Green Construction

If You're Planning to Build New Greens or Alter Old Ones This Report From A Recent Oklahoma Turf Meet Is Must Reading

THE architect on occasions is able to pick natural sites for greens that cut down greatly on the amount of soil necessary for green construction. At times sites can be chosen that are so natural that it would be difficult to improve upon them other than perhaps furnishing surface drainage.

There are architects who, after studying terrain of the proposed course, pick natural sites for greens and other features which they believe will lend to the playability, utility and basis principles of course construction and harmonize with natural terrain. They then try to plan the layout so the best features of the terrain may be utilized.

However, with modern soil moving equipment the architect is now able to modify areas of little character into molds of architectural achievement that blend into surrounding terrain. Strategic design must be given consideration and alternate ways must be furnished golfers .

This, however, is a panel on green construction, and it is not meant to discuss architectural features of course construction.

SUCCESSFUL supts., architects, course builders, equipment and supply authorities and turf research scientists participated in a green construction discussion at a recent Oklahoma Turf Conference session.

The meeting had as its panel of experts Floyd Farley, John Darrah, Al Houchin, Charles Wilson, Wm. Daniel, Marvin Ferguson, Leslie Snyder, Lester Hare and Bob Dunning. Models of green construction and demonstrations of soil performances added to the value of the session which supts. and other golf turf authorities declared was the top practical feature of conference programs for the year.

Supts. and chairmen having new green or alteration jobs to be considered will find the accompanying digest of the discussion of considerable dollar-and-cents value.

The transcript has been made available by Bob Dunning of Bob Dunning-Jones Co., Tulsa, Okla.

Base of the Green

The base of the green may be constructed of any soil at hand unless it contains material that would cause excessive subsequent shrinkage or would be deleterious to plant growth. It should be compacted and watered to prevent shrinkage.

Percentage of Slope for Putting Surface

There should be a minimum of grade of not less than 6 in. in 50 ft. and in most cases the maximum slope shall not be over 3 percent unless designed for a particular purpose. In almost every instance the slope should not be so severe that the ball will gain momentum after being stroked. A high percent of the putting surface should be suitable for cup cutting areas.

Where sudden rises or undulations are thought to be necessary in the putting surface the limit of slope, in most cases, should not be in excess of where the base is 10 times that of the altitude.

Multiple Distinct Cup Setting Areas

Several distinct cup setting areas in each putting surface are recommended. These shall be divided by gentle sloping undulations or long sweeping rolls or mounds and folds that, in most cases, can accommodate a cup cutting area themselves without undue penalty to the player.

Different pin positions may demand that a shot be played from entirely different angles from the fairway from day to day. This will require large greens.

The modern trend is that pin positions be targets for the low handicap player and the whole green may be used for the average player.

Pin positions themselves are relatively level, discontinuing the past practice of the whole green or parts of the green with large areas of continuous slope. In this regard pin areas have no general pattern but drain to the nearest outlet on all sides.

Division of Drainage Areas

Mounds may be used to divide drainage areas for surface runoff, orientation and character and to lend to and blend into surrounding terrain. Mounds are constructed so they do not gather water that is carried on to the putting surface. This requires long experience in construction and moulding.

Grading Shoulders and Aprons

All areas surrounding the green, including

shoulders and mounds, should be graded to be conducive to maintenance with gang type mowers or multiple reel power mowers. There should be room for this type of machinery to operate between traps or bunkers and the putting surface proper.

The maximum percent of grade on shoulders or areas surrounding the greens should be no more than 30 per cent.

Finished Surface Related to Base

From the standpoint of establishment of future turf all undulations and mounds and divisions between cup cutting areas that are to appear in the finished surface are part of the base of the green or the sub-grade and there should be no pockets where water can stand. A green should be constructed so that surface run off is in several directions, never **all off** the front of the green.

Rimming the Green

Immediately outside the putting surface there shall be provided an area 10 ft. wide that shall be hereafter known as the No. 1 buffer zone.

This zone should be covered to at least 12 to 18 in. with an approved top soil medium sandy loam in nature that doesn't contain material deleterious to plant growth to blend into and be a part of the surrounding area. This is rimming the green and is furnished as a means of blending into the surrounding terrain, for holding within its inside circumference prepared topsoil mixture of the putting green.

This rim shouldn't interfere with surface runoff. There should be soil in sufficient quantities on remaining shoulders so that the rim area shall blend into and be a part of the surrounding terrain without any sudden breaks.

Drainage Considerations

For the ultimate in green construction, drainage must be considered in five phases: (1) Surface; (2) Internal; (3) Lateral; (4) Air and (5) Drainage by diffusion.

For the very best in green construction there should be installed a herringbone system of 4 in. farm tile provided with proper protected inlets and outlets. Tile should be placed in the subgrade so that it will be at least 24 to 30 inches below the finished surface of the green on a carefully prepared grade of proper fall and bedded into 2 in. of crushed rock or approved gravel.

A space of from 1/16 to 1/8 in. should be left between tile joints to facilitate entrance of water. Joints should be protected with a small piece of tar or waterproof building paper to prevent materials from dropping into tile. Care should be exercised not to have these strips too long; otherwise they will cover the sides of the joints and prevent water from entering easily.

Trenches should be back-filled with approved crushed rock or gravel to the surface of the subgrade with laterals staggered and properly spaced. The base should then be covered with at least a 6 in. gravel blanket or crushed rock containing a minimum of fines, but there should be some fines.

There should be no pockets in the finished grade of the crushed rock or gravel blanket. Installation of tile affects drainage in three phases: internal, lateral and by diffusion, allowing interchange of atmospheric and soil gases, helping to prevent an over-abundance of carbon dioxide and preventing formation of carbonic and other organic acids toxic to vegetation. The latter is particularly true of the gravel blanket.

Demonstrations of water absorption and percolation show clearly that soils vary in absorption, percolation and drainage.

Fine Gravel — nearly all the water runs right through.

Medium Sand — about half the water runs through.

Fine Sand — water moves through it slowly.

Silt and Clay — water starts to go in, then stands on top.

Soil mixtures vary in moisture holding capacity in their relation between oxygen and water and this, in turn, is affected by:

Texture (size of particles)

Structure (arrangement of particles) and Physical condition affects root growth, moisture, heat, air and anchorage.

Used in the demonstration were glass containers with drainage outlets containing the same quantity of soil of different characteristics and beakers with equal quantities of colored water. Quantities of water that different soils retained were checked on return of water to beaker by drainage and the rapidity of drainage also was checked.

Choice of Basic Soils for Topsoil of Greens, Silt and Clay Content

Basic soils chosen for topsoil of greens before addition of sand and peat may entail a wide discusson of soil tpyes.

However, in Oklahoma, there can usually be found a clayey sand containing from 10 to 25 per cent clay with a minimum of silt from 0 to 3 or 4 per cent. Even these soils will vary widely as to size of sand particles.

It is realized that in many parts of the country that these types of soils are not readily available and consequently the choice of basic soils will necessarily come from other types such as loams, clay loams, sandy loams, etc. When possible, choice of soils should come from those containing near medium size sand particles and minimum of silt.

For Oklahoma, our choice of soil should come from medium sandy clays or clayey sands containing approximately 20 per cent clay and the minimum of silt from 0 to 3 or 4 per cent. If the sand part of this soil is of medium size then we have an ideal situation. A most important phase is to be able to choose and distinguish this type of soil. For complete accuracy mechanical analysis is necessary.

Soil Mixture — Sand and Organic Matter

To this material there is added a graded sand such as Muskogee No. 820 and 15 per cent peat by volume. If we were to start out

with our choice of basic soil with a clayey sand with a clay content of about 22 per cent, then we'd want to bring the mixture, with the addition of peat and sand, to within 5 to 8 percent clay content. Well graded sand must be used.

That part of the sandy soil that is not clay is sand. Therefore our final mixture is:

4 parts sand, 2 parts soil, 1 part peat, which is 79.42% sand, 6.29% clay, 14.28% peat.

Mixture by Volume

The proportion of exchange capacity comes through addition of peat and its intermixture with the clay fraction. This collodial material gives adequate nutrient and water-holding capacity, plus well aerated soil and adds to its friability and structure.

Material for the topsoil of the greens should be stockpiled to conform with the mixture by volume as follows:

4 parts No. 820 Muskogee sand
2 parts Selected Soil
1 part Eli Colby Brown Hypnum Peat

Or approximately 57 per sent sand, 28 per cent soil and 15 per cent peat.

Final mixture will be determined by clay content of the local basic soil.

These materials should be worked so that they become thoroughly mixed and incorporated into each other in a uniform mixture of the above percentages of even consistency throughout, and there should be no clods or lumps.

Mixing should be done with grinding and screening machinery or so that the surface underneath will not be undercut. This material should then be placed on greens to a uniform depth of 12 ins., or as desired, covering the entire putting green surface inside the rim. Allowance should be made for shrinkage. There should be no pockets where water could stand.

Materials for Topsoil & Drainage of Greens Based on 1000 sq. ft. of Surface.

For shrinkage and the drifting of topsoil material into the drainage blanket an arbitrary figure of 44 cu. yds. of material is set to cover 1,000 sq. ft. to a 12 in. depth. This will allow approximately 15 per cent for shrinkage. Note: This is especially true where crushed rock or washed gravel is used for the drainage blanket.

Percentages of Sand, Soil and Peat:

Sand	Soil	Peat
44	44	44
.57	.28	.15
25.08 cu. yds	12.32 cu. yds	6.60 cu. yds.

Muskogee No. 820 sand 25.08 cu. yds. per 1000 sq. ft .

Selected soil 12.32 cu. yds. per 1000 sq. ft.

Eli Colby Brown Hypnum Peat 6.60 cu. yds. per 1000 sq. ft.

Crushed rock, ¼ x 1½ ins., required to a 6 in. depth and for back filling tile trenches approximately 22 cu. yds, per 1000 sq. ft.

Tile—150 ft. per 1,000 sq. ft.

"Y" joints between 3 and 4 joints per 1,000 sq. ft.

Fertilizing New Greens

The putting green proper and the No. 1 buffer zone shall be fertilized as follows:

Per 1,000 sq. ft. 60 lbs. Milorganite, 30 lbs. Superphosphate 20% grade, 10 lbs. Muriate of Potash 60% grade, 4½ lbs. Nu-Green or 6 lbs. Ammonium Nitrate.

Also to be incorporated per 1,000 sq. ft.: 50 lbs. dolomite if required, 10 lbs. arsenate of lead.

Any changes in these recommendations will be in accordance with the analytical results of soil samples tested and any future analytical results of approved materials.

Three-fourths of these materials shall be mixed with prepared topsoil at time of its thorough mixing and before placing .One-fourth of the material shall be used as a top-dressing and lightly raked into the surface with a Del Monte rake or other approved tool.

Arsenate of lead an dolomite shall be incorporated throughout the topsoil at time of mixing and before placing. Arsenate of lead will prevent earthworms and grubs for a 7 to 10 year period.

After the putting surface is returned to a fine grade it shall be compacted to produce a firm seed bed, not tight or loose.

Grass Selection

The best seeded grass for Okla. greens that is readily available is agreed to be Seaside Bent. It is thought that Polycross Bent should be given a thorough trial. Of the bent grasses planted vegetatively, C-7 Cohansey, C-1 Arlington and C-19 Congressional are the most widely discussed as to desirability.

Establishment of Turf

a. Stolonizing:

Stolons: Require minimum of 5 bu. to 1000 sq. ft. Use 10 bu. for rapid coverage. Long field-pulled stolons preferred. Pull apart by hand or shred with Verti-cut.

Scatter stolons evenly ahead of rolled steel door mat, unrolling mat as grass is spread. When mat is fully unrolled, scatter top dressing of the same consistency of topsoil of the greens over mat lightly to cover about half of the grass. This will require about ½ to ¾ cu. yd. to 1000 sq. ft. Roll mat and move to next location.

Roll topdressed grass with full loaded water-ballast roller.

In regard to spreading topdressing over stolons, there are spreaders on the market that will spread topdressing evenly and adequately.

Proper Care

Water: Start watering at once, gently, with hose nozzle, not to flood. Water lightly and frequently so that grass stays moist. No drying out can be tolerated. On dry days sprinkling may be necessary every hour or two.

b. Seeding: It is generally agreed that the same method of fertilizing, as covered above, should be used in both seeded and stolonized greens. A firm seed bed is desirable. All agree that seeding should be done in two or more di-

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and which provides, in case of golf course and similar damage, "the party so offending shall pay to the party injured treble the value of the thing so injured, broken, destroyed or carried away, with costs, and shall be deemed guilty of a misdemeanor, and shall be subject to a fine not exceeding $500."

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rections. Some like to rake the seed slightly. Others prefer to seed and lightly topdress and roll lightly following top dressing. Light rolling is also suggested after raking seed in.

A desirable method where a firm enough seed bed has been established is to seed in four directions. Each operation is preceded and followed by power disc spiking. The area seeded in all methods should be kept moist at all times, not wet, in a manner that will not disturb seed or wash the seeded surface until the seedlings are firmly established.

Bringing New Greens Into Play

Greens established at proper planting or seeding dates can be forced into or be made ready for play at an earlier date by proper watering and a forced fertilizing program. After the seedlings have emerged they may be fertilized from once up to three times a week by using very light rates of urea or ammonium sulphate or nitrate, with potash and iron sulphate, may be used as required. These rates approximate 2 to 4 oz. of Nu-Green, 1 to 2 ozs. muriate of potash, ½ to 1 oz. iron sulphate, all per 1000 sq. ft. in 50 gal. of water per green.

Greensmowers should be set at ½ in. in height and should be very sharp. When grass reaches ½ in. in height mowing should start, removing the clippings. Mowing height should be very gradually brought down to desired height of cut for play. Frequency of cut is important. A very smooth surface for stolonizing and seeding is a first prerequisite and will have a great deal to do with the quality of the putting surface in years to come.

On PGA Committee

Jay Hebert and Jack Fleck are new members of the PGA tournament committee and Bob Toski is now the chairman of the committee. Hebert and Fleck replace Doug Ford and Jim Turnesa as committeemen and Toski succeeds Fred Hawkins. Holdover members of the committee are Warren Orlick, Harry Moffitt, pres. of the group, Harold Sargent and Hawkins.

Tell Them You Saw It Advertised in Golfdom

Plan to Accommodate 300 Assistants at PGA School

PGA's teaching and education committee, headed by Emil Beck, Pt. Huron, Mich. pro, is making plans to accommodate 300 young pros at the Dunedin, Fla. Assistants' Training School to be held Jan. 7-11, 1957.

Assistants who qualify for the course will be given a minimum of 22 hours training in Club Fitting and Repairing, Employer-Employee relations, Pro Shop Merchandising and several other subjects. There is no charge for registration or enrollment in the school and housing arrangements now are being made for those expected to attend. Beck estimates that it will cost the assistant about $75 a week for living costs after arrival in Dunedin.

Enrollment applications will be handled through home pros. Application blanks are now being distributed to pro shops throughout the country so that assistants can sign up.

Besides attending formal classes, assistants will get the opportunity to attend clinics and also play the PGA Dunedin course.

Turfgrass Conferences

Following is a list of turfgrass conferences and field days scheduled for the fall months in various sections of U.S.:

Sept. 17-18 — Midwest Turf Field Days, Purdue University, Lafayette, Ind.

Sept. 25 — St. Louis Dist. Golf Assn. Field Day, Westwood CC, Clayton, Mo.

Sept. 25-27 — Florida Turf Conference, U. of Florida, Gainesville.

Sept. 26-27 — Northwest Turfgrass Conference, Washington State College, Pullman.

Sept. 28-29 — Utah-Idaho Conference, Idaho Falls (Ida.) GC.

Oct. 1-2 — Rocky Mountain Turfgrass Conference, Colorado A & M College, Ft. Collins.

Oct. 4-5 — New Mexico Turfgrass Conference, New Mexico A & M, State College.

Oct. 15-16 — Southern Calif. Turf Conference, U. of Calif., Los Angeles.

Oct. 17-19 — Central Plains Turfgrass Conference, Kansas State, Manhattan.

Nov. 12-16 — American Society of Agronomy meetings, Cincinnati, O.

Dec. 10-12 — Oklahoma Turfgrass Conference, Oklahoma A & M, Stillwater.