The Why and How of Greens Reconstruction from an Agronomy Point of View

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It usually starts with this

There are many reasons to consider green renovation from a superintendent's standpoint

- Frequent turf loss
- Poor recovery from daily wear
- Inability to withstand heat stress
- Intolerance of close mowing
- Wet, soft surfaces
- Desire for different grass

Need to identify the cause(s) first

- Push-up rootzone
- Bad drainage
- Poor construction
- Failing infrastructure
- Effects of bad water quality
- Layering
- Climate change?

Resurface or reconstruct?

Resurfacing

Pros

- can be an easier sell because it takes less time and costs about 1/3 less than reconstruction
- is more likely to retain existing green contours
- disturbs a lot less area around the green
- does not require new irrigation

Cons

- does not necessarily solve internal drainage problems
- leaves little opportunity to modify contours
- requires a contractor who specializes in this type of work
- can result in layering problems if cap not matched to rootzone
- does not eliminate all root borne pathogens

Reconstruction

Pros

- is a long term investment lasting 25 years or more
- provides opportunity for design modification
- generally includes bunkers and irrigation
- resolves agronomic problems related to surface contours and internal drainage

Cons

- can take up to 6 months to complete
- can cost up to 1 million US
- may upset golfers playing unfamiliar greens
- is a full blown project involving a designer, project manager, contractor, and a supporting cast of consultants

Steps to successful resurfacing

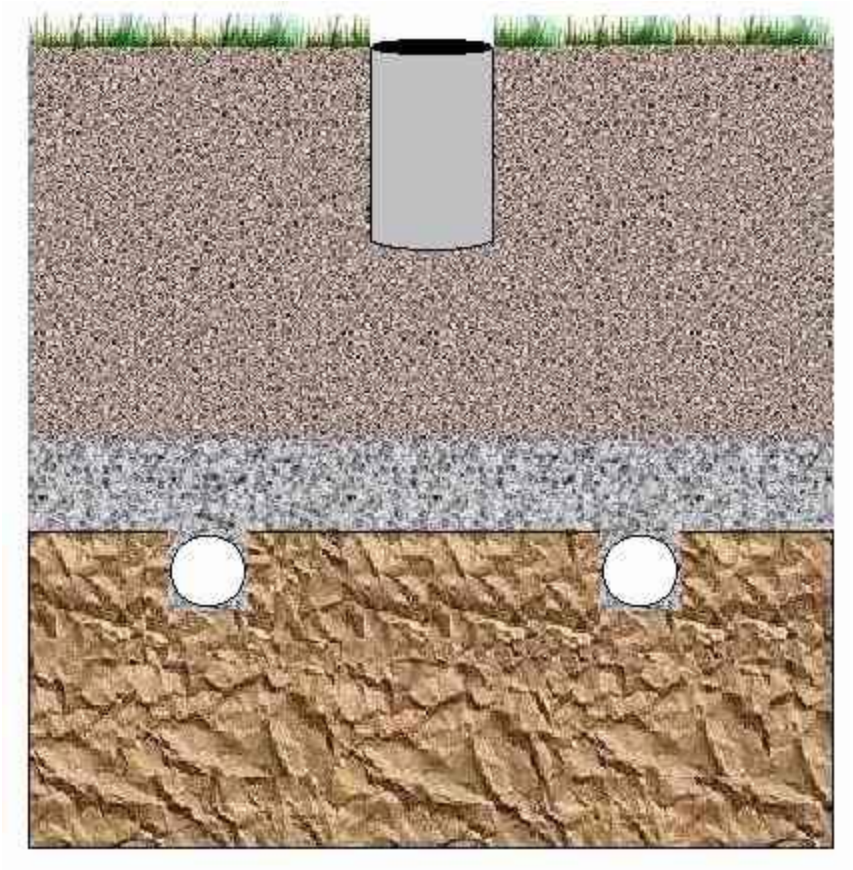
- **Test the existing rootzone and drainage**
- **Get rid of the old grass – completely!**
- **Remove at least 10 cm (4 in.) of material**
- **Match new sand or mix**
- **Break up the interface between the old and the new and incorporate the cap into the existing rootzone top inch**
- **Settle the surface before grassing**
- **Whenever possible do not sod to speed up establishment**

Reconstruction is more complex and costly but benefits can be greater

- Work with a qualified and experienced golf course designer
- Hire a project manager
- Clearly define the scope of work
- Develop a good specification and materials list, including irrigation
- Develop a short list of experienced renovation contractors with good references
- Prepare comprehensive bid documents and construction schedule
- Don’t always accept the lowest price
- Maintain flexibility to cover contingencies

USGA Construction Method

- It has stood the test of time
- It gives predictable agronomic performance
- It is proven by science
- It is by nature sustainable
- It gives the best all weather playing conditions



Rootzone Sand

Name	Diameter (mm)	by weight
Fine Gravel	2.0-3.4	≤ 3% fine gravel and ≤ 10%
Very Coarse Sand	1.0-2.0	total gravel plus very coarse sand
Coarse Sand	0.5-1.0	≤ 60% total coarse sand plus
Medium Sand	0.25-0.50	medium sand
Fine Sand	0.15-0.25	≤ 20%
Very Fine Sand	0.05-0.15	≤ 5%*
Silt	0.002-0.05	≤ 5%*
Clay	<0.002	≤ 3%*

Physical Properties of Rootzone Mix

***Total Porosity** 35% - 55%

***Air-filled Porosity** 15% - 30%

***Capillary Porosity** 15% - 25%

***Saurated Conductivity**

Normal: 6-12 inches/hr (15-30 cm/hr)

Accelerated Range: 12-24 inches/hr (30-60 cm/hr)

Particle USGA Recommendation (2004)

*The total of the very fine sand, plus silt and clay may not exceed 10%.

Rootzone Amendment

- Use only high quality organic or inorganic amendment material
- Use a qualified test lab to determine mix ratio based on performance
- Make sure that the contractor uses an experienced blender or has the ability to blend with precision
- If done in house, set up a clean, hard surface for mixing
- Use great care in the mixing process
- Test often to maintain quality control

Drainage Installation

- Use high quality, double walled, 100 mm (4 inch) round, perforated pipe
- Use no greater than 4.5 meter (15 ft) spacing
- Extend pipes all the way to the perimeter
- Leave main line “vented” at the top end surface grade
- Make sure of consistent fall
- Use multiple outfalls when appropriate

Gravel recommendations when intermediate chocker layer is not used

Performance Factors	Recommendation
Bridging Factor	D15 (gravel) less than or equal to 8 X D85 (root zone)
Permeability Factor	D15 (gravel) greater than or equal to 5 X D15 (root zone)
Uniformity Factors	D90 (gravel) / D15 (gravel) is less than or equal to 3.0

No particles greater than 12 mm

Not more than 10% less than 2 mm

Not more than 5% less than 1 mm

Rootzone Depth

- Standard depth is 30 cm (12 inches)
- High elevations can be 5 cm less and lows can be 5 cm more (+ or – 2 inches) without changing performance. Can it be more?
- In general keep the depth relatively consistent
- Spreading excess mix beyond the rootzone at shallower depths is not recommended
- Mix should be compacted with water and tracking to avoid settlement later on.

Grassing

- Determine the best grass for your situation – test plots
- Always use licensed and certified grass or seed to insure purity
- International courses should consider an on-site nursery or contract growing for warm season grassing
- Fumigation is optional and choices are limited
- Follow supplier's recommendation on grassing rates and surface preparation
- Take care to prevent contamination

Grow-in

- Never, ever let the surface dry out after grassing or seeding until rooting has reached 5 cm.
- Periodically roll to smooth surface and set grass sprigs and seed.
- Be patient……..
- Liquid feeding via sprayer (gun or walk boom) is better than granular
- Keep fertilizer inputs at low rates and frequent
- Start mowing with sharp blades set high enough to prevent scalping yet low enough to cut grass
- Begin topdressing program when surface is firm enough.
- Do not veticut too soon – wait until the turf can handle it.

Ten biggest mistakes

1. Not considering all factors in why previous greens failed
2. Resurfacing when reconstruction is needed
3. Not using a qualified design consultant
4. Not testing for the best materials
5. Not constructing to USGA Guidelines
6. Failure to insure quality control
7. Planting bad sprigs or seed
8. Mishandled grow-in
9. Opening too early
10. Poor maintenance practices