Vol. 2, No. 2
June 1979

Cultural Resources Management
CRM BULLETIN

A National Park Service Technical Bulletin

SCALE, TEXTURE, CONTINUITY: DESIGN COMPATIBILITY IN HISTORIC PRESERVATION

by
Rodd L. Wheaton and John Albright

INTRODUCTION

Late in 1978, discussions were held involving the design of a new structure to be built next to a historic one in Grand Teton National Park. The project designers felt the plans for the new building met all of the park's requirements, but the Rocky Mountain Regional Historic Preservation Team said it clashed with a rustic lodge nearby. The Team argued that if the building were constructed as designed, the visual integrity of the old lodge, a property listed on the National Register of Historic Places, would be seriously impaired. In addition, the grouping created by the new and old buildings would not only produce a discordant complex, but would also diminish the visual qualities of the immediate natural surroundings.

The initial design for the new building was rejected, and redesign became necessary. During the redesign process, the need for new construction guidelines in association with historic structures became obvious. When the discussions on compatible design between the designers and the Preservation Team had been completed and a new design had been accepted, study began on compatible design guidelines for the Rocky Mountain Region. The initial presentation of the concept came at the Cultural Resources meeting at Pensacola, Florida, in April of this year. Comments from that meeting were considered, and more study undertaken. The result was the set of guidelines which follows. They represent the initial approach to the problem. Comments and suggestions will be appreciated.

BACKGROUND

The word "compatible" has been defined as "capable of existing in harmony; congruous; accordant; consis-

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THE INDIAN IN AMERICA

The following text is from a speech presented by the Assistant Secretary before the Commission On Security And Cooperation In Europe held in Washington, D.C. on April 5, 1978. We believe Secretary Gerard's speech is an excellent one on the unique status of the Indian in American law and our governmental system. It is our hope that our continuing series of articles on attitudes and policies relating to Native Americans will make our readers more aware of the complex set of issues facing the National Park Service, a major land managing agency in the United States, as it seeks to develop a balanced response to the special demands Native Americans are making upon park lands.

The Editor

by
Forrest J. Gerard,
Assistant Secretary
for
Indian Affairs
U.S. Department of the Interior

Mr. Chairman, my name is Forrest J. Gerard. I am a Blackfeet Indian and serve as Assistant Secretary for Indian Affairs of the Department of the Interior. I appreciate the opportunity to appear before this Com-

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GROUNDWATER AND ARCHEOLOGY: SOME OBSERVATIONS

by
John E. Ehrenhard

During the spring and summer of 1974, the Southeast Archeological Center undertook an investigation of archeological resources in certain areas within Fort Moultrie National Monument. The Monument is situated on an island just outside the north bank of the Charleston Harbor. Its low profile, never rising higher than 10 feet above sea level, provided the archeologists with a serious hydrological problem as groundwater, which fluctuated with the tides, was reached in the excavations anywhere from 2-4 feet below the present day surface.

The never ending infiltration of water in the excavations, malfunctioning pumps, and clogged well points and lines, generated unexpected and needless downtime. The nature of groundwater, soil bodies, and the mechanics of dewatering naturally became a topic of interest. It is hoped that the general comments made here with respect to these subjects, based on our limited experience and belated revelations, may help others who may deal with problems of dewatering in the future.

NATURE OF SOIL BODY

For simplicity, it will be assumed that all soils can be divided into two classes referred to respectively as sand and clay. In general, sands are composed of macroscopic particles that are "rounded" or angular in shape. They drain readily, do not swell, possess insignificant capillary potential, and, when dry, exhibit no shrinkage. Clays, on the other hand, are composed of microscopic particles of plate-like shape. They are highly impervious, exhibit considerable swelling, possess a high capillary potential, and denonstrate considerable volume reduction upon drying.

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misssion to discuss the progress made since 1975 in the protection and assertion of the human rights of Native American nations, tribes, and peoples.

At the request of the Commission, we are preparing and will soon submit a report on the International Dimensions of Human Rights of American Indian and Alaska Native People. Indian tribes and their citizenry occupy a unique status in American society. This status may seem to be an anomaly until one remembers that it is as old as the Nation itself, and though frequently overlooked, is part of the fabric of American government in society. The rights which have been accorded the Native people to a continuing political existence, to land and natural resources, and to cultural distinctness are special, inherent, and unique rights, to which they adhere with the determination that accounts for their remarkable survival in the face of the pressures through history. Looked at from the perspective of the world's relations among nations, the continuing recognition of these rights by the United States constitutes a voluntary limitation of sovereignty by a powerful nation, which has few precedents in the history of the race.

The United States' relationship with the Indian tribes was described by John Marshall as like that of a larger nation extending its protection to a smaller one. This relationship is marked by the peculiar demands which necessarily result from the intimacy of being intermingled and interdependent in a way that is unlike other nations. The United States has recognized that the quality of our protection has not always matched its finest tradition. In our report, we discuss ways in which we have worked and are working to enhance this quality of protection.

Most American people deal with the federal government because of some particular characteristic giving rise to eligibility for a program or some activity subject to federal regulatory power. Indian people relate to the federal government as nations and tribes, and citizens of nations and tribes, and on that basis first, and in other ways only incidentally. Under United States law, Indian people enjoy benefits arising from their dual citizenship in the United States and in their tribes. The Indian interest of the federal government cuts across all categories. There is virtually no activity or agency of the government which has no relation to Indians, no Indian counterpart and no impact on the trust relationship.

Each Indian culture is in a state of transition, adapting to new circumstances, as is the whole of American society. The actions of government can affect, but cannot control, vast cultural changes and, as our governments related to each other on policy and program levels, it sometimes seems that the complexity in the interrelated nature of problems is so overwhelming as to make effective action impossible. But, in my experience, I have found that substantial progress is possible, if we do not allow ourselves to be intimidated by the scope and complexity of the problems, or to use them as an excuse for inaction. If we realize there is no single answer, we can proceed in an atmosphere of mutual trust prepared to make honest mistakes and correct them.

There are several things in the Indian field that can be said with certainty. One is that neither Indian rights nor Indian problems disappear if they are ignored. Another is that the American people are as insistent on justice for the Indian tribes as are the Native people themselves and their friends throughout the world. And finally, the true anomaly that must be resolved is that the Indians are the only poor people in the nations with the resources to lift themselves out of poverty. Our report provides examples of the ways in which the United States is assisting in this process, particularly over the past five years.

The art of government is that of balancing competing interests. The United States has undertaken a special legal and moral obligation with respect to Indian tribes. It is not unrealistic to say that the national honor depends on how we discharge this trust, and there is accuracy in the Indian view that their survival in society is largely dependent on the United States' fidelity to this trust.

I have some recommendations of a general nature to make as a concept. First, we must recognize the tremendous power that the United States asserts over the Indian tribes and the potential for abuse. We must acknowledge the historical record of abuse. Our system does not, by its nature, require judicial review of the exercise of discretion by the critical departments of the government, but we do have the resourcefulness to assure that the tribes have an ample opportunity to be heard in the policy-making processes and that political desisions affecting their vital interests are made openly. In my experience, I have found the Indian tribal leadership to be realistic in seeking fairness.

Second, even in the present era of tight budgets, we have ample resources to attend to the shocking and debilitating poverty of reservations. The responsibility to assist the tribes is that of the United States, not just the Bureau of Indian Affairs, but all agencies must cooperate in finding and funding long-term solutions in partnership with the tribes. With the present resources of the Bureau of Indian Affairs, the Indian Health Service and the special Indian programs in other agencies, we are just beginning to meet the needs dictated by the symptoms of poverty. We have learned from past experience that only a coordinated and solution-oriented interagency effort will lead to substantial progress.

The historic fundamental principles of federal Indian policy are: 1) recognition of Indian tribal self-government; 2) recognition of Indian Indian rights to land and natural resources; and 3) recognition of cultural distinctness of Indian tribes. In recognizing these principles, and particularly in signing nearly 400 treaties with various Indian nations and tribes, the United States assumed a federal-Indian trust relationship, which has many of the elements of a protectorate relationship among members of the international community of nations.

But also, down through the years, the United States has tended to pursue these humane policies in a paternalistic way, which has stifled the growth and development of Indian society, socially, politically and economically. Thus, although the United States is a leader among the world nations in its human rights policies with respect to indigenous people, it has many steps to take toward the successful implementation of these policies. The major recent step has been the policy of Indian self-determination, as best exemplified in the Indian Self-Determination Act. Implicit in the Indian self-determination operational policy is a subtle shift in emphasis which is of the greatest moment for human rights policy, as well as for Indian policy; no longer is federal policy preoccupied with programs that force Indians to abandon their tribal identity and assimilate individually into American society.

The present policy is designed to put Indians, in the exercise of their self-government, into a decision-making role with respect to their own lives. The assumption on which human rights policy must ultimately be based is not that this approach will simply be a better way of accomplishing the goals the majority society has has chosen for Native peoples, but instead, assuming that they have available to them all the tools

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USE OF FICTION AS A HISTORICAL SOURCE

by
Gordon Chappell

Camp Bonita Canon Officer's Quarters

...Captain Duncan pointed to a tiny two-room cabin back of several tall, wide-spread oak trees. [begin p.148]

"That is our house." Pride of ownership was in the officer's voice.

"Thank goodness!" excalimed his wife. "no one can rank us out!"

He had already explained as they drove from Willcox that a rancher named Erickson had built the house, but agreed to lease it for so long as the troop was in the canon. Geronimo had acquired the habit of utilizing the canon as a thoroughfare, and Mrs. Erickson declared she was tired of "picking up and packing" into Fort Bowie in order to save her own scalp and those of her children. The fact that the land was unsurveyed gave Erickson only a squatter's right, so he dared not remain away himself, for fear of losing his title. Hence the arrangement with Captain Duncan had been satisfactory to all concerned.

... It did not require many minutes to explore the cabin. A front room, well built and with two windows, had a fairly good wooden floor and an open fireplace. This room led into a smaller one which had evidently been been used as a kitchen. The [begin p. 149] floor in the back room was of earth, packed down solidly enough to be swept. A small sliding window and a hole in the roof for a stove-pipe, with a door opening from the back, completed the dwelling.

Captain Duncan led the inspecting party to the wall tent pitched beside the cabin and facing the same way. It was the dining room.

Back of the dining tent, but not connecting, two additional tents had been set up. One to be used as a kitchen, the other for Aunt Jane's [a black servant] bedroom.

[p. 151]...the girl, intent on reading the newspapers which were pasted on the walls, climbed on a chair, standing tiptoe. Captain Duncan's six feet-two length was telescoped on the floor at the opposite side of the room, while he perused the print above the baseboard.

The crude cabin had been transformed into a cosy [begin p. 152] home, with the front room arranged as a joint sitting room and bedroom. A tall screen concealed the bed during the day.

Curtains of unbleached muslin edged with broad bands of turkey-red calico and looped back with the same bright material hung at the two windows. A lambrequin, matching the curtains, draped the mantel. The rough pine table, constructed by the troop carpenter, was hidden beneath a gay cover and supported a coal-oil student lamp, while cheerful Navajo rugs on the floor and blazing logs in the fireplace lent the final touches to a really attractive and comfortable room.

"Why, this is not a room!" had been Bonita's excalmation as she entered the house for the first time and turned from her discovery that the grayish-toned walls were neatly covered with solidly printed newspapers. "This is a real literary salon! The papers date so far back that Mr. Noah must have started publishing them on the Ark..."

...from the hour of Bonita's discovery, keen rivalry sprang up between herself and the captain in their avid search for fresh news items, of which they kept strict tally...

[p. 154] The back room had been arranged for her boudoir. [Begin p.155] Heavy canvas tightly stretched on the earth floor was practically covered by an enormous buffalo robe, fur side up. A Sibley stove, which was simply a conical bit of sheet iron with its open base planted fornly in a box of solid soil, afforded ample heat.

The window at which Bonita stood slid sidewise when opened, and flaunted a gay cretonne curtain. A packing box, tipped on end and supplied with shelves, made a bureau, also draped with cretonne. Over this dressing table hung a mirror.

The bed was constructed of a wire-spring mattress upon wooden trestles, and again the cretonne hid the crude supports.

But the network of cords strung against the low ceiling was the most important item in the room. From these cords dangled many tin cans. The inventive genius of the girl had overcome the leaky roof after all efforts on the part of the troop carpenter had failed. Whenever a fresh leak appeared, she seized the broom and pushed a can, trolleywise, under the spot. It was a triumph of engineering skill and during the week of heavy rain Bonita had listened complacently to the dripping of the water in the cans.

The family retired and all slept serenely until two o'clock in the morning, when a terrific crash roused them.

"What--what--the devil---" ejaculated the captain as his wife grabbed his arm nervously. [Begin p. 156]

"Oh--oh---" gasped Bonita in the back room.

Mrs. Duncan scrambled hastily from the bed while her husband lit a candle.

The captain's lady, in classically flowing white gown, candle in hand, reached the doorway between the two rooms and saw Bonita sitting up in bed surrounded by tin cans of assorted sizes, each of which exuded muddy water.

"Uneasy lies the head that wears a crown," giggled Bonita, tumbling from the bed and seizing a towel. "You see," she punctuated her words with attacks on her wet hair, "I forgot to empty the cans--and now--they have emptied themselves on me!"

...than the girl who sat on [begin p.159] the low step of the door...

[p. 177] Captain Duncan settled in his easy chair with his pipe and a magazine...

...Outside raged the worst storm of the season...

"We are lucky that the house is so comfortable," observed Mrs. Duncan complacently.

Forrestine Cooper Hooker. When Geronimo Rode. (Garden City: Doubleday, Page & Company, 1924) xviii, 325 pp. Fiction.

When isolating historical fiction for nonfictional use, the important factor is the author's first-hand, first-person experience with the subject of his fiction. As a captain in the 5th U.S. Cavalry, Charles King lived the life of a frontier army officer for nearly two decades. In many instances, his novels are a thinly disguised treatment of real people and places. King's novels were widely circulated in the army of his day, and it was quite a game among officers and their wives to figure out which of their friends, acquaintances, and enemies were represented in King's latest novel. This accuracy allowed Oliver Knight to use King's portrayals of frontier army people as a source for his study of frontier army life and manners.

This brings us to the "Camp at Bonita Canon," a temporary military camp on which we have limited data. From historical sources, we know its name, its location, and some of the troops stationed there. But we have no descriptions of camp life. Selective use of a novel by Forrestine Cooper Hooker entitled When Geronimo Rode, published in 1924 by Doubleday, Page and Company, provides us with such descriptive data.

Forrestine Cooper Hooker was the daughter of Captain Charles Cooper

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Gordon Chappell is the Regional Historian for the Western Regional Office, San Francisco.

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who in 1885 and 1886 commanded Troop H of the 10th U.S. Cavalry, along with the Camp at Bonita Canon. In 1886, she married Ed Hooker, son of Colonel Henry Clay Hooker, and lived for some years at the Hookers' Sierra Bonita Ranch not far from Fort Grant, north of Bonita Canon. Her account of the Geronimo campaign is essentially accurate, along with the topography of Bonita Canon and her description of Fort Bowie. The many real people in her novel are portrayed accurately under their real names. It is known that some sort of cabin in Bonita Canon was used by the military before Neil Erickson homesteaded there in 1888. The author's foreward gives added historical validity to our fragmentary records.

> "Often I have been asked, 'How can I get authentic material for a Western story?' My stereotyped answer is, 'Live in the real west from earliest childhood, and remember the things you have actually seen and the people you have known. Then the story will write itself...'"
>
> "I lived in the heart of the Geronimo campaign and those who were actually engaged in it were my own friends..."
>
> "Fort Apache, Fort Grant, Fort Bowie, Willcox, Bonita Canon were familiar to me, not only in girl-hood but later. After my marriage at Fort Grant in 1886, I went to live at the headquarter Hooker ranch, ten miles from the garrison. So I remained for many years in that section and frequently rode over the old trails."

She goes on to describe personal acquaintances with army officers such as Nelson Miles, Anson Mills and Marion Maus, not to mention her father. Forrestine Cooper Hooker possessed the requisite experience to write a nonfiction reminiscence of those years, and although she chose instead to write a fictional treatment, her preface concluded: "The book is an authentic record of American conditions, heroism, and hardships endured by a little group of officers and enlisted men of the United States Army in the winning of the West..."

Apparently the descriptions in this novel of the tents, the stable, and the officer's cabin and tents, are the author's nonfiction reminiscence of what she saw there in 1885 and 1886. It may never be possible to prove whether the details of the cabin furnishings and the episode of the water pails are fiction or fact, but the furnishings described are indeed typical of a frontier officer's quarters, and there is every likelihood that even these features represent straightforward non-fiction reminiscence.

Elsewhere, the author has taken identifiable liberties with fact. Some elements of the romance between the fictional "Bonita" and her lieutenant may come from Forrestine Cooper's own courtship, but there are obvious changes for literary purposes. Indeed, "Bonita," whose father is dead, lives with Captain Duncan's family with her father (and perhaps mother), and the name of the canon in English simply means "pretty little canon." The literary change in name from "Camp at Bonita Canon" was probably a factual elision by the people who who lived there, in view of the awkwardness of the official designation in military records.

Until some nonfiction source of description of "Camp at Bonita Canon" is discovered, the only source we have for such description is When Geronimo Rode. Under the circumstances, it seems reasonable and justifiable to extract from it descriptive data regarding the camp and, with care, to use it as nonfictional data. ■

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they need to make informed decisions, that they will make and be responsible for their own decisions.

Consequently, it is difficult to measure the actual impact of recent trends in Indian policy. The educational level Indians is improving; the health conditions are improving; economic conditions are improving, but slowly, and there is admittedly a long road ahead toward the solution of the serious economic problems of Indian reservations. Despite recent funding trends made necessary by government-wide budget tightening, the overall funding level for Indian programs has risen dramatically in the past 20 years.

The major impact, however, is in the degree to which Indian tribes are managing their own resources, controlling their own assets, and administering their own programs. Throughout the field of Indian affairs, the major problems now are largely the result of the implementation of positive programs and the resolution of problems stemming from active tribal governments.

Tribes are now included as full participants in major policy initiatives, most recently in the planning and implementation of the President's water policy. Federal assistance has been made available to tribal and intertribal organizations to enable them to make their own decisions with respect to energy and other natural resources development. The education functions with the federal structure are being reviewed and organized in cooperation with Native people. As a result of recent Congressional action, action, the Indian governments and families now have increased capability to protect their most valuable asset, the Indian children. And, the federal federal agencies are actively reviewing and revising their policies and practices as they work with Native people to implement the American Indian Religious Freedom Act.

Tribal governments are expanding their activities in all areas: taxation, regulation and the delivery of services. Tribes and states, once adversaries, are entering into joint studies of intergovernmental cooperation to define areas of possible aggrievement, even while mindful of the remaining areas of competition.

The allegations against the United States with respect to the treatment of Indians are directed at both process and results, that is, the degree to which Indians control their own affairs and the conditions associated with the poverty of reservations and urban Indian communities. The historic federal practice has been to deal with the symptoms of poverty paternalistically, in derogation of tribal rights of self-determination. This practice has not been successful.

The present federal policy and practice is based on the assumption that only the tribes can find and implement permanent solutions to their own problems. Many successful tribally-run programs throughout the country give us reason to believe that we can look forward to increasing concrete results in dealing with reservation problems. Self-determination is an end in itself, both in domestic policy and in international human rights protection, and recent trends in federal policy have shown substantial progress toward that end. But, self-determination is also perceived to be the most efficient and effective means of achieving results of social and economic progress, and although it is too early to claim conclusive victories, we feel we have have every reason to be optimistic. ■

A PORTABLE KIT FOR CONDUCTING AN INVESTIGATION OF ARCHITECTURAL FABRIC OF HISTORIC BUILDINGS

by
Anthony Crosby
Historical Architect, Denver Service Center

All people involved in an analysis of architectural fabric frequently use certain standard tools in their investigations. For some partial investigations, these tools may consist of only a measuring tape and a plumb bob, while for others, environmental monitoring devices may be required.

The next few paragraphs describe the equipment used by one individual for architectural fabric investigations. This particular set was assembled to help analyze masonry buildings from a conservation standpoint. Some of the contents such as the chemical kit may not be necessary when undertaking a different kind of investigation. However, most items are appropriate for any kind of architectural investigation, and could serve as a checklist for future investigations.

In the following list, the numbers of the items in the kit correspond to the items in figure 1. Those marked with an asterisk are considered indispensable.

1. Field book.
2. Sample bags and containers.
3. Sandpaper.
4. Aluminum foil.
5. String, rubber bands, and adhesive tape.
6. Sponge.
7. Knives, probes, and tweezers.
8. Magnifying glass or lens.
9. Flashlight.
10. Dial or stem thermometer.
11. Metric/English measuring tape 3m/10 ft.
12. Plumb bob.
13. Levels.
14. Brushes and blow tube or compressed air.
15. Pentrometer.
16. Chemical kit.
17. Sling psychometer.
18. Surface thermometer.
19. Conductivity meter.
20. Camera.
21. Munsel color chart.

I am comfortable with a kit which can be contained in a relatively small bag, and the one I use is approximately 15 inches long and 8 inches in diameter. The convenience of a kit of this size is simply the ease of transporting it to the site. I also have a hard case measuring 20 inches by 16 inches by 7 inches for larger equipment, but this is not taken to the site unless the need for additional equipment is known beforehand.

Many of the items in the list fulfill general needs and are elaborated on. The choice of a field book for item number 1 is simply a personal preference and could be satisfied by any material suitable for recording information. A 3-meter measuring tape could also be filled by another type, and in fact, if the primary focus of an investigation is to measure an entire structure accurately, a longer tape would be necessary. Items such as sample containers, sandpaper, aluminum foil, string, rubber bands and adhesive tape can be used for a multitude of functions. Examples vary from the use of containers for collecting and storing material samples to the use of aluminum foil for taking molding profiles. Item number 13 includes an 8-inch carpenter's level as well as a string level.

Knives, tweezers, probes, a magnifying glass, a flashlight and a mirror are often required to study materials in place and also to collect material samples for further study. It is often necessary to clean an area before it is studied and for most situations, brushes, a sponge, and a blowtube, or container of compressed air are adequate.

A sling psychometer, item number 16, is used to determine relative humidity and temperature. In combination with a surface thermometer, item number 19, it can be used to determine the possible occurrence of surface condensation. A dial thermometer is used to determine the internal temperature of a wall and indirectly, the location of a dew point. The pointed stem can often be pushed into a wall between building units and the temperature registered at a depth corresponding to the length of the stem.

The conductivity meter, item number 21, is used to determine the relative moisture content on the surface of a building material. An electrical current travels between two pin-type probes and measures the relative conductivity in arbitrary units for most material, but it measures the absolute moisture content of wood. For materials other than wood, if the surface on which the probes are set is damp, then a relatively high reading can be observed. If the surface is drier at another time a lower lower reading is observed. The conductivity meter I use is manufactured by Protimeter, Ltd. of Buckinghamshire, England, but similar ones are available from other manufactures such as Soil Test, located in Evanston, Illinois.

The pentrometer, also by Soil Test, is used to determine the relative surface hardness of a material. Compressive and shear strength can, to a certain degree, be determined by using a procedure developed by Erhart Winkler, Department of Earth Science, University of North Dakota.

Item 10, the chemical kit, includes containers of hycrochloric acid, diphenylamine, barium chloride, silver nitrate and deionized water, all readily available at a pharmacy or chemical supply house. These chemicals provide a very quick means for determining whether soluble salts exist as efflorescence, and whether subflorescence are carbonates, nitrates, sulphates, or chlorides. Such knowledge could quickly point to the probable course of moisture or the presence of significant airborne pollutants. As an example, the presence of nitrates would normally indicate a ground water source since nitrates are the product of decomposing organic material. However, the presence of nitrates in an area obviously not affected by ground water could be reflecting the presence of nitrogen oxides in the air.

A Munsel Soil Color chart is also included in this kit so that color comparisons of building materials can be made quickly. Since this particular kit was put together for use primarily in association with masonry buildings, the limited range of this particular color chart to earth tones is not restrictive. If a wider range of colors is encountered, perhaps as a part of a decorative scheme, a more complete color chart would be necessary to accurately describe them in the field. This chart is often used to compare the color of similar material, since a dark stain often results from excessive amounts of soluble salts.

A camera is probably the one single item most often taken to a site regardless of the relative complexity of the field investigation. The camera can record the most information at any one time, but more than any other piece of equipment, it is used as a crutch. The subtle causes for much deterioration require more specific information than is available on film, and that information has to be determined by a variety of other means.

In summary, the particular kit discussed in this article would cost approximately $230.00, exclusive of the camera (if all items were purchased at one time). However, many of the items are probably already in the possession of most people, so the actual investment would probably be somewhat less. The single most expensive item is the conductivity meter which will cost approximately $100.00. The cost of individual items drops dramatically from there, the next most expensive item being the Munsel color chart at approximately $35.00, followed by the sling psychometer at $18.00. ■

GROUNDWATER, from page 1

In problems dealing with groundwater, the "soil body" is considered to be a continous medium of many interconnected openings which serve as the fluid carrier. That portion of a soil not occupied by solid matter, may be occupied by groundwater. These spaces are known as voids. The nature of the pore system within the soil can best be visualized by inference from the impermeable boundaries composing the pore skeleton. They are fundamentally important as they act as groundwater conducts. Typically, they are characterized by their size, shape, irregularities and distribution.

Let us assume, for the purposes of this discussion, that the soil particles are all of uniform spherical shape. The porosity of a soil is a measure of the contained voids and may be expressed as the percentage of void space to the total volume of the mass (Figure 1). Calling the total volume (V), and the "volume of voids" (V_1), we have for the porosity: $P = \frac{V_1}{V}$ and for the void ratio: $V_r = \frac{V_1}{V - V_1}$

For a cubical array of uniform spheres, porosity can be expressed as: $P = 1 - \frac{\pi}{6} = 0.476$. For a rhombohedral packing, which represents the most compact assemblage of uniform spheres, the porosity is:

$P = \frac{1 - \sqrt{2}}{6}\pi = 0.26$. Figure 2 shows the pore volume available for the flow through the cubic and rhombohedral arrays respectively. It should be noted that even in the ideal porous medium the pore space is not regular but consists of cavernous cells interconnected by narrower channels. Natural soils contain particles that can deviate considerably from the spherical shape and are far from uniform in size. The true nature of the pore channels defies rational description.

The subsurface occurrence of groundwater may be divided into zones of saturation and aeration. In the zone of saturation, all voids are filled with water under hydrostatic pressure. The zone of aeration consists of voids occupied partially by water and partially by air. Water occurring in the zone of saturation is commonly referred to simply as groundwater. This general zone may be further subdivided into: (1) the soil water zone, (2) the intermediate zone, and (3) the capillary zone; thickness of zones varies with soil types and vegetation (Figure 3).

Soil Water Zone: Water in the soil water zone exists at less than saturation, except temporarily when excessive water reaches the ground surface as from rainfall or irrigation.

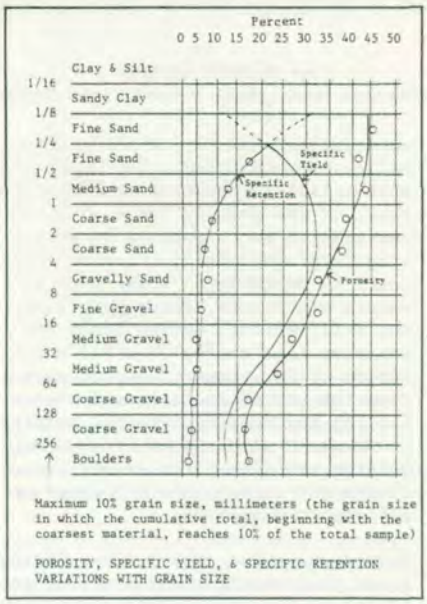
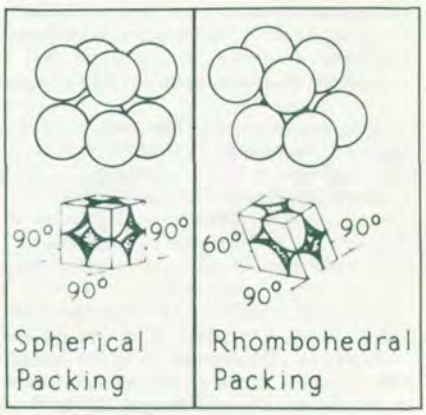


Figure 1

Figure 2



Intermediate Zone: The intermediate zone extends from the lower edge of the soil water zone to the upper limits of the capillary zone. It may vary in thickness from zero, when the bounding zones merge with a high water table approaching the ground surface, to several hundred feet under deep water conditions. The zone serves primarily as a region connecting the ground surface to that near the water table through which water moving vertically downward must pass.

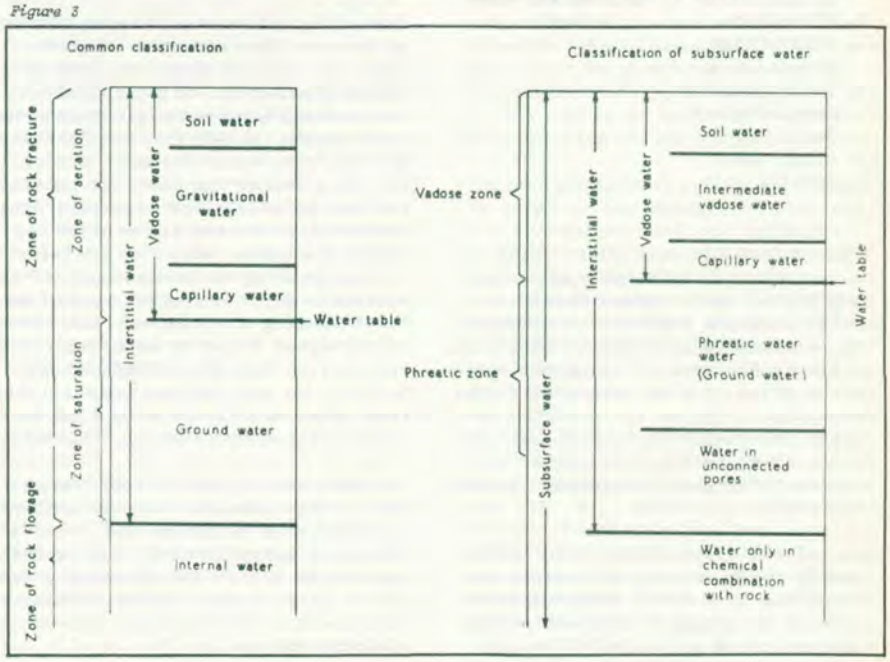
Capillary Zone: The capillary zone extends from the water table up to the limit of capillary rise of water.

Saturated Zone: Groundwater fills all of the voids in the saturated zone.

PRINCIPALS OF OPERATION

The principal of operation in "well pointing", also known as a sand point or well point, is to drive a screened, perforated pipe or pipes into the ground ahead of excavation so that the water may be drawn from the subsoil by pumping. Usually water under pressure is used to jet a hole large enough for the point to enter the ground. Choking of the screen can be overcome by jetting a hole larger than the point so that the space around it can be filled with coarse sand or fine gravel which will form a screen additional to that provided by the well point.

Figure 3



When the points have been sunk, "swing arms" are connected to the suction header and stop valves fitted between the header and swing arms, allowing for the isolation of any well point (Figure 4). Connections from the well point must always rise to the header which should in turn rise to the pump. This will eliminate the possibility of vapor locks forming.

Well points at Fort Moultrie were either a "progressive" or "ring" layout. The progressive layout is used for excavating trenches, the ring system for excavating a set area. In the progressive layout the suction header is placed alongside the line of the proposed trench. Depending upon the strata and quantity of water to be handled, either a single row of well points or one on each side of the trench is required (Figure 5). If the trench is being excavated by hand the points may be located close to the trench sides, but if heavy equipment is used, suction heads should be outside the tracks of the machine. Points can be spaced at standard intervals or multiples of standard intervals, according to the nature of the ground and the quantity of water. In fine running sand, wide spacing will usually suffice; but in loose gravels or coarse sand where large volumes of water are encountered close spacing may be necessary.

Typical pumping equipment consists of a self-priming single stage centrifugal pump. This type of pump will lift a liquid provided the pipe between the supply and the pump housing enclosing the impeller is completely filled with water before the machine is started. Pumping will continue so long as no air accumulates around the impeller.

A certain amount of pressure is required to get water flow into a pump before additional pressure or velocity can be added. For our purposes this "head" is expressed in energy/pounds due to pressure and is known as the "Net Positive Suction Head" or NPSH.

A pump must be installed so that the head available at the intake is equal to or greater than the rated NPSH of the pump. If the available head is less than the required NPSH the pressure in the well point reduces to the vapor pressure of water and the pump will "cavitate." Cavitation is the formation of a vacuous space around the impeller which is normally occupied by water. This subsequently reduces the pumping capacity.

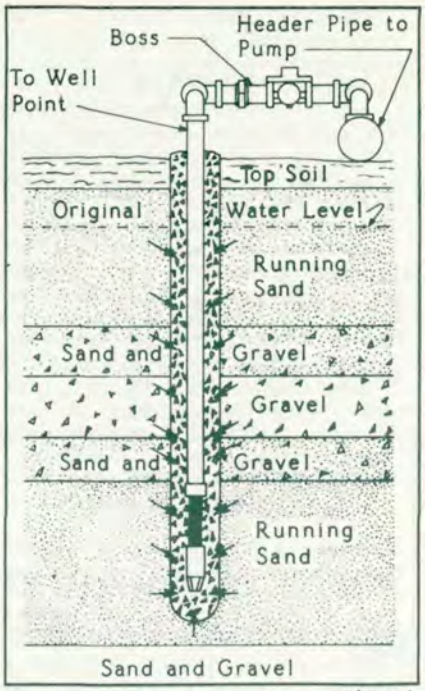


Figure 4

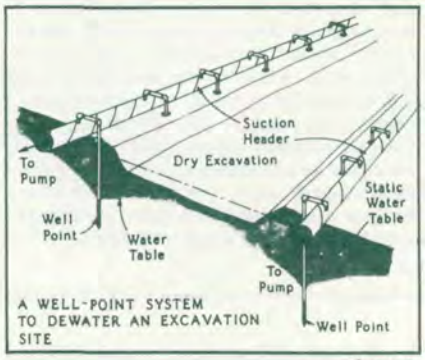


Figure 5

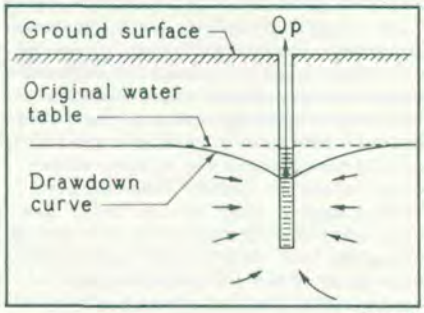


Figure 6

When a well point is pumped, water is removed from around the point; the water table is lowered. The drawdown at a given point is the distance the water level is lowered. A drawdown curve shows the variation of drawdown with the distance from the well (Figure 6). In three dimensions the drawdown curve describes a conical slope known as the as the cone of depression. The outer limits of the cone define the area of influence of the well.

For a given well the drawdown can be determined at any point if the well discharges are known or vice-versa. The drawdown at any point in the area of influence is equal to the sum of the drawdowns caused by each well individually. Thus:

$$D_T = D_A + D_B + D_C + D_N$$

D_T is the total drawdown at a given point and D_A, D_B, D_C, D_N are the drawdown values at the points caused by the discharge of wells A,B,C,N respectively. The summation of discharge may be illustrated as shown (Figure 7); the individual and composite drawdown curves are given for Q_1, Q_2, Q_3.

The purpose of well screens and gravel acks is to maintain open access within the water bearing stratum while ensuring that it operates freely once installed. A screen and many times a gravel pack are an absolute necessity if the well draws on fine unconsolidated sands. The screen and pack should prevent first the collapse of the well due to the abstraction of large quantities of sand, and secondly, damage to the pump due to sand particles in the water.

The use of correctly designed equipment is important to the overall efficiency of the dewatering system. Well screens' designs should incorporate such features as:

1. a means to prevent the movement of sand into the well.
2. effective nonclogging openings; slot size should match gravel pack medium or that of the surrounding area.
3. a maximum open area of screen.
4. an adequate strength to prevent its collapse.
5. a low inlet resistance.

Gravel packs should include the following design features:

1. be sand free after development.
2. give lowest possible resistance to permeation.
3. offer low entrance velocities.

The gravel pack should ensure that the completed well operates free of sand; thus, the particle size of the pack depends upon the particle size of its surroundings.

There are several basic requirements for a gravel pack: For formations of sand, the aquifer must be stabilized. It is not usually practical to have very

See GROUNDWATER, page 8

GROUNDWATER, from page 7

small slot sizes and so an artificial gravel pack should be selected which forms the correct size of pore opening and stabilizes the sand in formation. The use of a pack in a sand formation enables the screen opening to be considerably larger than if the screen were placed in the formation by itself. The pack adjoining the screen consists of larger sized particles than the surrounding formation, and hence, larger voids are formed at and close to the screen allowing water entry nearly free from head loss.

The grain size of a gravel pack should be chosen so that it ensures that the completed well operates sand free. Standard sieve analyses should be used for all determination of aquifer size for the design of gravel packs.

The gravel pack standard grain size is equal to the aquifer standard grain size multiplied by the screening factor.

G.P.S.G.S. =
A.S.G.S. X Screening Factor

Charts for determining the standard grain size of any type of aquifer are commercially available.

The well screen should not retain all the surrounding aquifer of gravel pack contents but should be designed to allow the fine and medium size particles to wash out during the development of the well; however, screens still tend to become blocked and restrict the open screen area. Blockage of the openings will cause higher velocities of the water locally which will carry larger particles from the surrounding formation and lead to further blockage. A uniform distribution of inlet openings will, if spaced as close as possible, provide uniform development over the length of the screen and so avoid areas of underdevelopment and high velocities.

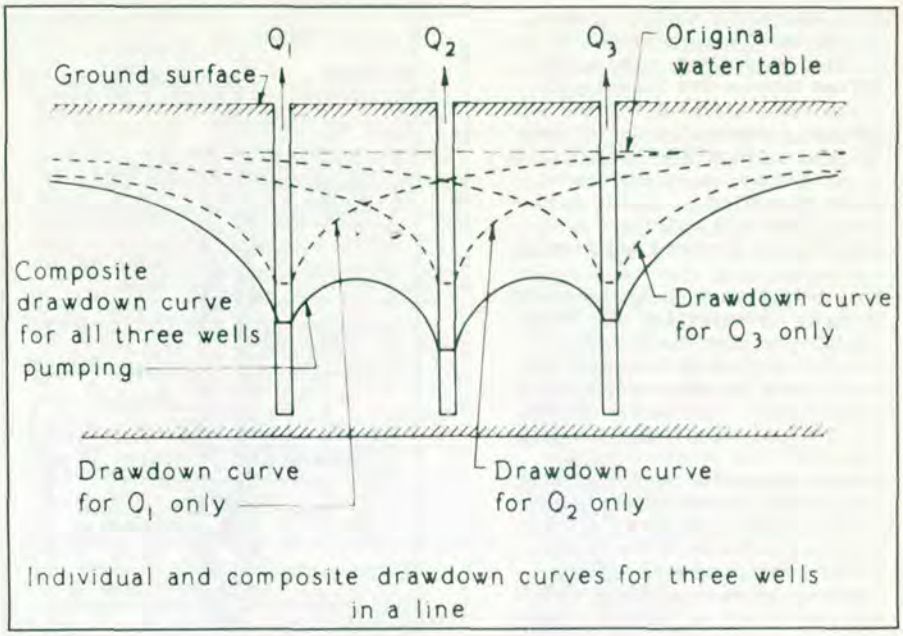


Figure 7

It is suggested that an open area greater than 25 percent gives little increase in efficiency; however, the performance decreases considerably when the open area is less than 15 percent. To a point, the higher the percentage of open area available the more area there is to be blocked before head loss becomes significant; and therefore, an additional open area should result in an increase in efficiency over a longer period of time.

DESIGN, from page 1

tent; not repugnant." The key word in the definition, "harmony," served as the theme of the architectural design guidelines followed during the great public works developments of the middle and late 1930's in the National Parks. In 1937, Thomas C. Vint, Chief Architect of the Western Division of the National Park Service, published a report on the massive construction program in the parks that had then been underway for four years. In that report, Vint outlined the design objectives for new buildings, signs, shelters, bridges, or any new park structures. He suggested that the structures should "be in harmony with the natural surroundings" and with one another. Stone, rock, and log should be in scale to the surroundings and to each other, and natural materials should be used.

As the historic preservation movement developed in the 1960's and 1970's, the themes of compatibility and harmony appeared again, this time in the various design guidelines and ordinances created by the nation's towns and cities. Probably the best known of these, the Savannah Plan, prepared in 1966, used a concept of relatedness points. Under this concept, a developer's design for a new building within Savannah's historic district would have to meet six of sixteen design elements before construction could begin. Many cities today use variants of this plan, with results ranging from gentle and harmonious blending of new and old buildings to examples of mimicry of the past which tend cheapen both the historic and modern structures involved.

Vint and his colleagues throughout the System focused on the natural surroundings in their designs. Their concern for blending the natural and built environments produced practical and handsome structures that today show the charm of design and functional durability of rustic architecture. The principles of harmony and compatibility used by the park designers in the 1930's still serve as excellent criteria for designers concerned with the creation of new structures associated with those remaining from the great development spurt of the 1930s.

As the historic preservation movement developed in the 1960s and 1970s, the themes of compatibility and harmony appeared again, this time in the various design guidelines and ordinances created by the nation's towns and cities. Probably the best known of these, the Savannah Plan, prepared in 1966, used a concept of relatedness points. Under this concept, a developer's design for a new building within Savannah, Georgia's historic district would have to meet six of sixteen design elements before construction could begin. Many cities today use variants of this plan, with results ranging from gentle and harmonious blending of old and new buildings to mimicry of the past which tends to cheapen both the historic and modern structures involved.

The screen length and diameter can be chosen from the slot size and total opening required. Allowance should be made for 50 percent of the open area becoming blocked. The screen length is a function of the hydrogeology while diameter depends primarily on choice, the method used to drill the well, or a combination of both. Determination of screen slot size depends on the critical particle size of the aquifer or gravel pack to be retained. A standard sieve analysis of the aquifer or pack determines this size (commercially available).

Commercial well screens' slot design:

1. slotted rings
2. wedge-shaped bars or rings
3. bridge slots
4. louvre slots

In the design of simple slotted screens, it was found that circular perforations were not satisfactory, and oblong slots were developed. These have open areas as high as 40 percent; however, the slot was completely punched out, and there was considerable loss of strength. The slots may be vertical or horizontal, but it is suggested that vertical slots may not stabilize fine particles. Horizontal slots stabilize these particles, but they tend to "bridge over" the slot. These screens tend to have a high degree of blockage.

A temporary form of screen is the mesh type, in which a wire screen mesh is placed around a well-perforated tube. High corrosion and clogging are the disadvantages that occur with this type of screen.

Wedge-shaped bars or rings can be arranged to give a continuous opening in the form of an "inverted V", with the narrow opening on the aquifer side either in the vertical or horizontal plan. Horizontal slots are usually formed on a continuous wire-wound process. Advantages claimed are that a large open area is given, that slot width can be varied over a large range, and that the wedge-shaped bars or rings give strength. Clogging is said to be small; however, the effective open cross-sectional area may be limited by the transverse or longitudinal bracing.

The bridge slot screen is an adaptation of the simple slot screen, only here the perforation is not completely pressed out but is allowed to form bridge over the opening. This produces a higher strength than simple slot designs, and gives up to 30 percent open area. A limited series of slot sizes can be provided, and good gravel deflectors are formed.

If the hole is pushed out of the screen so that a small "roof" is left projecting over the hole, then the louvre perforation is formed. Claims are made that:

1. added strength is given.
2. material is prevented by the roof from running down into the well.
3. as there are no parallel surfaces, the degree of clogging is small.

SCREEN MATERIAL

Well screens are readily available in a number of materials:

- commercial steel
- steel coated with chlorinated rubber
- galvanized steel
- plastic coated steel
- plastic
- copper
- stainless steel
- aluminum
- fiberglass

In conclusion, it must be remembered that each site necessitating dewatering will involve its own special problems involving soils, porosity, amount of water, etc. What works at one site may not be successful at another.

The author is a Research Archeologist at the Service's Southeast Archeological Center in Tallahassee, Florida.■

Remove not the ancient landmark thy fathers have set.

Proverbs 22:28

ROCKY MOUNTAIN REGION CONSIDERATIONS

Concepts such as those found in the Savannah Plan work best in urban scenes where comparisons are both numerous and close at hand. The Rocky Mountain Region seldom presents a background for urban-style compatible design. Instead, the cultural resources include four-story log hotels, diminuitive patrol cabins, stone cabins, stone, log, and frame service buildings and lodges; residences of formal and vernacular design; and Pueblo-style ruins. Structures are sometimes clustered in units and are sometimes isolated. The natural backdrop of the structures within the region is equally diverse, for the buildings are set in forests, deserts, mountains, meadows, lakefronts, and plains. Obviously, a "relatedness points" concept using as many as sixteen elements cannot apply to such diverse surroundings and structures. The design guidelines must instead be broad, flexible, and adaptable to each specific situation. Recognizing this, the Historic Preservation Team of the Rocky Mountain Region has developed guidelines involving three elements only: Scale; Texture; Continuity. Nevertheless, all three elements must be addressed. None can be ignored in the design process under the Rocky Mountain Region Design Compatibility Guidelines.

DEFINITIONS

Scale: For the purposes of these guidelines, scale is the relationship of the mass of the existing historical structures to the new structures, in similar or harmonious proportions, especially height and width.

Texture: Texture refers to the predominant surface quality of the existing historical structure materials in relation to the predominant surface quality of the new structure's materials. Light reflective qualities and surface quality of the new structure must relate harmoniously to the old.

Continuity: This is the paramount design compatibility element within the guidelines. It includes consideration of the general/specific pre-existing architectural style or tradition of the existing historical structures in the design and placement of the new structures. Color is a key element in continuity, as is the relationship of solids and voids. Architectural rhythm and spacing, in cases involving groups of buildings, are elements in continuity, as is the continuation of predominant lines in the existing structure, whether horizontal, vertical, or diagonal. The relationship of the existing structures to the immediate natural surroundings, and any formal or natural landscape features must be considered in the designs. Roof shapes, window shapes, projections, and architectural details must be considered as well.

ROCKY MOUNTAIN REGION DESIGN COMPATIBILITY GUIDELINES

The Rocky Mountain Region Design Compatibility Guidelines apply to all

See DESIGN, page 10

DESIGN, from page 9

structures on the National Register of Historic Places, those eligible for nomination to the Register, or included on the List of Classified Structures. Any design for new construction (including additions to existing structures) adjacent to, or in visual or physical association with, such cultural resources must conform to the design compatibility guidelines criteria as a routine part of the Regional Director's review and approval. The design compatibility guideline review process is sequential and is intended to ensure cooperation between the project designer and the Regional Historic Preservation Team from the initial stage of the project through the construction phase.

Throughout the design process, coordination between the designer and the Regional Historic Preservation Team will be close and continal. In this way, problems concerning compatible design can be addressed as they occur, with both parties being equally familiar with the project.

The process functions in four phases:

PHASE I: Predesign. The affected cultural resource will be identified through 10-238 review; applicability of design compatibility guidelines will be noted in the Task Directive; the requirement to meet design compatibility guidelines will be an essential part of the process of selecting the designer (A and E or Denver Service Center) and any consultants; and in a predesign conference between the Regional Historic Preservation Team and the designer, the design characteristics of the affected cultural resources will be determined.

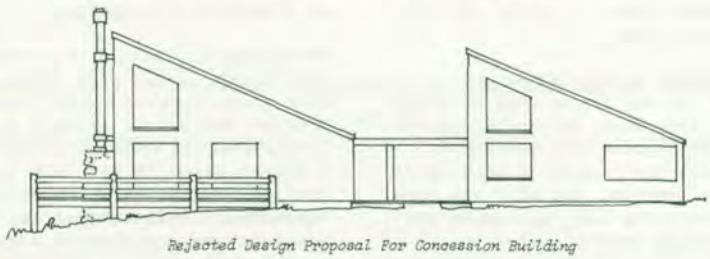
PHASE II: Preliminary design. The design will be reviewed for adherence to the three design compatibility criteria. The preliminary design will receive formal compatibility review. Disapproval will require redesign. Approval at this stage will be final, with the understanding that the final design will not differ markedly from the approved preliminary design.

PHASE III: Monitoring. The Regional Historic Preservation Team will monitor the project for design compatibility through the preparation and review of construction documents, and throughout the construction process, for any changes in the approved preliminary design.

PHASE IV: Maintenance and management guides. Preparation of maintenance and management guides will be reviewed to ensure that projected maintenance actions will not introduce incompatible elements. This includes operations and management agreements in concessioner facilities.

Historic Leek's Lodge

Accepted Design Proposal For Concession Building



Rejected Design Proposal For Concession Building

SCALE

As illustrated by the south elevations, the approved design of the proposed Leek's Lodge concession building respects the scale of the historic Leek's Lodge, Grand Teton National Park. The foundations of the proposed new structure have been divided between two structures to reduce mass. Further, the architects, Meiiji Resource Associates of Bountiful, Utah, have employed the textural device of natural materials and have used such design features as gabled roofs, extended porches, and asymmetrical window fenestration to maintain compatibility with, while not mimicking, nearby Leek's Lodge.

The Bear Lake Transportation Shelter in Rocky Mountain National Park

TEXTURE

The Bear Lake Transportation Shelter, built in 1978 at Rocky Mountain National Park, illustrates the importance of the texture of materials. The structure, designed by David Snow of the Rocky Mountain Regional Office, employs log and half-log construction, diagonal bracing, vertical, rough sawn boarding, exposed pole rafter tips, and a wood shingle roof, doubled every fifth course. Though this structure is isolated from nearby historic structures, the textural qualities reflect Superintendent Brooks' theme of architectural continuity employing designs based on the park's historic architecture.

Rocky Mountain National Park Utility Area Historic District

New YACC Storage Buildings

CONTINUITY

A significant aspect of the Rocky Mountain National Park Utility Area Historic District, dating from 1934 to the 1940's, is the integrity of its continuity in design. However, the district serves as a working maintenance yard, not a museum enclave, and this made additions to the historic scene necessary. The construction in 1978 of two YACC storage buildings maintained the continuity of the district. Sited on the predominant southwest-northeast axis, the structures are aligned with the facade of adjacent structures and open into the yard. The continuity also is maintained by appropriate scale and the use of vertical rough sawn siding and gabled, wood shingled roofs.

NONHISTORIC DESIGN CONTINUITY

Nonhistoric design continuity is allied with design compatibility between new and historic structures. Many designers and park managers are now becoming concerned with continuity of structures within parks. Signs, walkways, barriers, and shelters, they feel, should be similar throughout the park, should blend with major or visually predominant park buildings, and all manmade features should rest comfortably with the visual surroundings and the natural environment.

Whether this growing appreciation for nonhistoric design continuity results in the creation of design guidelines patterned after the design compatibility guidelines remains to be seen. Yet it is clear that a new respect for design which is harmonious with both the natural and the built environment, whether historic or nonhistoric, is growing at all levels within the National Park Service. Such an attitude can only enhance the care of the resources and the experience of the visitor.

Any questions you may have on points discussed in this article can be addressed to:

Regional Historic Preservation Team
Division of Science and Resource Preservation
Rocky Mountain Regional Office
National Park Service
P.O. Box 25287
Denver, Colorado 80225

Phone: (303) 234-2764

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NON-ARTIFACTUAL CULTURAL RESOURCES AND NPS PLANNING

by
David R. Stuart

The American Indian Religious Freedom Act (P.L. 95-341) and the National Park Service's "Policy Guidelines for Native American Cultural Resources Management" (Special Directive 78-1) have stimulated much discussion regarding the consideration of Native American concerns in NPS planning (see Moore 1978). When the foci of Indian concerns coincide with recognized archeological resources, few difficulties exist; the NPS policy of preservation (Management Policies 1978: V-2ff) is generally harmonious with preferences of the Indian community. Planning difficulties are more common when Native Americans identify locales of traditional importance that do not exhibit physical evidences of human behavior, ie., are not archeological resources.

Such non-archeological, traditional loci of cultural values might include natural features or landscapes to which mythological or religious values are attached, sacred "spirit places" to which purified pilgrims go to seek supernatural assistance, even gathering, fishing, or hunting places that have been given traditional importance. Even without any associated archeological resources, these locales are cultural resources. They may indeed be vital to an adequate anthropological understanding of the local Indian culture, and NPS impacts upon these resources may have far-reaching effects upon the contemporary expression of a lengthy cultural continuum.

The Department of Interior (anon. 1973:2) has stated that in addition to archeological, historical, and architectural resources, "the term cultural resources can include districts, sites, structures, and objects important to an indigenous culture, a subculture, or a community for traditional spiritual, religious, or magical reasons..." The Service, on the other hand, has limited its definition of cultural resources to archeological, historical, and architectural resources (Management Policies 1978: V-2; anan. 1974). Moreover, the national historic preservation mandates emphasize artifacts (in the broad sense of physical entities made or modified by humans) and the cultural data inherent to them and their contexts. It has often been quite frustrating to evaluate the effects of a Park Service undertaking upon non-artifactual cultural resource following the historic preservation pathway (36 CFR 800). Such efforts have often been stymied in the past when non-artifactual cultural resources were held to be ineligible for inclusion in the National Register of Historic Places.

Non-artifactual cultural resources should, however, be evaluated in terms of the National Register criteria (36 CFR 60.6) and nominated if they meet the criteria (as per Executive Order 11593 and Management Policies 1978: V-5). It should be noted that the National Register recognizes properties whose qualities are significant not only to history, architecture, and archeology, but also to culture. Many nonartifactual cultural resources clearly have yielded, or may be likely to yield information important to the anthropologically studied prehistory or history of a Native American group (36 CFR 60.6[d]). Several such sites have been recently listed in the National Register.

It will, nevertheless, be difficult to extend the coverage of the historic preservation mandates to many non-artifactual, cultural resources. In these cases, planning considerations may still be required under the National Environmental Policy Act of 1969, which not only encourages the preservation of historic resources (Sec. 101[b][4]), but also specifically directs a consideration of social impacts. The Council on Environmental Quality's implementing regulations for NEPA (40 CFR 1500) require a comprehensive evaluation of impacts upon the human environment, including the relationships between social groups and the natural environment. As King, et al. (1977; 8-10) have elegantly pointed out, assessments of social impacts done under NEPA authority are much more holistic than those investigations and consultations conducted as per the historic preservation mandates. Social impact assessments must consider all affected ethnic or social groups. The CEQ regulations do, however, specifically direct: the solicitation of input from affected Indian tribes during the scoping process (§1503.1[a][2][ii]).

Yet, a shift to greater reliance upon NEPA authority to evaluate effects on non-artifactual cultural resources does require some informed caution. It has been argued that while NEPA requires certain procedures for determining the total environmental impact of a federal undertaking, it provides no real protection for any specific resource. The same can be said of historic preservation pathway of 36 CFR 800. Having completed the procedural pathway, an agency may continue against the wishes of the Advisory Council, and destroy historic resources.

NEPA's applicability is limited to major actions which may significantly affect the quality of the human environment. While the definition of "major

See NON-ARTIFACT, page 18

NEW TRAINING PROGRAM AT NORTH ATLANTIC REGION

The North Atlantic Region is sponsoring a region-wide skills training program beginning August, 1979. The basic program for these initial students will run two years, and is geared to the training needs of maintenance personnel working on historic buildings and structures. Skills training will be oriented around carpentry, masonry, and painting, with additional emphasis on record keeping, working with preservation and exhibit specialists, and spotting potential historic preservation problems.

The program uses a correspondence course format, along with classes at local vocational-technical schools, and finally, two to six weeks work with with a Park Service historic preservation team. Prior to graduation, the interns must perform a minimum of four weeks "hands on" work under the supervision of the North Atlantic Preservation Lab. Satisfactory completion of this final assignment will lead to certification through the North Atlantic Region Certification Board, which is monitoring the program.

Three to six employees will be accepted to this training course on the basis of their current involvement in historic preservation maintenance work and their interest in developing historic preservation maintenance skills. In advance of the initial classes, an individual development plan will be completed on each student, taking into account the type and kind of work the employee has performed in the past and the training sessions he has attended.

The most extraordinary facet of this new program is that it is not an isolated phenomenon. NPS cultural resource sites across the United States seem to be increasingly aware of historic preservation maintenance training needs and, more importantly, to be doing something about them. The North Atlantic Region effort is only one of several programs contributing to a heightened preservation consciousness. The current North Atlantic program is the work of of William Binneswies, chairman of the the Certification Board, Russ Beasley, Blaine Cliver, Cynthia Pollack, John Raftery, Marie Rust, and Richard Volpe. ■

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actions significantly affecting the human environment" remains nebulous, the courts have consistantly favored a liberal interpretation. Indirect and long-range cumulative impacts upon both natural and cultural elements must be specifically considered, and through tiering (40 CFR 1502.20), virtually all NPS actions will be addressed.

The CEQ regulations clearly indicate that in those cases when project impacts are entirely social or economic, no environmental impact statement is required (40 CFR 1508.14), regardless of the severity of those impacts! We can only presume that informed NPS decision makers look beyond this weakness in NEPA and will strive to reflect NPS policy (Special Directive 78-1).

Lastly, whereas an amendment to the National Historic Preservation Act of 1966 (P.L. 94-458) permits the withholding of locational information for sites on the National Register when such information could jeopardize the resources (e.g., through vandalism), non-artifactual cultural resources considered only under NEPA could be vulnerable via Freedom of Information Act requests.

Despite these weaknesses, NEPA remains an effective authority under which to integrate Native American concerns into NPS planning. Application of NEPA to this planning problem will avoid many of the difficulties inherent in dealing with non-artifactual cultural resources via the historic preservation pathways. Yet even though NEPA provides a sufficient mandate for the consideration of the effects of NPS undertakings upon non-artifactual cultural resources and concerned social groups, NPS planners, decision-makers, and field personnel must individually cultivate sensitivity. Only when NPS personnel generally appreciate cultural relativism and the desirability of perpetuating our plural cultural heritage will Native American concerns be adequately addressed.

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The author is an archeologist in the Legislative Compliance Division, Denver Service Center. ■

CRM BULLETIN
Volume 2, Number 2
June 1979

Published quarterly by the Assistant Director, Cultural Resources, in the interest of promoting and maintaining high standards in the management of those cultural resources entrusted to the National Park Service's care by the American people.

Editor: Douglas L. Caldwell
Assistant Editor: Mary V. Maruca
CULTURAL RESOURCES, WASHINGTON

Designer: Patrick A. Hurley
PROFESSIONAL PUBLICATIONS DIVISION, WASHINGTON

Cultural Resources
National Park Service
U.S. Department of the Interior
Washington, DC 20240

Postage and Fees Paid
U.S. Department of the Interior
INT 417

U.S.MAIL