THESIS
ON
THE BLACK CANYON

1977-78

DANIEL FAYAD ELIAS

HOOVER DAM NATION
This thesis deals with the exploration of issues: addressing social issues in architecture; the juxtaposition of strong, conflicting images and their subsequent interface; and the urban context which must be structured for the uniqueness of this specific program and site.

These issues and their consequences are the basis for the design and the ultimate viability of the "Hoover Dam*Nation of the Black Canyon Gambling Resort." The resolution of these issues for this project is its thesis.
Key words which set off the imagery for this project include:

<table>
<thead>
<tr>
<th>Juxtaposition</th>
<th>Clamour</th>
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<tr>
<td>Hyperbole</td>
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<td>Pleasure-Zone Architecture</td>
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<td>Structure</td>
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<td>Orientation</td>
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This project will entail the design of a gambling resort with all necessary support facilities which will include casinos, recreation, entertainment and shopping facilities, temporary and permanent lodgings and a transport system tying all activities with themselves and the outside systems.

The site for this resort will be located at the Hoover Dam, in the Black Canyon, 26 miles southeast of Las Vegas, Nevada.

The issue is juxtaposition in every way. Yes, the spaces will be designed and the urban fabric will be structured, but, the attitude is crucial! The attitude is formed by the context: (the marriage creates paradox), the man-made versus the natural; heroic architecture versus the vain; the decadent versus the purposeful, the degenerate gambler versus the generating dam; leisure versus utility, etc. To view this project as anything less than a collision of images and to express it as such within the context of an urban solution is to give the project less than the potential it has.

It is crucial then, that the important elements which reinforce the illusions that create the reality of Las Vegas, be constituent in the attitude this thesis takes.
"Hoover Dam Nation of the Black Canyon Gambling resort" is a poignant title for this thesis as it suggests a metaphorical image that concisely relates the attitudes which this thesis takes. Indeed, the idea of an aggregate of common interests which the "Dam Nation" colored by its containment in the "Black Canyon" suggests, gives way for the development of the general scale from which the design must begin.

The coherent, holistic image the entire project must take is like the cover picture of a magazine, which heightens and informs the anticipation of its contents.

This is the first scale, the scale which confronts the contextual problems of the site while establishing its own identity.

The context of the site informs the scale and the identity: The canyon is a bold natural phenomena which the Colorado River carves away as it snakes thru the canyon floor, all the while the dry desert air with its hell-like blasts of summer heat melts the canyon into wavering waves of illusion.

The Hoover Dam is strong, so unnatural, so incredible. It holds back 115 miles of water, and uses that water to create so many things: recreation, electricity, irrigation water, flood control. It is a monument to man's ingenuity, productivity and optimism. Its "art deco" execution is in itself a geometric expression of man's dominance over nature as it tames the Colorado and reaps its benefits.

The resort's main purpose is gambling, the most decadent expression of materialism which religious doctrine has condemned forever, which brings such inevitable misery to those who engage in it, and which seems as instinctive to men, from the richest man to the poorest, as food and sleep. A gambling casino serves a truly legitimate social and existential
function. The siting of these casinos in the Black Canyon with all its ubiquitous harshness; with the Hoover Dam in all its man-made, productive glory, becomes an eloquent juxtaposition of the sacred and profane in man's nature.

The resort, comprising of six casinos, must allow on a subsequent scale, the individual expression of each casino, while maintaining the overall imagery. Each casino will establish a theme which sets off the execution of its programatic criteria.

The following program is a program for just one of the casino/hotel complexes, yet its scale suggests the general programs for the other five casinos.
In that the casino is the focus of all activity, it must be the most elaborately and ambitiously designed of all spaces in the resort. To promote continuous activity, it should be removed completely from the diurnal cycle. The lighting levels should always remain low. There should be no clear circulation through the casino so that there will be a maximum interface between guests and casino activities.

**Casino Summary**

Games: 20,000 sq ft total

a. slot machines-1500 (3'1x1'8"wx1'6"d)
   - 15 change booths and control
   - 200 stools
   - Personnel (1 shift)
     - 10 change girls
     - 5 floor men
     - 1 slot machine assistant
     - 3 maintenance and repair men

b. "21" - 32(3'6"x5'wx3'h) games
   - 32 tables - 5 spot and 6 spot layout
   - 183 stools
   - Personnel (1 shift)
     - 32 dealers
     - 3 pit bosses

c. Card Room - 850 sq ft
   - 6 octagonal card tables
   - 48 chairs
   - Personnel (1 shift)
     - 8 dealers
     - 2 pit bosses

d. Craps - 12(12'1x6'wx3'h) games
   - 12 crap tables
   - Personnel (1 shift)
     - 12 stick men
     - 12 box men
     - 24 dealers
     - 4 pit bosses
e. Roulette - 8 games
   6 single tables (3'1x6'4x3'h)
   2 double tables (14'1x6'wX3'h)
   8 stools
   Personnel (1 shift)
      8 dealers
      1 pit boss
f. Keno lounge - 600 sq ft
   Keno counter - various layouts to
      suit seating for 100 with table.
   Personnel (1 shift)
      16 dealers
      1 shift boss
      1 2nd and 3rd man
   Keno machine - 80 ping pong balls
      and rack keyboard switch and 3 keno
      boards throughout. One large 4
      sided board for entire 360-degree
      view, 16 stools and 3 chairs.
g. Wheel of Fortune - 1 (6'1x3'wX3'h)
   1 table layout
   8 stools
   Personnel (1 shift)
   1 dealer
h. Crown and Anchor - 1 (5'1x4'wX3'h)
   1 table layout
   8 stools
   Personnel (1 shift)
   1 dealer
i. Mechanical Games - 150 sq ft
   4 blackjack machines
   2 keno machines
   others
Administration Offices - 5100 sq ft total
   a. Casino Manager 140 sq ft
   b. Assistant Manager 120 sq ft
   c. President 130 sq ft
   d. Administrative Assistant 140 sq ft
e. 2 Vice-Presidents (each)  140 sq ft
f. Personnel Manager  140 sq ft
g. Public Relations Manager  180 sq ft
h. Publicity Manager  140 sq ft
i. Show and Entert. Manager  120 sq ft
j. 2 conference rooms  400 sq ft

Cashier - 5 counter Booths (1 shift) - 500 sq ft
counter - 40 ln ft
storage shelves - drawers
4 desks
4 chairs
6 stools

Personnel
1 head cashier
5 cashiers

Currency Counting Room - 200 sq ft
Vaulted space

Personnel - adjacent use by cashiers
1 counter, desk and chair

Credit Office - 600 sq ft
4 desks, chairs
filing cabinets
2 typewriters
Seating for guests - waiting area

Personnel
1 credit manager
1 assistant manager
2 secretaries

Accountant's offices ( @ 150 sq ft)  300 sq ft
Coin Storage room (vaulted)  400 sq ft
Coin Counting Room  800 sq ft
Small Conference room  200 sq ft

Restrooms for Administration
Men  150 sq ft
Woman  150 sq ft
President  100 sq ft
### Public Restroom Summary

<table>
<thead>
<tr>
<th>Description</th>
<th>Area</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Men's - 5 @ 450 sq ft</td>
<td>2250 sq ft</td>
<td>12 water closets</td>
</tr>
<tr>
<td>10 water closets each</td>
<td></td>
<td>12 lavatories</td>
</tr>
<tr>
<td>16 urinals each</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 lavatories each</td>
<td></td>
<td>d. Locker and dressing rooms</td>
</tr>
<tr>
<td>b. Women's - 5 @ 300 sq ft</td>
<td>1500 sq ft</td>
<td>1150 sq ft</td>
</tr>
<tr>
<td>12 water closets each</td>
<td></td>
<td>Men's - 50 lockers @ 500 sq ft</td>
</tr>
<tr>
<td>12 lavatories each</td>
<td></td>
<td>Women's - 50 lockers @ 650 sq ft</td>
</tr>
<tr>
<td>c. Powder rooms - 5 @ 300 sq ft</td>
<td>1500 sq ft</td>
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### Staff Facilities Summary

<table>
<thead>
<tr>
<th>Description</th>
<th>Area</th>
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<tbody>
<tr>
<td>a. Lounge - Dealer's Kitchen (men)</td>
<td>600 sq ft</td>
</tr>
<tr>
<td>b. Lounge - Woman's kitchen</td>
<td>600 sq ft</td>
</tr>
<tr>
<td>c. Restrooms</td>
<td>550 sq ft</td>
</tr>
<tr>
<td>Men's - 300 sq ft</td>
<td></td>
</tr>
<tr>
<td>8 urinals</td>
<td></td>
</tr>
<tr>
<td>6 water closets</td>
<td></td>
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<tr>
<td>6 lavatories</td>
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</tbody>
</table>

### Hotel Summary

<table>
<thead>
<tr>
<th>Description</th>
<th>Area</th>
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</thead>
<tbody>
<tr>
<td>a. Front desk</td>
<td>250 sq ft</td>
</tr>
<tr>
<td>b. Bellman area</td>
<td>120 sq ft</td>
</tr>
<tr>
<td>c. Reservation Desk</td>
<td>150 sq ft</td>
</tr>
<tr>
<td>d. Manager's office</td>
<td>140 sq ft</td>
</tr>
<tr>
<td>e. Linen room</td>
<td>600 sq ft</td>
</tr>
<tr>
<td>f. 1000 hotel rooms @ 314 sq ft</td>
<td>315000 sq ft</td>
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<tr>
<td>g. Auxiliary space @ 40% of above</td>
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<td></td>
<td>126000 sq ft</td>
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The resort's main theme is entertainment - the main form of entertainment being the casino activity while supporting it is the dinner theatre where the shows are performed. This space shall have all the necessary theatre and dining provisions and continue the design themes generated in the casino.

**Dinner Theatre Summary**

- **Capacity - 750 to 1000 guests**: 16000 sq ft
- **Band facilities**: 600 sq ft
- **Cashier station**: 25 sq ft
- **Equipment**
  - 40 booths - 6 to 8 people: 4000 sq ft
  - 60 tables - 4 to 5 people: 4200 sq ft
- **Bar - 50 ln ft**: 250 sq ft
- **30 stools**
- **Bar storage**
- **SmorgasboardService - 25 ln ft**: 1500 sq ft
- **Kitchen and cleaning**: 2500 sq ft
- **Storage**: 500 sq ft
- **Stage - platform**: 1250 sq ft
- **Dressing rooms - 3 @ 150 sq ft, 1 @ 250 sq ft**: 700 sq ft
- **Control Booth**: 300 sq ft
- **Stage storage**: 150 sq ft
- **Off stage waiting area**: 200 sq ft
- **Personnel**
  - 8 cocktail waitresses
  - 8 bus boys

Dining rooms should be located off of the casino with views towards the casino floor. Lighting should be at a lower level than the casino foot candle output, so that attention remains on the casino activities.

**Dining Area Summary**

- **Restaurant - 350 max. capacity**: 4200 sq ft
a. Coffee Shop
   seating for 150 persons
   service counter - 36 ln ft
b. Food preparation area
   Personnel
   10 waitresses
   4 bus boys
   4 cooks
   2 dishwashers
   Dishwashing area
   Food storage
   Cold
   Dry
   Circulation
   Restrooms

Bars should be located off the casino floor with lighting levels lower than the casino lighting foot candle output.

Bars Summary

a. Casino Bar and Platform
   counter - 64 ln ft at 40 persons
   40 stools
   8 tables - at 4 persons
   Platform and combo area
   Personnel
   2 bartenders
   1 cocktail waitress
   Band and change room
   Liquor storage
b. Casino Bar
   counter - 36 ln ft at 24 persons
   24 stools
   Personnel
   1 bartender
   4 cocktail waitresses

2430 sq ft
800 sq ft
250 sq ft
200 sq ft
180 sq ft
640 sq ft
<table>
<thead>
<tr>
<th><strong>Banquet/Ballroom Summary</strong></th>
<th><strong>15000 sq ft</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Projection Booth</td>
<td>800 sq ft</td>
</tr>
<tr>
<td>b. Storage</td>
<td>500 sq ft</td>
</tr>
<tr>
<td>c. Serving Pantry</td>
<td>600 sq ft</td>
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</tbody>
</table>

The shopping area will have approximately 100 shopping facilities accessible from all casinos. These shops have traditionally been specialty shops built in and around the casinos to attract the splurging instincts of a big winner gambler. Within this framework, will be the shops; restaurants; wedding chapels; small, specialty casinos; banks; etc.:

<table>
<thead>
<tr>
<th><strong>Summary of Casino Complex Spaces</strong></th>
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<tbody>
<tr>
<td>Casino</td>
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<tr>
<td>Administrative Offices</td>
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<tr>
<td>Dinner Theatre</td>
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<tr>
<td>Dining Areas</td>
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<tr>
<td>Bars</td>
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<tr>
<td>Public Restrooms</td>
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<tr>
<td>Staff Facilities</td>
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<tr>
<td>Banquet/Ballroom Facilities</td>
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<tr>
<td>Hotel</td>
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<tr>
<td><strong>Total</strong></td>
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</table>

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**Shopping Area Summary**

500000 sq ft

A security and medical facility to monitor and provide resort security with a detention area and a small emergency medical facility capable of emergency care shall be adjacent to a heliport to connect with the hospital in either Boulder City or Las Vegas.

Gardens, swimming pools, sunning areas, tennis courts and other recreation areas shall be incorporated as part of each casino/hotel complex.
Due to the vast scale of this project, a strong people mover network integrally weaved into the fabric of the resort is necessary.

a. Movement must be efficient and connections thorough.

b. Parking structures for guest and employees shall be provided with connections via people mover system.

c. Heliport facilities for the security/medical facilities and the casinos, with connections via the people mover system.

It is in the nature of the competitive market to grow and change. It is especially important in such a keenly competitive market as the gambling world that it has the means to alter itself in whatever fashion the market may demand.

a. Potential areas of growth
   - Additional hotel rooms
   - Enlarged casino and entertainment facilities
   - Additional shopping facilities
   - Additional casino complexes
   - Expanded transit network

b. Potential changes
   - Different power sources
   - Inclusion of new games in casino
   - Refurbishing or rebuilding of casino image and facilities

c. Expandability - growth from the existing structure should be linear proceeding down the canyon away from the dam structures.
The Hoover Dam is a reinforced concrete arch-gravity dam structure depending for stability on both gravity and arch action. It is 1244 feet long, 45 feet wide at its crest, 660 feet wide at its base and 726.4 feet tall from the lowest point in the foundation. The radius of curvature at the upstream edge of the dam is 500 feet, the central angle varying from about 15° at elevation 600 feet to 140° at the crest elevation 1232 feet.

Black Canyon Highway, Highway 93, passes across the crest of the dam as it winds its way to Las Vegas. Parking areas along the dam are provided for visitors to leave their cars and to view the dam. The road is 33 feet wide with a 4 foot sidewalk on the upstream side and a 6 foot sidewalk on the downstream side. The parapet walls along the outer edges of the sidewalks are 2 feet thick and four feet high above the road way.
concrete panels of the "WPA - Art Deco - Heroic" era which are rich examples of the work of Oskar J. W. Hansen.

The entrances to the towers are finished in green and black terrazzo floors with circular designs inspired by the decorative art of the Indians. The walls are of dark green marble which combines with the floor colors to give a subdued coolness after leaving the heat and brilliancy of a typical sunny day. The lobby and elevator doors are of the same stylized "Indian" design with the ceiling and railings of aluminum. All lighting is indirect.

Equally spaced between the towers are observation alcoves that are 8 feet by 10 feet in plan and offset, like the towers, from the crest of the dam.

The U-shaped powerhouse has two wings 650 feet long with a maximum width of 120 feet. Their height
from their foundations is 230 feet. These wings contain a total of 17 hydro-electric turbines.

The center building of the powerhouse stands 250 feet above its foundations which gives it the larger mass which builds in scale to the scale of the dam immediately behind. In the center building are the offices, shops, control and storage rooms.

The architectural treatment of the powerhouse was modestly reserved. The goal here was to simply let its quite mechanical function be its expressive theme. On the exterior, a vertical treatment expressing columns was adopted to express the scale of the building. Certainly, despite the efforts to render true scale to the exterior, the interior in almost every way appears scaleless and huge - from the depth of the enormous trusses overhead to the repetition of the huge turbines, all identical, all in a row; the interior of the powerhouse is trully awesome.
The four intake towers, immediately upstream from the dam resemble huge fluted columns. These graceful spires regulate the flow of water from Lake Mead. The operating house at the top of the structures contain all machinery for gate operations. The 12-sided hoist house has aluminum casement windows in all 12 openings with narrow metal louvers above accentuating the tower’s slenderness. Each of the domed roofs is covered with large concrete shingles to form a dias on which is mounted an ornamental lantern. The hoist house is 56 feet tall while the overall structure is 395 feet tall. Seldon, though, is the structure seen below the average reservoir water level of elevation 1180 feet.

The spillways are resultants of purely a hydraulically functional program. Yet, they are totally in scale with the mammoth proportions of Hoover Dam.
Highway 93 bridges over the Arizona spillway as an arch bridge purposely overbuilt to appear in scale in size and strength with the spillway. Each spillway consists of an overflow weir, equipped with four 16 foot by 100 foot drum gates, a side channel, and an inclined tunnel shaft, extending from the downstream end of the side channel to the outer diversion tunnels which cut through the canyon walls to the Colorado River discharge valves downstream. Each spillway is capable of discharging 200,000 second-feet of water.

The two canyon wall valve houses are placed into the canyon walls downstream from the dam. To suggest the structures were firmly planted into the canyon wall a definite batter of 1:24 was given to the base of the facades and the lines of the windows purposely were shortened below the parapet to suggest horizontality. Both structures are approximately 150 feet above the Colorado River and are 200 feet long.
36 feet tall, and 65 feet deep. Each contains six -
8 foot wide steel conduit mechanical valves which ter-
minate the penstocks from the intake towers. Each
valve opening is capable of discharging approximately
4000 secon-feet of water, spraying 430 feet out into
the canyon. All twelve valve openings in the canyon
wall valve housings have this capacity.

Other features of this inventory include the
cableway and the power lines emanating from the po-
werhouse.

The cableway is a 150 ton-capacity, 3-inch dia-
meter, cable stretching 1374 feet across the canyon
approximately 1000 feet downstream of the dam. The
cableway is in operating condition and is used to tran-
sport items to the powerhouse from above.

Transmission towers and cables race up the sides
of the canyon walls from the powerhouse to the power-
plant on an adjacent site, yet are not an eye-sore.
Four towers are spaced evenly along the down-
stream face of the dam. The inner two towers contain
elevator shafts which connect with galleries in the
dam including those leading to the powerhouse. In all,
the elevators are capable of stopping at 4 different
levels in the dam connecting to galleries which end
at the downstream face of the dam. The outer two tow-
ners, containing restrooms, also contain a utility gal-
lergy which connects with all the towers along the
crest of the dam.

The towers, each 34 feet tall above the crest,
and roughly 20 feet square in plan, contribute to the
appearance of symmetry and strength. The exterior fa-
ces are battered at 1:100 and the downstream faces
intersect the the face of the dam about 70 feet below
the crest of the dam.

The elevator towers are the public entrances to
the dam and constitute the first introduction of hum-
an scale in the surrounding field of massiveness. Fla-
The site is located in Boulder Canyon, on the 36° latitude immediately downstream from the Hoover Dam. Boulder Canyon is a form of desert ecology. Essentially, it is a giant rock carved through by the continuous thrashing of the Colorado River. Very little desert vegetation exists - mainly a few scrub bushes taken root in sparse patches of barren soil. Wildlife consists of desert insects, snakes and birds. Fish are plentiful in the well stocked Lake Mead.

The insertion of Hoover Dam in the canyon has produced Lake Mead, which through a manipulation of dam machinery, can regulate the size of the reservoir. This capacity over the 110 miles of Lake Mead thwarts the chance of spring run-off causing flooding of the reservoir and the Colorado River.

Research undertaken between 1940-50 recording the epicenters of earthquakes in the area of the Hoover Dam indicates that within a 5 mile radius a great many had been recorded; within a 2.5 mile radius less than 30 epicenters were recorded and within a one mile radius none had occurred. The conclusion of the research was that the potential of epicenters in the immediate vicinity of the Hoover Dam were negligible.
The Hoover Dam Area of Black Canyon is from 200 to 500 feet wide at normal river surface. This part of the canyon is cut through a series of crystalline rocks of pre-cambrian age, consisting principally of schist, quartz diorite, and granite, occurring in the order named from the head of the canyon.

The forces responsible for the faults exposed along Black Canyon also caused extensive jointing of the rock, defining innumerable angular, interlocking blocks and rock fragments, and causing an appearance of instability and porosity at many places. However, tunneling in some of the most thoroughly jointed rock at the dam site showed that within a few feet of the surface, the joints were so tight that practically no grout could be forced into them; so the rock, for all practical purposes, is a dense, solid formation.

The ultimate compressive strength of the rock ranges approximately from 11,000 to 22,000 pounds per square inch.
### Climate Summary

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SITE SUMMARY
In this analysis, there is extracted out of a particular organizational element which is found as a useful reference for this project. The Las Vegas "Strip" was chosen as a type of land-use organization; the Houston Airport for its circulation organization; an arcology for its structure-use organization; and Walt Disney World for its anticipation organization.

In the case of the Las Vegas "Strip," the focus is on the land-use organization. This organization shows linearity; sequence of the main elements: car, sign, parking, entry, and casino; and, the essential grouping of casinos as a product of the competitiveness of the "Strip."

Circulation is the key issue in the case of the Houston Airport where several means of transport, at their own specific scale and speed, must interface in and out and between each other. The resultant organization suggests a circulation disbursement from the concentration center to the specific activity of boarding the plane.

The dam arcology study analyses the adaptability of an urban fabric to the specifics of a particular structure where the activities form the "skin" over the "skeleton" of the "urban organism." Here functional preference and distribution is structured in relation to the form-suggested circulation system.

Walt Disney World has a circulation system clearly organized, yet, while this is essential to the function of it, the fundamental organizer is the organization of anticipation. Imagery, visual perception, and procession are established for what they may lend to mounting anticipation.

These examples illustrate different aspects of organization which anticipate possible references for the design of "Hoover Dam*Nation Gambling Resort."
1. CASINO SLOT

2. PARKING OR SHOPPING SLOT

3. SIGNAGE SLOT

4. CAR/VIEWING SLOT

5. CEREMONIAL ENTRY

LAS VEGAS "STRIP"
LAND USE ORGANIZATION

SECTION

PLAN
PARKING
TO HIGHWAY

PARKING VIEW MOVEMENT SYSTEM

ENTRY
LOCK

HOTEL

PARKING VIEW MOVEMENT SYSTEM

ENTRY
LOCK

HOTEL

ACTIVITY
ACTIVITY
ACTIVITY
ACTIVITY

MAGIC KINGDOM

ANTICIPATION
PREPARATION
DISTANT VIEWS OF KINGDOM
INTENSIFIED ANTICIPATION
PREPARATION
ARRIVAL - CONSUMATION
INTENSE VIEWING

DISNEY WORLD
ANTICIPATION ORGANIZATION

ANTICIPATION GRADATION SCALE
DAM ARCOLOGY
STRUCTURE-USE ORGANIZATION

HIERRARCHY OF PLACE

1. DOWNSTREAM FACE: SOCIAL SIDE - SUN/VIEWS/AIR, ACCESS TO CITY CENTER.
2. TOP: TRANSIT SYSTEM ACCESS IN AND OUT OF CANYON AND TO BOTH SIDES OF A-FRAME.
3. UPSTREAM FACE: FUNCTIONAL - INTERFACE WITH GROUND AND WATER TRANSPORT NETWORKS.
4. INTERIOR SPACE: LEAST SIGNIFICANT IN TERMS OF ENVIRONMENTAL DESIGN.
Houston Airport
Circulation Organization

Final Transition  Specific Activity  Movement Channels  Concentrated Activities  Communication and Movement  Movement Channels  Specific Activity  Final Transition


To Runway

3

To Runway

To Highway
Two basic conceptual alternatives presented themselves: to build on the face of the dam, or to build downstream from the dam in the canyon.

The first concept suggested the following:
- aggressively dominate and exploit dam structures and to perceive the dam as a "new urban typography." This attitude would force an incredible image: The casino would envelop the dam, the profane dominating and obscuring the sacred, the degenerate gambler straddling triumphant the "heroic architecture" of the "generating dam."
- there would be a progression from the top of the dam to the floor of the canyon where the casino would be - deeper into the world of "Hoover Dam*Nation."
- there would be six casinos with one grand hotel with the casinos surrounded by a commons area of shops, theatres, restaurants, etc.
- elevator shafts inside the dam structure could be utilized as a means of bringing people down from the transport terminus at the top of the dam to developments on either side of the dam.

This concept was rejected, for while it was structurally possible to build on the face of the dam and other dam structures, a great deal of meaning would be lost by losing the visual imagery and impact of the dam as it stands now, as well as for what it means to America.

The second concept, which was chosen, placed the resort downstream and totally independent of the dam physically. Thus, the design of the resort became an interplay between all three images of the context - the canyon, the dam and the casinos.

It created a metaphorical tension allowing contradicting and complex meanings to emerge.

In this concept, the resort would play off the
canyon walls and would deal with a progression from arriving, checking into the individual casinos' hotel, and then down to the casino at the base of the resort.

This organization lends itself to the thematic expression for each casino in their hotels and supporting activities.
CONCEPT 1
The initial and most general schemes were as an outgrowth of the contextual juxtapositions:

* The resort should be geometric, as an expression of a man-made object, like the dam.
* It should appear to be detached from the dam, broken away and changed in character. It should manipulate three-dimensionally the geometric order of the dam while maintaining its syntax.
* It should be feminine, intricate and detailed as opposed to the simple, masculine form of the dam.
* It should be colorful, almost garrish to suggest a decadent nature juxtaposed to the purity of the "whit'd' dam.
* It should be a high tech solution used for a decadent purpose as the dam is an age old solution for a productive purpose.
* It should give a sense of community, contained by the canyon, the dam and the sky. A fantasy architecture removed from daily routine or the expected. The car should not bring one here, a device specifically as part of the complex should deliver the patrons.
* The complex should physically interface the canyon minimally.
The dam at its rim, having a radius of 500 feet implies the completion of a circle. The first scheme completes the circle, and overlapped it with a progression of circles down the canyon with the same one-thousand foot radius. These circles in plan and elevation, perpendicular and parallel to each other produced a structure similar to a pendentive. Thus, the spherical triangles created by the pendentives became hotel spaces and a low level of circles in plan became the casino activity spaces. This lower “down in the canyon” level would be supported by cables strung from the plan circles, above, which in turn are supported by the pendentives which come to simple single shafts resting on the walls of the canyons.

The strong geometric order of the “pendentive structure” informed circulation, systems and functional organization. The form of the hotel spaces, were in actuality, the upside down form of the dam, and had the of sun protection as each level overlapped the one below. The activity level could be viewed as “new land” developed in the image each casino desired. The affect of the spaces created by the pendentives’ arches gave a sense of containment within the site context, an “identity which could develop into a “sin-city” imagery of flash neon advertising casinos and brothels and wedding chapels, all within the view of the purity of the "white" dam.
Variations on this structure were explored. One was a comparative analysis between a pendente structure of overlapping arches which could provide again a spherical triangular form for the hotel rooms as well as a lower level of "new land" suspended from the arches. This structure would touch the canyon in a total of 12 points as opposed to 10 points of the former. It was less concise or structurally elegant as the former in that its arches were subjected to torque.

Another exploration was conducted to study the ability of the pendente structure to bend and follow the canyon. The geometry at the bend at once became awkward as the arches came down to one shaft at an obtuse angle. While the structural integrity was diminished in this case, it was still manageable.

VARIATIONS ON THE STRUCTURE
A dissatisfaction with the "new land level" hanging monotonously in a regular pattern from the super structure above led to the development of activity spheres under the super structure supported by their own shafts resting on the floor of the Colorado River. The skin of each sphere became the restaurants and shops, and support functions for the casinos which hung suspended from the arches of the sphere. At the base of each pendentive, where all circulation converged, a passage connected the shaft with the sphere.

In an overall context, the spheres and superstructure made an elegant fit. Yet the actual manipulation of the scale of the sphere proved awkward and objectionable as the three-sphere scheme each contained two casinos needing considerable elbow room to establish their identities. Though the idea of the casino hermetically sealed in a sphere full of leisure and decadence was an idea to return to.
While the design of the activity area was not certain the upper structure was being further explored and refined. The structure, circulation and deployment of rooms was found to be reasonably attainable, while at the same keeping intact the original general generators of its design.

The next scheme returned to the "sin city" look of the first scheme yet became more playful and energetic. Spokes, tangent to the main arch became strong visual forms holding up the activity level. Several ideas were explored here. One conceived the deck as a bridge between shafts, and used the spokes to hang tensile membranes over the casinos areas of each complex. Another staggered the heights of each bridge so that each bridge had a view of the dam and then each bridge was connected by recreation decks where gardens and pools and tennis courts provided distraction for the gambler. Yet, the last phase of this development was the separation of each casino activity area into a boat like form floating above the Colorado River.

Above each boat were sail-like forms which gave a strong overall expression to the resort while under the sails each casino could create its own atmosphere. Each casino would then be connected to the next with the recreation level located by the completion of the minor arches. Suspended from these arches, they would have a hanging garden effect as they symbolically stood closest to the sun.

SCHEME 3
Finally, a dissatisfaction with the pendentive structure surfaced, as it became evident that its construction would be exceptionally difficult (c.f. The Saarinen “Arch”) and the handling of the activity areas still proved awkward.

After considerable meditation, an insight totally altered the conception of the complex through simply turning the pendentive structure upside down. Its shafts stood in the air - heliport, cable car drop off, lobby, and the location for the knuckle, for the cables to drape, of what obviously and terribly appropriately would be a tension structure. Here the hotel rooms would be hung from the cables and enclose a space which could contain the activity dock. - All hung from a shaft; a simple shaft which the slight, delicate cables could hang from. Each hotel room could face outside and inside simultaneously while it seals the great space inside.

Scheme 4
After analyzing the decision to reorient the organization of the superstructure, by flipping it and all the consequent implications, it was felt that the design at once became very workable. It successfully allowed for the thematic expression of each casino while maintaining the overall identity of the resort. Its contextual juxtaposition became stronger as well - while the completion of the circle at the rim of the dam through implication was lost, the form of the dam could be completed. The spherical segment of the dam form could now be continued in the same orientation with the hotel rooms. The change of texture, color and structure from the dam to the superstructure while maintaining similar scale was a significantly symbolic juxtaposition. In relation to the dam, the superstructure in section became a charactature of the canyon, a bizarre, "high-tech" abstraction like the dam suggests of itself as negative form of the canyon. A section thru the superstructure and the canyon looking towards the dam becomes quite revealing. The dam becomes the negative space of the superstructure which in turn becomes the abstraction of the canyon. This is quite curious and appropriate - the canyon, a natural phenomena is triumphantly altered by the productive dam structure and in section reads not as organic form, but, as it is completed by the dam, as rectang'ie, a man-made invention. With the siting of the superstructure, the dam now is visually claimed at the service of the resort metaphorically and physically.

Further development of the now finalized scheme concentrated on structure, erection sequence, systems, circulation and the design of just one of the six casinos.

Each casino, despite the modularity of the exterior appearance, has a thematic expression completely unique and independent of the other casinos.

DESIGN DEVELOPMENT
The tensile structure network works in the following manner:

- Masts with knuckles at their top sit in the canyon walls and are dropped over by major cable ways which in turn are anchored into the canyon.
- These major vertical hanger cables support the dead loads of the system, and form parabolic curves.
- Horizontal boundary nets of secondary supporting and restraining cable are drawn to continuously curved surfaces and anchored into the canyon.
- From the main vertical hanger cables to the bottom boundary cables, secondary cables are attached at equal intervals continuously along the curves. These cables support the hotel rooms. Each line of these cables are coupled, with horizontal beams holding the cables apart. These beams become chocks to rest the hotel rooms.
- At the ends of the secondary cables at the point of attachment to the boundary cables, ox box trusses are attached and become the activity decks.
- The activity decks in turn become the base for the Casino programmatic functions to be built on or these functions may even be suspended from the cables above.
"Shelf" Beams which support Hotel Rooms and their Connection with Minor Cable

Side View (above) and Front View (below) of Major and Minor Cableway Connection.
1. Erection of masts into canyon walls.
2. Generator cranes placed at top pivot at top of masts.
3. Stringing and anchoring of main vertical cables.

1. Stringing of horizontal boundary cables.

1. Stringing of all minor cable ways.
2. Erection of deck structure.

1. Infill of prefabricated hotel rooms between minor cables.
2. Erection of casino spaces on deck structure.
Systems strategy for the resort was analyzed by carefully studying sun, wind and other climatological factors and how they specifically affected the analysis of the interior space on three scales - the hotel room skin, the "great space", and the interior spaces of the enclosed activity areas.

From these observations and analysis, a strategy was arrived at to utilize a combination of natural phenomena such as the "chimney affect" and "high tech" machinery such as a "single heat recovery system" to environmental control all interior space efficiently.
Observations on the interface of Hoover Dam® Nation

with the environment of the Black Canyon. (Note: Black
Symbolic of Death, Sin and Satan)

Sun: - In almost every case, part of the complex
is in shade at some time of the day. (Save for June 21, Noon)
- In almost every case, the sun enters, to
some degree, the interior volume. (Save for June 21, Noon)
- Greatest sun exposure June 21, Noon -
Exterior
- Greatest Sun Exposure March 21, All Day
Interior
- West side of complex receives most unbalanced sun exposure.

Wind: - Complex subject to "Mountain-Valley Wind
Currents", where wind currents follow up the sides of the canyon in strong convection action:
- Average winds speeds 10 mph (at Willow Beach, 16 miles downstream) desert, due
to uniform solar radiation, normally not windy. Expect little wind off plateau's
adjacent to canyon.
- Wind off of plateau strikes backside of west complex.
- Same wind strikes hotel room skin on east side.
- Coldest winds hit directly the back side of the west complex.
- Warmest winds do also
- Valley does not operate as a wind channel

Temp - Range: 36° (January) to 110° (July)
Humidity - Range: 20% (June) to 50% (January)
Possible Sunshine - Range: 70% (January) to 90% (July)
SUN PATTERNS
Cool air from shaded side of skylight sucked into great space via open louvers and fan. Directed by differential thermostat.

Fan direction reversed when inside and outside air too warm. Also utilized when great space needs ventilation.

Fan direction reversed to suck air out of space to pull air up from cooler shaded underside.

In winter, louvers generally closed to keep warm air in. And to trap warm air between rooms as insulation.

Individual room cooled and heated from individual unit.

Individual room balcony floor to be non-reflective material to prevent reflection of sun's rays into rooms.

Window wall of room uses reflective glass to diminish effect of solar gain.

Brightly colored canopy awnings to provide sun screen protection for windows.
Chimney Effect

Warm Air vented throughout via fan network

Heat Recovery System for Winter use

Shaded Cool Air

Cool Air drawn from shaded wall

Reflective Glass on shaded back wall to diminish solar gain

Cross ventilation via fan network and/or natural wind currents

THE GREAT SPACE
The supply air is drawn from the underside of the deck passed thru boilers or chillers and thru a forced air system ducted to the space.

The ducted air is distributed thru a zoned air system and returned via an air plenum.

The supplied air to the spaces may be exhausted or recovered by recirculating back down the vertical spine to the mechanical service levels.
The resort being a mere 25 miles from Las Vegas easily facilitates either car or helicopter movement between these two points of the gambling world.

The idea of oasis, of fantasy world and change of pace informed the circulation system to be one of cable cars. This system is consonant with use of cables throughout the structure. Off-site parking & garages, out of view of the Black Canyon, would relieve patrons driving and cable cars would transport them to the lobby of the casino of their choice. All services would arrive or depart through the use of cable crucks, or targes.

Heliport, located above the lobbies of each casino would provide a direct shuttle service from points about Las Vegas to the resort.

Cable cars would be used as elevators collecting hotel guests from their rooms and ride them down or up on the outside skin of the resort reminding them of the contextual juxtapositions of the Black Canyon, dam and resort.

Interior circulation would be provided by cable trains moving about the dock level from casino to casino.
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The interior forms of "Fayad's" casino were developed to play off the form of the "great space" of the shell. Organizationally recreational areas, including, gardens, tennis courts, swimming and sunning areas, shopping areas, service facilities and main circulation all occurred on the deck level. The dinner-theatre on the second level, banquet hall on the third, casino on the top of the main mass opened up to the space. A restaurant hangs off the vertical circulation spine midway up the space with views all about. The vertical circulation spine connected all these levels as well as the lobby and heliport levels above, to each other. Escalators connected levels of the main mass together while cat walks interfaced elevator shafts in the skin to the activity levels.

The space was to have a "neo-art deco", "high-tech," grandiose expression - a perversion of the solemnity of the Hoover Dams "SPA" expression. The interior was to be colorful, "zippy", playful and terribly monumental. The liveliness of the space was a kinesthetic provided not just by the plunging and ascending elevator, the tinkling fountains but the movement of people in and all about the spaces.

A number of refinements brought the design to its final form.
BANQUET HALL 1"=50'-0"


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