DATA SHEET

Return to index

Sheet #:	**D2b.2**
Title:	**SOIL AND ROCKS - Modeling Methods**
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Originally Compiled by:	**Stella, Webb and Ravenscroft**
References:	NMRA Bulletin, Dec. 1954, M.B. Wakefield Model Railroader, Dec. 1949, J. Allen HO Model Trains, Jan.-Feb. 1952, B. Martin Model Railroader, July 1952, B. Lilley HO Model Trains, Nov. 1952, B. Crosby HO Model Trains, Feb. 1953, B. Crosby Model Railroader, Feb. 1953, MR Staff Model Railroader, Mar. 1953, W. McClanahan HO Model Trains, Oct. 1953, W. McClanahan Model Railroader, Oct. 1953, M.B. Wakefield Model Railroader, Dec. 1953, MR Staff Model Railroader, Feb. 1954, M.B. Wakefield Model Railroader, Dec. 1954, MR Staff Frank Ellison on Model Railroads, Faucett Practical Guide to Model Railroading, Kalmbach
Page:	**1 of 8**

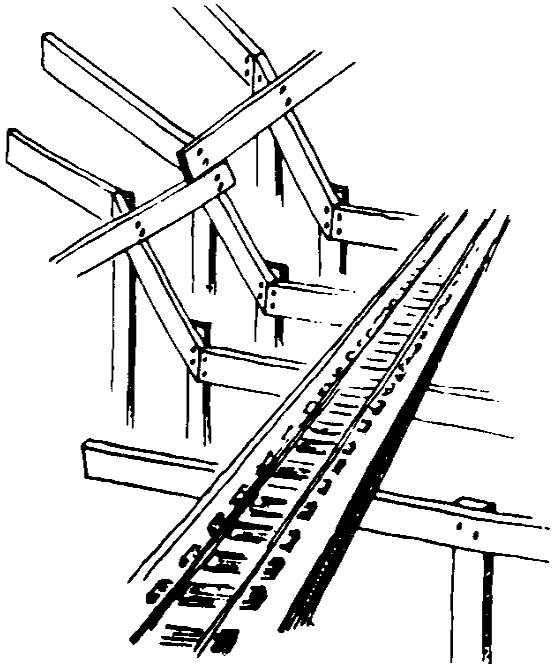
GENERAL

Modeling a realistic scene starts with careful study of the prototype. Take pictures, make notes of interesting details and then plan the arrangement. Keep in mind the basic characteristics of real soil and rocks as outlined on Data Sheet D2b.1. Don't try to attempt too many varieties or crowd too much into a small space. Both of these faults take too much time and detract from the main object of the model -- the railroad itself.

This data sheet does not attempt to describe modeling procedures in detail, but rather covers the field generally and compares the different methods with the hope that choice of methods will be made simpler and applicable alternates will not be overlooked. For detail instructions, use the list of excellent references listed on this sheet.

FRAMEWORK

The foundation for modeling a terrain of soil and rocks is a wood framework built of scrap pieces of 1x2 or larger used to form uprights and lateral members. These pieces need not be cut to the desired finished contours, but to do so will make later work easier. Spacing of these framework members will depend upon the type of supporting material and covering to be applied as explained below. Stryrofoam sheets can also as a scenery foundation.



FRAMEWORK FOR SUPPORTING SCENERY AND ROADBED

SUPPORTING MATERIALS

Most final covering materials, such as plaster, plaster cloth, bubble wrap or paper mache are not sufficiently strong to bridge between framework members and, hence, some sort of supporting material is tacked to framework first. The choice of supporting material depends upon stiffness and weight of the final covering to be used. Supporting materials are compared in the following.

SUPPORTING MATERIALS	ADVANTAGES	DISADVANTAGES
Screen wire or hardware cloth	Strongest - framework can be widely spaced and still support wet plaster. Satisfactory for all covering materials and the only one suitable for heavy plaster.	Expensive Harder to handle - also dangerous; gloves should be worn.
Chicken wire or cardboard strips	Low in cost. Easy to form special contours. Light in weight.	Low in strength. Cannot be used to support even thin plaster unless covered with burlap
Styrofoam	Cheap and fast. Can be laminated and can be used as a framework replacing heavy benchwork.	Creates a lot of fine dust when being shaped. Water soluable glue needed to laminate.

COVERING MATERIALS

Covering materials are either spread on with a spatula like plaster or a paper mache mass or laid on like wet cardboard or paper toweling. The former require fine mesh supporting material such as screen wire and the latter can use coarse supports like screen wire or cardboard strips. Covering materials can also include hardshell, plaster cloth and expanding foam.

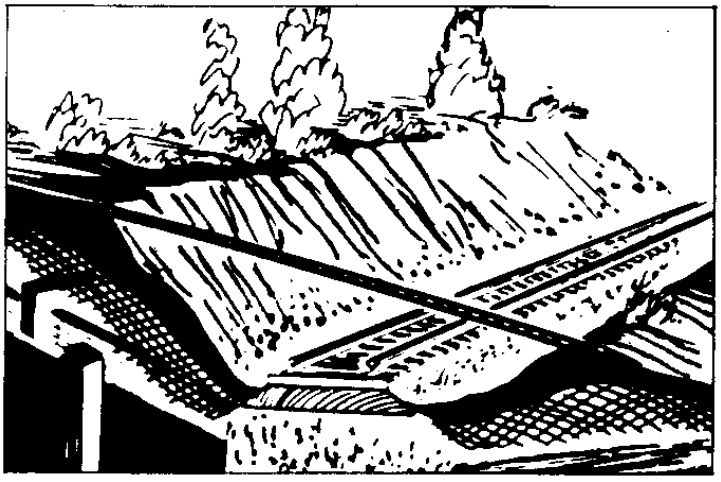
In general, plaster mixes are heavier and stronger, and can be readily molded into details such as rock formations. On the other hand, laid on materials such as paper toweling are lighter, cheaper and faster but they can only be used for relatively smooth surfaces such as hills or fields.

In describing the various techniques that follow, the more popular combinations of supporting and covering materials were chosen.

SCREEN WIRE AND PLASTER

This combination is the most popular chiefly because it is the most flexible -- it can be used to model nearly any kind of soil or rock formation.

In applying the screen wire over the framework, work with gloves to avoid cutting your hands on the raw wire ends. Use as large pieces as practical making joints where possible over contour-cut framework members. If joints are unsupported they should be sewn together with soft iron wire. Use large head tacks to fasten wire to the framework.

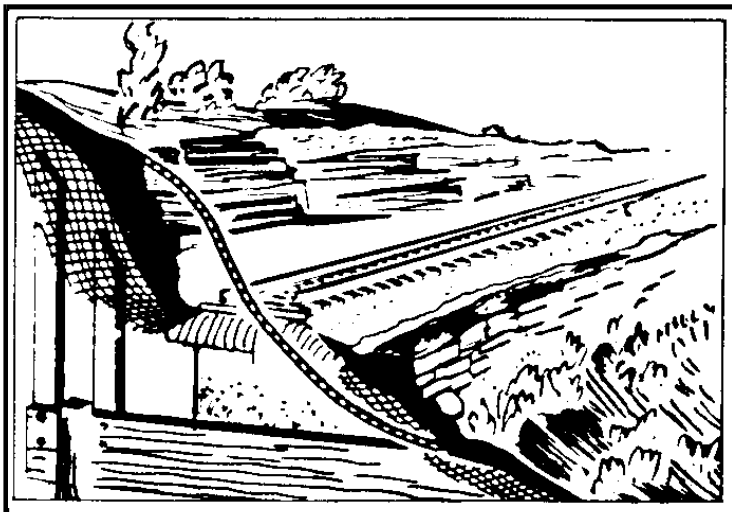


EARTH CUT
Note original contour of the terrain.

SCREEN WIRE AND PLASTER - continued

Plaster mixes of all sorts have been used. . Slow setting patching plaster or wood fiber plaster are satisfactory. Do not use Plaster of Paris or quick setting patching plasters.

Hydrocal is a very popular plaster for scenery construction because it is cheap, easy to find and produces realistic scenery. It is used both as the scenic base and for making rocks. For scenery base, create a soupy mixture and soak paper towels in this mixture then apply on top of the screen. Mixing some dry pigment in the plaster mix will ensure that if the scenery is chipped later on after painting there won't appear annoying white spots that constantly need retouching.



CUT AND FILL
Note original contour of the terrain.

Perma-scene is a light weight special plaster mix commercially available in ready to mix form. It is relatively expensive but very effective when used properly. Adequate instructions are furnished with the material. Poly Terrain is also a scenery material that is available.

PAPIER MACHE

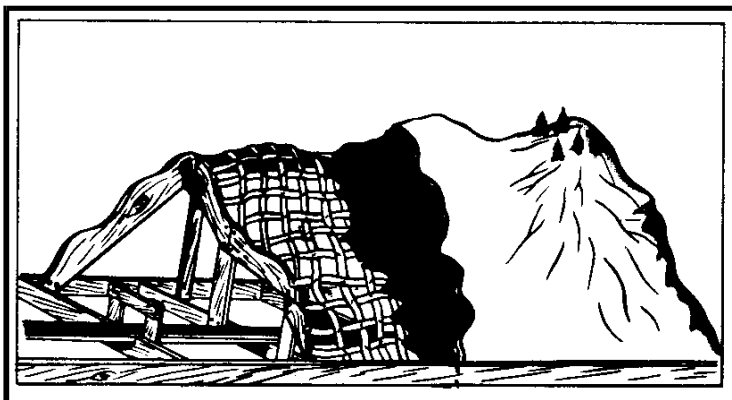
Of all of the different types of coverings, ***papier mache*** is the most inexpensive. It is also the weakest, and thus it should have a very stiff support to prevent it from cracking under accidental blows

Crumple up sheets of old newspapers and soak them in water for at least three days. Then knead them under water until they are pulverized. Take out two handfuls of the mess, squeeze out most of the water, and put it into a pail. Mix some flour and/or powdered glue with the paper until it is very messy but firm. Now smear it onto the support and shape to suit. Repeat the process. Let dry for about three days before painting.

CARDBOARD AND PAPER TOWELS

In site of the lack of strength and the mess involved, the use of cardboard strips or chicken wire supports covered with paper toweling is quite popular because the cost is extremely low. It is particularly useful for rough terrain.

As shown in the accompanying drawing, cover the framework with a webbing of cardboard strips. The spaces should not be larger than two inches. Now soak 4"x4" or



CARDBOARD STRIPS AND PAPER TOWELS

CARDBOARD AND PAPER TOWELS - continued

somewhat larger pieces of paper such as paper toweling (commercial not kitchen) in a very strong solution of commercial starch and leave them in the solution overnight. Then lay them over the cardboard webbing. After this dries thoroughly, paint on a thin plaster mixture to add strength to the covering. Instead of using a starch solution, many modelers prefer to use watered down glue, which provides a stronger support than starch.

A variation of this method is to soak large sheets of cardboard in water. Then lay these sheets over a closely spaced bare framework and tack them down while making the you will have a support almost as strong as a screen wire.

For smooth terrain or coarse cuts or rock work, the above coverings may be left as is and painted. If detail modeling is needed, apply additional plaster carefully as the support is not very strong and follow the methods suggested under "Modeling the Covering."

CANVAS OR BURLAP

This method is cheap but it doesn't have much strength. It needs a lot of bracing and the framework members should be cut to the desired contour. When tacking the canvas or burlap to the framework, stretch it as tight as possible. To add to its strength, dip the canvas or burlap in glue, paint, or a strong starch solution and put crumbled paper under the final support to give the support some shape until it dries.

A coating of thin plaster applied over the burlap or canvas adds to the strength and gives an adequate finished covering for relatively smooth terrain or for draped burlap used to form mountain peaks. For more detailed modeling of rocks, etc., heavier plaster work is required. It should be applied carefully following the suggestions under "Modeling the Covering."

A variation of this method which results in a stronger support is to use old rags dipped in some stiffener and applied over a cardboard webbing or chicken wire.

Celastic is a commercial, colloid treated fabric that comes in rolls and is dipped just before use in a special solution that makes it very plastic and easy to form and which eventually hardens the material to a covering of considerable strength. It is rather expensive and requires special precautions to eliminate the fire hazard while being installed.

MODELING THE COVERING

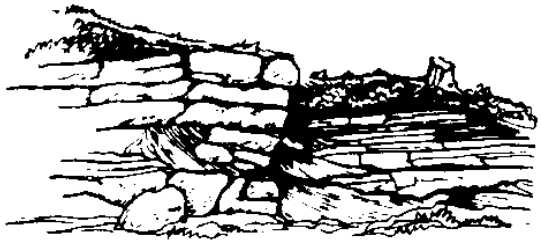
Apply the selected covering to the supporting material with a spatula or common butter knife. For ground to be covered with grass or soil, the covering should be put on with a fairly smooth finish. Wet fingers are useful for this. While the plaster is still wet, traces of erosion can be inscribed with a wet knife or spatula. Stones can be formed by dropping wet plaster on semi-dry ground and shaping the lumps with your wet spatula if necessary.

For rock outcroppings there are several methods available. A sandstone cliff will be formed by scribing cracks in an almost dry

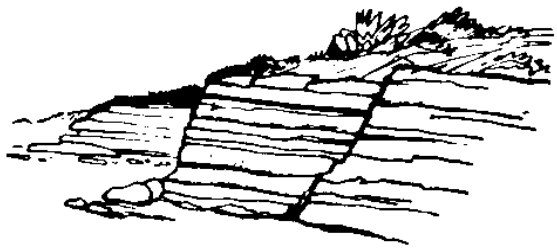
FORMING ROCKS

MODELING THE COVERING - continued

mix with a wet knife. Lava can be successfully modeled by pushing wet plaster along a gentle slope. Limestone cuts can be modeled by making broad cuts in wet plaster. These cuts should be farther apart than sandstone cuts and should be rounded into the ledge part. Put in vertical cracks at suitable distances. In most cases, work from the bottom to the top, pressing down layers of the plaster mass. Experience with any given plaster mix will tell when it is of just the right consistency to be effectively modeled and formed. There are many special methods for modeling various details, some of which are described in the following paragraphs. Many more can be found in the references cited.



LIMESTONE SANDSTONE



SANDSTONE STRATA

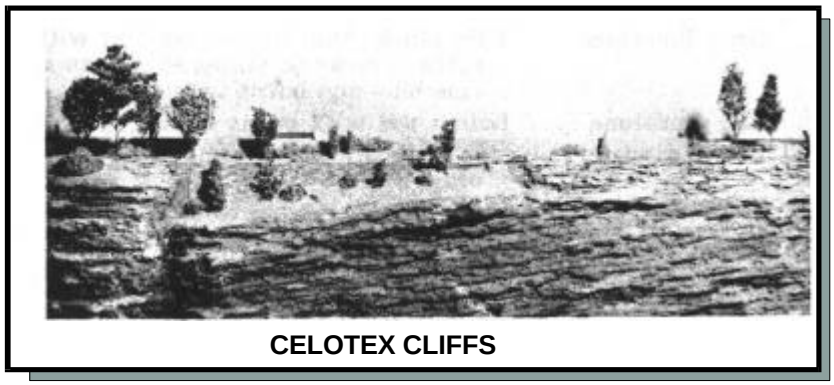
ROCK CASTINGS

A good way to model rock formations is to cast them out of plaster. Lumps of coal, actual rock fragments, and carved blocks of wood make good patterns for the castings. Over the pattern spread a layer of latex molding rubber and repeat until the rubber is at least one-eighth of an inch thick. When dry, peel off the mold and use it to make castings out of your favorite plaster mix. By placing the rubber mold on a suitable surface, concave or convex formations can be obtained. Sections can be easily joined by sawing or carving the dry castings. To install in the layout, put some wet plaster on the back of the casting and on the surface the casting is to be applied to (preferably screen wire), and push the castings in place.

BARK OR CELOTEX CLIFFS

Cliffs built up out of broken Celotex or pieces of bark are particularly effective for realistic looking, stratified, rock formations. Such formations are a good way to separate two tracks near to each other but at different levels. Break off a series of pieces about 2"x6", keeping the edges ragged. In lieu of Celotex or bark, cork board can be used or even asphalt shingles.

Building up the cliffs is done much as one would lay bricks, using glue and



CELOTEX CLIFFS

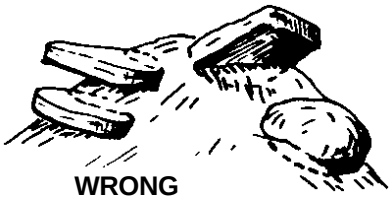
BARK OR CELOTEX CLIFFS - continued

nails to hold each course in place. Keep the cliff line irregular. Final appearance will be much better if the rock strata is not all level. One or more parts should be laid on a slope. After construction is completed, the broken surfaces may appear a little too delicate. If so, brush over them with a very thin coat of plaster.

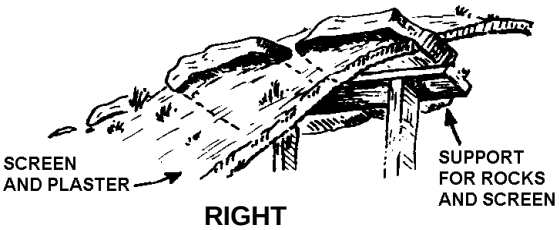
If thick, deep grooved bark from older trees is available, it can be glued or nailed vertically to a light wood framework much as one would put shingles on the side of a house. Keep the grooves more or less horizontal and fit pieces together carefully.

USING NATURAL ROCK

Natural rock can effectively be used to model rock outcroppings. Supports must be strong and rocks should be mounted realistically. See drawings to the right. Igneous and metamorphic rocks are often found in the same area. Other combinations occur less frequently. In general, sedimentary rocks should overlie other types. Be consistent industrially: coal and oil fields occur only in sedimentary rocks, metallic mining in any kind, quarries in granite, marble, limestone, etc.



WRONG
Rocks set too shallow, types and attitudes are inconsistent.

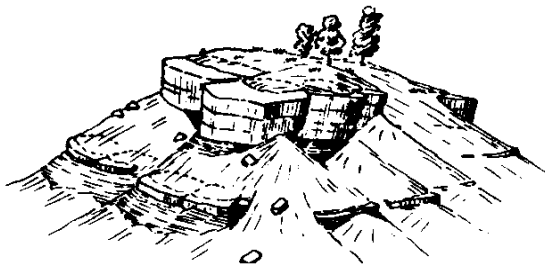


RIGHT
Rocks set deeply into holes in screen wire, plaster "soil" built around them, beds consitently tilted.

In general, use fine textured rocks of the same type as that which the model is to represent. Sedimentary rocks are layered deposits outcropping in step-like ledges or cliffs. Thickly layered sandstone or limestone is easily modeled. Thin layered shales are difficult to find in scale size. Boulders can be modeled by pebbles. Metamorphic rocks are usually layered and often steeply inclined. They can be modeled by finely layered shales or other rocks. Igneous rocks are massive and rounded or from thick, evenly layered cliffs vertically cracked and grooved. They are easily modeled out of natural rocks of appropriate shape.

BOULDERS

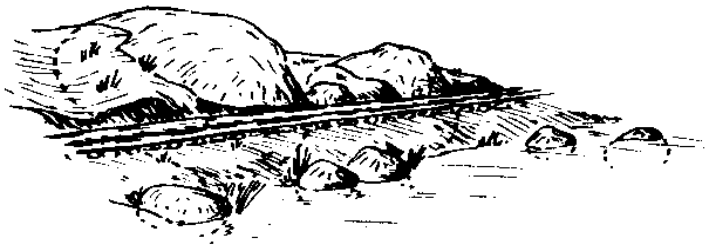
Scale boulders may be made of common laundry starch painted with oil colors or model paint. Do not use water colors. Pieces of wood, plexiglass, or buckeye nuts may also be used. These imitation rocks are so light and strong that they are recommended for scale landslides.



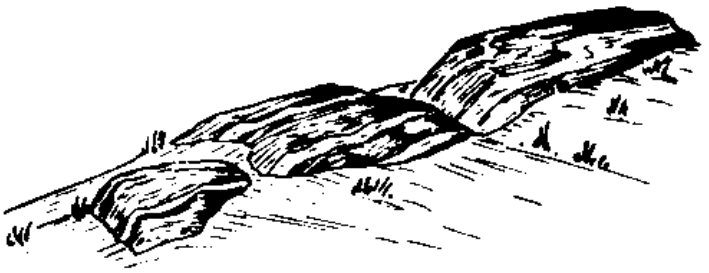
Flat lying sandstone or limestone in (plaster) shale and soil slopes. Outcrops built of shabby siltstone or shale fragments

PAINTING AND WEATHERING

The chief technique to keep in mind when painting modeled soil or rock surfaces is to be constantly changing the shade and even the color used. Keep several shades of brown, tan, dull led, gray, etc., at hand, dipping the brush in the one and then another to blend and vary the colors. In general, remember that the top of hills or knolls and of exposed rock formations are worn by the weather and are lighter in shade and the bottoms of gullies, rock crevices, etc., are darker because the rain washes all the dirt into such places.



Granite outcrops and stream bank boulders made of smooth pebbles set into plaster soil and stream. Massive rounded rocks.



Metamorphic rocks with fine layering used for metamorphic outcroppings set with consistent pattern.

There are two basic methods of achieving this shading so necessary for realism. One method is to apply a series of dilute washings, actually pouring them over the area to be covered so that they naturally carry the majority of the pigment into the gullies and crevices. This method is a bit tedious but very effective. Oil colors well diluted with turpentine are generally used.

The other method is to do the shading in the color itself. If painting is done with tempera water colors, this is the method of choice. Apply the base color fairly heavy and while still wet, touch the brush in white paint and smear on the top of the rock formation blending into the base color and brush strokes away from the top. While still wet, do the same with black in the bottoms of ditches along the right of way, in crevices, and gullies.

Choose a paint that will dry to a perfectly flat finish with no gloss or shine. Avoid enamels or semi-gloss paints. Flat oil paints are long lasting but the cleaning of brushes and utensils is somewhat of a nuisance. Tempera water colors are reasonably permanent and brushes clean rapidly in water. For greater permanence the finished job can be sprayed with a clear flat lacquer or wallpaper water-proofing mixture.

In painting angular surfaces, choose a direction from which the light is coming and keep the surfaces facing same, lighter in shade than the others making the change sharp at the corner or edges. In painting rounded surfaces, keep the side facing the light lighter in shade but blend the change smoothly ending with a darker shade on the opposite or underside.

COLORS FOR SOIL	PAINT COLOR TO USE
BROWN	Burnt Umber Burnt Umber and Van Dyke brown
RICH BROWN	Burnt Umber and Burnt Sienna
REDDISH BROWN	Burnt and Raw Siennas
REDS	Scarlet (red plus a little orange) with a little Burnt Sienna
BLACK	Van Dyke brown
TAN	Heavy Raw Umber stain
GRAY	Thin Raw Umber stain

COLORS FOR ROCKS	PAINT COLOR TO USE
GRAY LIMESTONE	Thin Black stain first - then tint with extra thin weak stains of Ultramarine blue and Burnt Sienna
RED SANDSTONE	Indian red with Burnt Sienna
BROWN SANDSTONE	Van Dyke brown with small amount of orange
YELLOW SANDSTONE	Light Chrome yellow with Van Dyke brown
GRAY GRANITE	Thin black stain first - then tint with extra thin Ultramarine stain
BLUE GRANITE	Ultramarine blue and black mixed in medium heavy stain
RED GRANITE	Claret straight from the tube