層的垂直切面



2. Selection of the Turf Grass
草地用草的選擇

Mixed or Single species of:

下列混合或單一的草種:

1. **Cynodon "Hybrid/Cultivar"**
2. ***Axonopus compressus* 大葉草**
3. ***Zoysia sinica*中華結縷草**
4. ***Chrysopogon aciculatus***
5. ***Paspalum conjugatum***

Carpet Grass (*Axonopus compressus*) 大葉草 vs.
Hybrid Bermudagrass - Tifton 419 雜交狗牙根
***(Cynodon dactylon* x *C. transvaarlensis* cv. Tifway)**

Zoysia grass中華結縷草, Spear Grass 粘人草 (Center) & Tilo Grass 雙耳草 (Right)

***Zoysia sinica*: Is not quite available in the market. Two other Zoysia species used in Hong Kong are: Z. matrella and japonica.**

Why Hybrid Bermudagrass was chosen?
為什麼選擇雜交狗牙根草

1. Unit density of the grass, i.e. stem & sward no./unit area.
   單位面積內草的密度高.
2. Recuperation rate
   恢復能力高.
3. Better performance throughout the year –
   全年表現良好.
4. More resistance to diseases.
   抗病、蟲害性強.
5. Quality planting material in sod and in sprig forms are available in the market.
   高質素的"草皮"及"散草"可以在市場購買到.

Turf Establishment Method
草地擴繁的方法
Sodding vs. Sprigging - 草皮 vs.散草

- **By Sodding 草皮法:**

1. **"Instant" effect.**
2. **Not cost effective.**
3. **More difficult to fine-tone after the grow-in Period.**
   - **a. Uneven Surface.**
   - **b. Less root anchorage.**
   - **c. Difficult on final adjustment on ground level.**

- **By Sprigging /Stolonization 散草法:**

1. **Takes only slightly Longer to establish.**
2. **More cost effectiveness.**
3. **Easier to maintain:**
   - **a. Better root anchorage.**
   - **b. Evener final surface.**
   - **c. Easier adjustment on ground level.**

Certified Tifton 419 Sod Production Farm
驗證 Tifton 419草地苗圃

Tifton 419 Sprigs
Tifton 419 的散草

Grassing Mock-UP Plots - 1
種草的實體示範 - 1

Construction of the Mock Up Box (Top)

Sodding (Left) & Sprigging (Right) – Both Week 2 & 4

Grassing Mock-UP Plots – 2
種草的實體示範 - 2

Sodding (Left)– & Sprigging (Right) – Both Week 6 & 10




Mock up Plots in June 2008
種草的實體示範 - 3

2. Construction of the Turf Pitches
草地球場的建造

Sub-Soil Drainage System – 1
地下疏水系統的建造 - 1




Sub-Soil Drainage System Laying – 2
地下疏水系統的建造 - 2

Aggregate Drainage Layer Laying
碎石疏水層的建造

Sand Rootzone Layer Laying
沙根系層的建造





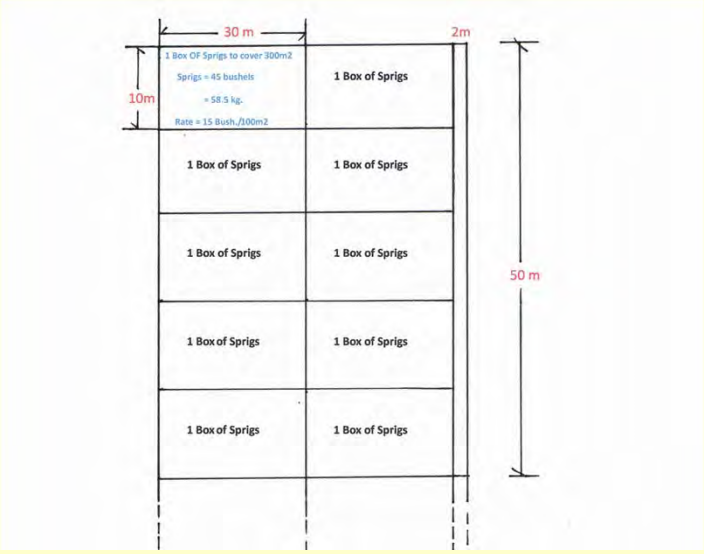
Vertical Profile of the Turf Pitch
草地球場的垂直切面

Compost Spreading

Planting of the Sprigs
“散草”的種植

1. Planting Rate: 12-15 Bushels/100 m^2
2. Even-Spreading of the sprigs manually.
3. Pushing the Sprigs by Disc Roller
4. Light Rolling.
5. Top-Dressing.
6. Manual Insertion of Loose Sprigs when needed.
7. Watering.

Layout Map Showing Zoning for Sprigging
種草時球場分區示意圖



Pre-Planting Preparation
種植前的準備工作

Sprigging - 1

“散草”的種植 - 1






Sprigging - 2

“散草”的種植 - 2

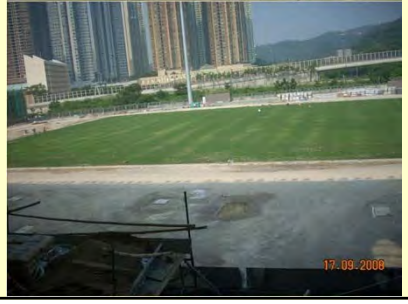



Sprigging -3

“散草”的種植 - 1

Turf Pitch in the Making

草地球場的生長過程



Coverage Check
覆蓋度測試

3. Cultural Practices Followed The Turf Establishment Period
草地生長過程中的護養方法

Mowing
剪草

Irrigation - 澆水

Fertilization

Top-dressing
覆(蓋)沙

Rolling
滾壓

Verti-cutting/Dethatching
垂直切割/除死草層

Coring/Spiking

Spraying of Pesticide
噴殺蟲(菌)劑

Weeding

Winter Over-Seeding
蓋種冬天草

Handing to the Owner

Ready for the East Asia Game in 5-13 Dec. 2009

移交前場地的狀況

4. “Crisis” Encountered During the Growing-in Period

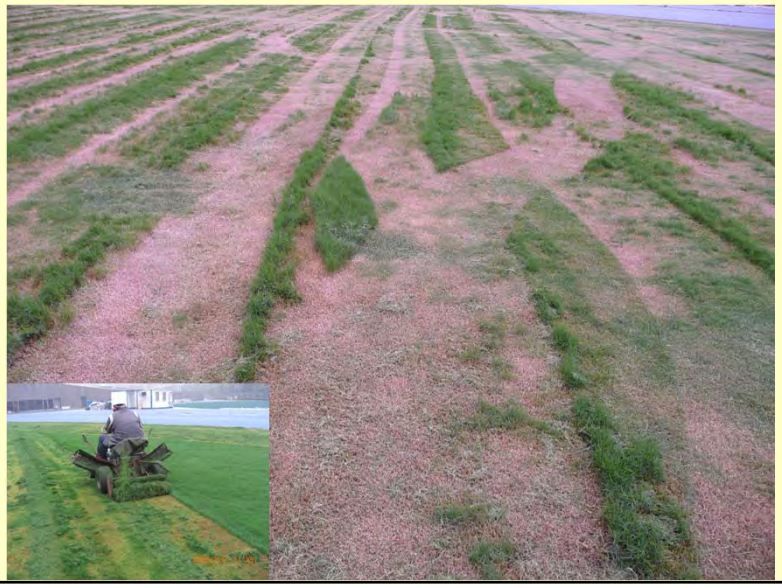
在種植期間的一些危機

Massive Worm Infestation
蟲害的侵襲

Cutworm Infestation
蟲害的侵襲

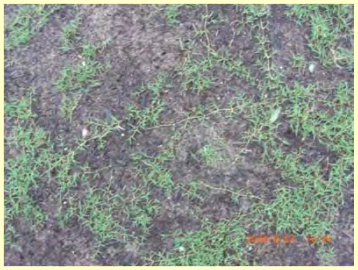
Discoloration of the Pitch
草地變色

Grass Left Too Long Before Mowing - Scalping
草留得太長才剪 - 禿頂



Inferior Compost Used – 1

Woodchip Removal



Inferior Compost Used – 2

Weed Infestation - 雜草侵襲

Inferior Compost Used – 3

Mushroom/Puffball Infestation

蘑菇及馬勃的侵襲




TKO Turf Pitches at the Present

將軍澳草地球場的現況

What a relief! WOW!

5. Conclusion

結論

Lessons Learned – 1

Choice of Turfgrass -草的選擇

1. Hybrid Bermudagrass, e.g. Tifton 419 is a preferred turfgrass for athletic fields, i.e. with the mowing height > 12 mm.
2. One may consider the more recently released cultivars of Seashore Paspalum, e.g. Salam, SeaIsle series.
3. Carpet Grass, Spear Grass & Hilo are not suitable.
4. ***Zoysia sinica*** has no proven record in Hong Kong; perhaps the improved Zoysia species should be considered.

Lessons Learned – 2

Rootzone Construction -根系層的建造

1. The old specification of All-“soil”-based medium is not preferred for rootzone construction for athletic fields in Hong Kong.
2. The All-Sand-base rootzone construction method is workable in Hong Kong.
3. Both Sai Tsao Wan & Tseung Kwan O’s Sports Fields would serve as examples for future turf pitch construction in Hong Kong.

Lessons Learned – 3
土壤改良劑(有機堆肥)的選擇

1. Don't use any of the wrong type of compost: It may not be fully decomposed and hosting weed seeds and fungal mycelia.

   不要使用不良的堆肥,因其可能未經全部腐化及窩藏雜草種子及真菌菌絲.

2. Fumigation of the "soil" is recommended for small area.

   可能的話,可以進行土壤熏蒸,以加消毒.

Lessons Learned – 4
Establishment vs. Maintenance
建造及保養

1. **The rule of thumb is 30% on establishment and 70% on maintenance.**
   三分種植,七分護養.
2. **Add in another 10% for HEART. You need to have the passion and sense of belonging in dealing with turfgrass.**
   另加一分肉緊 - 虛心,耐心,投入的心及愛心等.
3. **Controlled usage is the key word.**
   控制使用量.
4. **You need to develop daily, weekly, monthly and yearly programs in maintaining turfgrass.**
   需要建立每日、每周、每月及全年的護養計劃

謝謝各位

Thank You!

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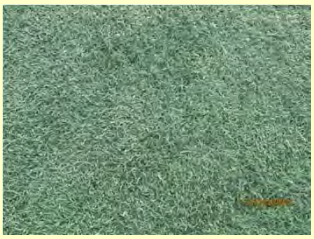
Natural Turf Pitch (Top) vs. Artificial Turf Pitch (Bottom)



康樂及文化事務署新聞公告
二〇〇七年二月二十四日（星期六）

- 第三代人造草地足球場滿足需求配合足運發展
- 為滿足市民對草地足球場的殷切需求，同時配合足球運動發展，康樂及文化事務署（康文署）最近開放五個第三代人造草地足球場供市民使用。
- 康文署署理助理署長（康樂事務）黃達明表示，鑑於市民對使用第三代人造草地足球場的反應理想，康文署將陸續提供更多第三代人造草足球場。
- 五個新投入服務的第三代人造草地足球場分別位於跑馬地遊樂場、黃竹坑遊樂場、摩士公園和九龍仔公園，全部由天然草地足球場改建而成，分別於上月底和本月開放供市民使用。
- 黃達明表示，康文署已計劃逐步將部分現有的天然草地球場改建成第三代人造草地足球場，並會在新落成的場地中提供更多的這種人造草地足球場。
- 他說：「第三代人造草地足球場更能切合市民對草地足球場的需求和足球運動發展的需要。由於它不受天氣影響，加上耗損較少，每月可供使用的節數比天然草地足球場多出四倍。」
- 黃達明闡釋，天然草的生長易受客觀因素如天氣、日照和降雨量等影響，加上使用後會造成耗損，故現時每個天然草足球場每月最多只可以開放約六十節，以維持草地的質素。相對人造草地足球場因不受天氣影響，每月可用場數多達二百七十節。
- 他說：「相對於真草足球場，人造草地足球場的損耗較少，故維修費用更便宜；加上無須使用殺蟲劑、除草劑或化學肥，故更為環保。」
- 第三代人造草地是把人造草植入特別纖維基底，並加入沙粒和橡膠粒，不論在質感、足球回彈和速度方面都與天然草很接近。這種人造草皮十分適合足球運動，並符合國際足協人造草地足球場的標準，不少歐洲國家都開始使用作為足球訓練和比賽場地。
- 康文署經諮詢香港足球總會的意見，建造第三代人造草地足球場，確保符合足球運動發展和訓練的需要。
- 現時康文署在全港共有十一個第三代人造草地足球場。首個改建的第三代人造草地足球場為九龍仔公園一號球場，於二〇〇三年五月開放使用，現時平均使用率接近九成，繁忙時間更高達百分之一百。
- 黃達明說，康文署正計劃改建七個天然草地足球場，工程預計於年底陸續展開。

中华人民共和国国家标准 - GB/T 19995.1— 2005
天然材料体育场地使用要求及检验方法
第1 部分： 足球场地天然草面层
Technical requirements and test methods for natural material sport fields
Part 1: Grassed surface for football fields

- **5.10 根系层渗水速率**
- **－ － 采用圆筒法合格值应为(0.4～ 1.2) mm/min， 最佳值应为(0.6～ 1.0) mm/min。**
- **－ － 采用实验室法合格值应为(1.0～ 4.2) mm/min， 最佳值应为(2.5～ 3.0) mm/min。**
- **同一场地应采用一种检测方法， 当检测结果有分歧时以实验室检测法为准。**
- **5.11 渗水层渗水速率**
- **实验室法应大于3.0 mm/min。**
- **5.12 有机质及营养供给**
- **根系层要求应有足够的有机质及氮(N)、磷(P)、钾(K)、镁(Mg)等。**
- **5.13 环境保护要求**
- **不应使用胶带有危险的或是散发对人、土壤、水、空气有危害污染的物质或材料。**
- **5.14 叶宽度**
- **叶宽度宜不大于6mm， 可根据各地区具体情况， 选择合适的草种。**
- **5.8 茎密度**
- **单位面积内向上生长茎的数量， 合格值应为(1.5～ 4)枚/cm3， 最佳值应为(2～ 3)枚/cm3。**

謝謝各位

Thank You

<END>

Reference