ACKNOWLEDGEMENTS

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Valparaiso, IN
Van Scheltema, John K.
Architect
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BIBLIOGRAPHY


Business And Commercial Aviation, April, 1968, pp. 98-72.

Business And Commercial Aviation, September, 1969.

Business And Commercial Aviation, April, 1975.


Federal Aviation Administration, Planning The Airport Industrial Park, September 30, 1963.


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APPENDIX

AN AIRLINE SUPPORT FACILITY
INTERCONTINENTAL AIRPORT
HOUSTON, TEXAS

LOREN H. URIDEL
ARCHITECTURAL THESIS
1978-79
DEPARTMENT OF ARCHITECTURE
COLLEGE OF ARCHITECTURE & PLANNING
BALL STATE UNIVERSITY
MUNCIE, INDIANA

ARCH 404/Architectural Thesis
BUILDING PROGRAM

Due September 26, 1978

Please review Introduction to Architectural Programming by Edward T. White as you develop your thesis program. Pay particular attention at this point to his checklists for fact gathering, both traditional (pages 37-44) and non-traditional (pages 30-34). At least be sure to include all pertinent materials on the following areas in the following sequence, unless otherwise directed:

1. General problem description including location and site (use maps of city, county, state, region)
2. Similar projects and critical issues (you will derive this more extensively in the building types study)
3. Client description
4. Planning by related organizations
5. Functions
6. Growth and Change
7. Building codes
8. Financial
9. Other including "Non-Traditional Facts"
10. Appendices

Use White's detailed outline for these categories, but use this sequence. Include climate considerations in your site analysis. Please prepare all material to be fitted to an 8½" x 11" format, preferably a loose leaf notebook so that you may add or delete material throughout the year. Save all xeroxed copies of reference materials for the appendices and keep the program itself as lean as possible. Photos of the site and important maps may be in the body of the program.

Try to cover as many areas as possible early in the process, allowing for depth of development later as you understand critical issues. Some of White's categories may not apply to your project, while others may be very important to expand. A broad view is essential at the outset.

Unless you have more specific information you can assume your net square footages will be increased by twenty-five percent to include room for walls, circulation and heating, ventilation and air conditioning.

Net Floor Area - - - - - NFA
Walls (3% NFA) - - - - +NFA (3%)
HVAC (10% NFA) - - - - +NFA (10%)
Circulation (12% NFA) - - +NFA (12%)

Total (Gross) Square Footage
SITE ANALYSIS

The attached sheet is a brief outline of the site characteristics that should be considered in a minimal site analysis.

A few notes in regard to the utilization of this outline might be in order:

1. The outline should be viewed as just that; an outline. Other site characteristics unique to your site should be included.

2. As many items as possible should be recorded graphically, i.e. graphs, charts, diagrams, photographs, etc.

3. Some of the results can be achieved by recording each piece of information individually, other results such as dynamic interrelationships are best seen by pairing or combining compatible pieces of information.

4. This information should be considered as a method of communicating the character of your site to others as well as yourself. The graphic techniques utilized should recognize and emphasize this potential.

5. References:

"Guide to Site and Environmental Planning" Harvey Rubenstein
"Site Planning" (pages 92-94) Kevin Lynch
"Landscape Architecture" (Chapt. No. 2) John Simonds (Best Graphic Style for Thesis Work)

6. Don't forget:

Balance
Sub Systems
Complexities
Synthesis
Discovery
Thought
Directions
Keys
Interrelations
Attitude Sketches
Thru Site Sections
Issues
Impact
Demands
Patterns
Recommendations
SITE ANALYSIS OUTLINE

I. MACRO-CONTEXTUAL
   THE SITE REGION
   A. Soil
      1. Type
      2. Characteristics
   B. Environment
      1. Physical
      2. Social
      3. Emotional
   C. Accessibility
      1. Automotive circulation corridors
      2. Pedestrian corridors
   D. Major Regional Activity Nodes
      1. Shopping Centers
      2. City or Town Centers
      3. Other
   E. Climate
      1. Precipitation-rain/snow
      2. Temperature
         a. ambient air-seasons
         b. sun days
         c. days below freezing
         d. days above 90°
         e. etc.

II. MICRO-CONTEXTUAL
    THE SITE
    A. Topography
       1. Contours
       2. Site profile sections
    B. Existing Vegetation
       1. Trees
          a. height
          b. spread
          c. species
             (1) Deciduous species
             (2) Coniferous species
       2. Shrubs
       3. Ground cover
    C. Drainage Characteristics
       1. Where does the water go on the site?
       2. Where does it go off the site?
       3. Erosion
       4. Low points, swamp, marsh, etc,
    D. Water Features
       1. Ponds
       2. Lakes
       3. Streams
       4. Other
    E. Utilities
       1. Water
       2. Gas
       3. Power
       4. Telephone
    F. Special Features
       1. Knolls
       2. Ravines
       3. Sinkholes
       4. Other
    G. Views
       1. Into site
          a. good/poor
          b. up/down
          c. open/enclosed
          d. from roads/buildings/open spaces
          e. other
       2. From site/existing buildings
          a. good/poor
          b. up/down
          c. open/closed
          d. other
    H. Edge Conditions
       1. soft/hard
       2. enclosure/non-enclosure
       3. sensitive/insensitive
       4. other
    I. Ingress/Egress
       1. vehicular
       2. pedestrian
       3. rail
       4. etc.
    J. Orientation
       1. sun
       2. prevailing winds
    K. Other Site Sensory Features
       1. disturbing/pleasing sounds
       2. disturbing/pleasing odor
       3. other
    L. Site Scale (size relative to the size of a human)
       1. Size relative to a football field
       2. Size relative to building program and other requirements such as parking
BUILDING TYPE ANALYSIS

A typical building type analysis consists of a set of annotated diagrams or organizing elements for buildings of a particular type. These diagrams should show the role of space, circulation, structure and siting as determinants of the form of each building. For each major determinant one or more characteristics may be identified as having a stronger influence on the building form.

Space:
- hierarchy
- composition
- zoning by function
- zoning: public to private

Structure:
- grid/module
- enclosure
- span

Circulation:
- entry
- hierarchy
- distribution

Siting:
- entry
- orientation
- boundaries

Other aspects of the designs can be noted if they are pertinent.
<table>
<thead>
<tr>
<th>Exhibit</th>
<th>Scale</th>
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<tbody>
<tr>
<td>Location Plan</td>
<td>1&quot; = 200'</td>
</tr>
<tr>
<td>Site Plan</td>
<td>1&quot; = 50'</td>
</tr>
<tr>
<td>Floor Plans</td>
<td>1/10&quot; = 1'-0&quot;</td>
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<tr>
<td>Longitudinal Section(s)</td>
<td>1/10&quot; = 1'-0&quot;</td>
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<tr>
<td>Transverse Section(s)</td>
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<tr>
<td>Elevation(s)</td>
<td>1/10&quot; = 1'-0&quot;</td>
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<tr>
<td>Mechanical Schematic</td>
<td>1/10&quot; = 1'-0&quot;</td>
</tr>
<tr>
<td>Structural Schematic</td>
<td>1/10&quot; = 1'-0&quot;</td>
</tr>
<tr>
<td>Model</td>
<td>1/10&quot; = 1'-0&quot;</td>
</tr>
</tbody>
</table>
- Main Entry - Needs Work - Stair/Ramp

- "See simulators" - Possibly More Open - Also Clustered - A Unique Element

- How do you 'hold up' projections into the atrium.

  ![Diagram]

  Look at H.O.K. & some of their buildings -
  These do not align w/

  ![Diagram]

  You might get bold - turn it out & express exit.
• On your final drawings, show buildings adjacent to your site on the site plan—if possible.
• Looks as though you might have some problem on the deck especially at main access.

• Access between atrium and capella.
• Order/organization between "rainbow edges" of atrium balloon.
• Some color would help a lot—especially on mech plan/sec.
• How does mech system work @ location w/o atrium.
• Entry node of collector.

Good jobs.
MIDQUARTER REVIEW.

1. BUILDING PROGRAM: due 1:00 pm Monday October 9th to be submitted to thesis instructor, completely typed in final 8½"x11" format, unbound in a folder or envelope. The program includes: the Thesis proposal, facility program, site analysis, and building type study as described in the handouts.

2. PRESENTATION: October 9, 10, 12, or 13 (see schedule). Student is responsible arranging the attendance of faculty or other outside critics. 25 minutes will be provided for presentation of and comments upon each student's design problem analysis. Because the time limit will be strictly adhered to, students wishing to provide enough time for reviewer comments should make compact and clear presentations, addressing the following items:

PROGRAM:
a. major functional elements with areas (sq. ft.) required
b. principal relationships between functional elements (interrelationship matrix, bubble diagram, etc.)
c. critical issues to be addressed by the design

SITE:
a. location, area (sq. ft.), orientation, access
b. relationship to local and contiguous features or areas
c. most desirable or practical zones of site for building
d. climatic considerations

BUILDING TYPE:
a. basic building prototypes, their basis for organization and important features
b. special problems
c. implications for thesis project

THESIS DEFINITION:
a. design objectives
b. basic alternatives, relationship between required program size (sq ft), building massing, site development
c. problem boundaries, assumptions, contextual issues, future development
d. design evaluation criteria
e. Direction of thesis project
The basic approach should be to explain as fully as possible the issues and ideas you're working with.

Minimal documentation would include:
- diagrammatic plans of all levels
- diagrammatic sections
- diagrammatic site relations
- conceptual site model(s) with conceptual building model(s)

*You could communicate your ideas using diagrammatic polarities, such as:

<table>
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<th>closed</th>
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<tbody>
<tr>
<td>thick</td>
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<tr>
<td>dark</td>
<td>light</td>
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<tr>
<td>quiet</td>
<td>noisy</td>
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<td>served</td>
<td>serving</td>
</tr>
<tr>
<td>public</td>
<td>private</td>
</tr>
<tr>
<td>linear/focal/poly-nucleated</td>
<td>complex/simple</td>
</tr>
<tr>
<td>curved</td>
<td>straight</td>
</tr>
<tr>
<td>opaque</td>
<td>transparent</td>
</tr>
<tr>
<td>heavy</td>
<td>light</td>
</tr>
<tr>
<td>straightforward</td>
<td>contradictory</td>
</tr>
<tr>
<td>natural</td>
<td>man-made</td>
</tr>
</tbody>
</table>

A concise statement of your attitude toward the project at this point in time should be included.

It's quite possible that one conceptual idea could be developed in more detail than the others but we'd still like to see all the alternatives you have investigated accurately depicted and professionally presented. These then may be used as a context for explaining what direction you see the project taking.
COLLEGE OF ARCHITECTURE AND PLANNING
BALL STATE UNIVERSITY
MUNCIE, INDIANA

ARCH 405
Winter Quarter 1978/79
Fisher, Koester

DUE:
MONDAY, JANUARY 8
FOR MID-QUARTER PRESENTATION

Drawings required (these are minimum):
Location map
Site plan
Floor plans of all levels
Transverse building section
Longitudinal building section
One elevation
Mechanical system(s) schematic (plan or isometric)
Structural system(s) schematic (plan or isometric)
One fairly detailed building model including context,
   with additional study model(s) as appropriate

Note: Scales of all drawings and model(s) must be established by
agreement with instructor this week (Nov. 28-Dec. 1).

All drawings to be in pencil or equally clear media.
Minimum required drawings in ink:

- Location plan(s)
- Site plan
- Floor plans of all levels
- Transverse building section
- Longitudinal building section
- Four elevations
- Mechanical system(s) isometric *
- Structural system(s) isometric *

Detailed final model of entire building including context, with additional study model(s) as appropriate.

* These two exhibits may be combined.
PRESENTATION REQUIREMENTS

A. Due:
   Monday, 9 April, 1979

B. Exhibits Required:
   1. One-point section perspective through a major space in
      your building showing finishes, detailing, furnishings,
      wall construction, environmental systems, etc. at a
      scale of $\frac{3}{8}''=1'0''$ or $\frac{1}{2}''=1'0''$
   2. Isometric showing building structure at a scale of
      $\frac{1}{4}''=1'0''$
   3. Isometric showing building HVAC systems at a scale of
      $\frac{1}{4}''=1'0''$
   4. Detail study of some aspect of your project - landscape
      design, graphics design, interior design, etc. - in
      which you have a specific interest. The details of this
      study are to be discussed with your instructor.
INTRODUCTION IN THE URBAN CONTEXT

I. The concept of large scale, dynamic interior spaces, such as atriums and courtyards, has been forced into architectural history's glorious past with the coming of new styles and techniques, and present day concerns over building costs and economics.

A. Through the work of John Portman, architect/developer, the atrium concept has been reborn, and, with proven financial success.
   1. Concept established at Peachtree Center, Atlanta
   2. Concept most prevalent in association with Hyatt Regency Hotels
      a. Idea continued in Hyatts designed by firms other than Portman
         i.e. Dallas Hyatt by Welton Beckett Associates

B. The creation of "people spaces" is what the concept is all about.
   1. Spacial proportion and activity
   2. Relating interior and exterior

C. Present day atrium use is most commonly associated with suburban malls
   1. Enclosed mall concept by Victor Gruen
      Southdale shopping mall, Minneapolis, 1956.
   2. Sprawling suburbia is unrestricted in land area with lower land costs
      a. massive parking lots
      b. no interior/exterior relationships

D. More dynamic, exciting people spaces in urban contexts are being inspired by urban zoning, design review boards, etc.

II. A study by Laurence A Alexander, director of downtown research and development center has done a comprehensive study of public attitude toward downtown malls;

A. Dislikes about the malls:
   1. inadequate public facilities
      a. i.e. drinking fountains
      b. restrooms

B. Likes
   1. freedom of movement
   2. lack of interfering vehicular traffic
   3. parklike atmosphere
      a. trees
      b. fountains

III. Portman ingredients for "people spaces"

A. Nature
B. Water
C. Movement (peace or)
D. People watching people
E. Shared space
F. Light, color, and materials
G. Incorporation of eating/dining
IV Projects:
A. San Francisco Hyatt/Embarcadero Center, Portman
B. Los Angeles Bonaventure, Portman
C. Renaissance Center, Detroit, Portman
D. University of Alberta, housing, Diamond and Myers
   1. students' union housing fits over an existing street
E. Toronto Eaton Centre, Bregman-Hamann and the Zeidler Partnership
F. Midlands Shopping Mall, Council Bluffs, IA., Astle, Ericson, and Assoc.
   1. special care in detail and crafts in this firm's first commercial project
G. The Gallery, Philadelphia, Bower and Fradley
   1. special attention in relating to streetscape
H. Water Tower Place, Chicago, C. F. Murphy
   1. tallest concrete structure
   2. response to incentive zoning
   3. zoned to maintain view of Michigan Avenue for Hancock occupants
I. Citicorp., New York, Hugh Stubbins and Assoc.
   1. elite clientele, dining emphasis
   2. response to incentive zoning, floor area requirements,
      "no height restrictions"

V Urban Design as Total Design

A. Complete services, including
   1. accommodations
   2. dining
   3. shopping
   4. parking

B. Orientation and design considerations for
   1. outdoor-streetscape relationships
   2. the automobile
BIBLIOGRAPHY


Hyatt Regency Hotels promotional literature.

"Inventive Control of Sun ...", Architectural Record, Mid-Aug. 1978, pp. 85.

John Portman and Associates, Portman Properties brochure.


Murphy, Jim, "Midlands Transplant", Ibid., pp. 60-63.


"Patterns of Light Always Changing, Enliven a Subway Station in Toronto", Architectural Record, Mid-August 1978, pp. 72-75.


HOUSTON

Air Gateway of the Southwest

Houston Intercontinental Airport
Intercontinental — The Perfect Airport for People

Houston Intercontinental Airport brings the airplane to the passenger, and takes the walking out of air travel. The airport, which consists of two major terminals and a 350-room hotel, is designed with the comfort and convenience of the passenger in mind. Elevators and an underground train work in pleasant harmony to provide quick and easy access to flights and to all parts of the terminal complex. You can ride the train or walk to your destination through air-conditioned underground corridors connecting the terminals and hotel. It's an easy airport to reach. Intercontinental is located in north Houston between two major freeways. Air coach service to downtown and four suburban terminals is available along with taxi service to all parts of the Houston region. Auto rental service is available at the airport. Intercontinental, developed and operated by the City of Houston, is a major international gateway with Federal inspection services as well as a major domestic air center.

PARK NEAR FLIGHT STATION: Spiral driveways provide drive-in access to parking space for 750 cars on the third and roof levels of each terminal. More parking—for 2100 cars—is provided at ground level on either side of the terminals and another 2000 spaces are available in nearby parking areas. Many passengers are less than 600 feet from car to plane, eliminating a long walk to and through the terminals.

TERMINAL EXITS IN SIX DIRECTIONS: Passengers can ride elevators to and from parking on third and roof levels. The north exit leads to ground-level parking for private cars. Family and friends can pick up passengers at the east exit. The south exit leads to buses and taxis, and the west exit is reserved for rental cars. The passengers can go down to the underground train on the lower level. This separation of pedestrian and vehicular traffic assures passenger safety, comfort, and convenience.

BRINGS PLANES TO PASSENGERS: From each corner of each terminal, a short concourse connects to a nearby flight station, so that flight stations cluster compactly around each terminal. As a result, passengers walk only 80 feet from the center of the terminal to a ticket counter, and a maximum of 475 feet to a flight station.

Hobby — A Second Major Airport

A convenient second airport operated by the City of Houston is located in the southeast part of the city. William P. Hobby Airport served as Houston's main airport before Intercontinental went into service. Commercial airline service to and from Hobby serves points in Texas, primarily. However, commercial airline flights to major U.S. cities also are scheduled on a daily basis. Hobby is a major regional center for corporate and private aviation with a wide range of facilities and services provided.
Houston Facts

Current Facts Concerning The Nation's Fifth Largest City

LOCATION: Houston—west of Harris County, Texas—is located on the upper Gulf Coast, at 29°55'50" latitude and 95°20'00" longitude, 30 miles from the Gulf of Mexico. Official latitude of the City of Houston is 29°48'00" North. Harris County ranges from sea level to 310 feet.

AREA: The Houston-Galveston Standard Consolidated Statistical Area (CSA) contains 225 standard Metropolitan Statistical Areas (SMSA): the Houston SMSA ( Brazoria, Fort Bend, Harris, Liberty, Montgomery, and Waller Counties) and the Galveston-Texas City CSA (Galveston County).

Inland distance from Houston to the Mexican border is 365 miles and to the Mississippi River is 630 miles.

Houston-Galveston CSA

7,161,958 sq.mi. 14,735,32 sq.km.

Harris County

2,010,586 sq.mi. 1,047,136 sq.km.

Harris County Incorporated area

1,510,580 sq.mi. 1,047,136 sq.km.

With the exception of Galveston island, which is also a part of the Houston-Galveston CSA, all of the area of Harris County is within the SMSA.

STORY: Houston was founded on August 30, 1836, by brothers August C. and John Kh, who paid just over $1 per acre for 4,642 acres of land near the Texans of the Alamo. The city was named for General Sam Houston, the first president of the Republic of Texas. Houston is one of the largest and most densely populated cities in the United States.

Houston is the capital of the State of Texas and the center of the state's economy, known for its diverse culture, abundant natural resources, and high quality of life. It is one of the most populous cities in the United States and is home to numerous businesses, including many Fortune 500 companies.

In 2017, the population of Houston was estimated to be 2,344,000. The city is divided into 133 census tracts and 23 general census blocks, making it one of the most diverse cities in the United States.

TOTAL EMPLOYMENT: Houston SMSA—December 1977...

TOTAL WAGES & SALARIES: Houston SMSA—1977...

COST OF LIVING: Despite a comprehensive high-inflation rate—7.3% in 1987, versus 6.5% nationally—Houston continues to offer lower living costs than most other metropolitan areas. Findings from the 1987 Bureau of Labor Statistics survey of annual living costs for three standards of living in 40 U.S. metropolitan areas...

Houston SMSA...

1,271,300...

$1,4 billion...

In 1977, Houston's living costs for a family of four were lower than the national average of 90.3%.

In 1977, the average family of four in Houston paid $1,271,300 in wages and salaries.

In 1977, Houston's living costs for a family of four were lower than the national average of 90.3%.

In 1977, the average family of four in Houston paid $1,271,300 in wages and salaries.

MOTOR VEHICLE REGISTRATIONS: HARRIS COUNTY—December 31, 1977...

Passenger cars...

1,211,839...

Trucks...

311,378...

All other vehicles (tractors, trailers, etc.)...

245,595...

Total registrations...

1,771,776...

During 1977, Harris County motor vehicle registrations increased by 136,834 (8.4%); passenger cars, 62,277 (3.6%); trucks 73,678 (27.2%); all other vehicles, 30,882 (17.4%).

GOVERNMENT: Houston has a mayor-council form of government in which the mayor and eight councilmen (five district councilmen and three councilmen-large, all of whom are elected at-large) serve as the legislative body. The mayor and city council are elected for two-year terms which run concurrently. A county judge and four commissioners perform the principal administrative and legislative functions for Harris County. They serve four-year terms.

ASSESSED VALUATIONS: 1977...

City of Houston...

$10,624,360,460...

Harris County...

$10,309,104,260...

TAXATION: In Houston there are no state or local personal or corporate income taxes. There is a limited 4% state sales tax and 1% city sales tax on purchases of $10 or more. The only taxes applied generally to all types of business firms in Texas are ad valorem taxes, corporate franchise taxes, and annual corporation franchise taxes. Certain businesses are subject to severance taxes, occupation taxes, and other taxes, depending on the nature of their operations.

STATE & LOCAL TAXES (1977): Claimed ratios of assessment and tax rates per $100...valuation of State at 12%, City at 13%...

Harris County is an Independent School District (52% $1,730). The State of Texas exempts oil from the first $7,000 assessed valuation for a declared homestead...

For owners over age 65, exemptions are granted by Harris County (first $15,000 assessed valuation), the City of Houston (first $10,000 assessed valuation), and Independent School Districts (first $5,000 assessed valuation).

Harris County...

$1,500...

$3,000...

Public Utilities: 1977 nonresidential electric current consumption in Harris County, 36,800,959 Mwh; electric current customers in Harris County, 768,310; 1977 nonresidential natural gas consumption in Harris County, 429,000,000 Mf; natural gas customers in Harris County, 508,500; telephones in service in the Houston Metropolitan Area, 1,729,802.

WATER SUPPLY: Houston obtains its municipal and industrial water from both underground and surface sources. Surface water now accounts for 45% of potable supply and is housed in 70% of total population.

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HOUSTON CHAMBER OF COMMERCE: The Houston Chamber of Commerce, chartered 1886, is a voluntary association of more than 8,000 business and professional employees working to make Houston a better place in which to live, work, and do business. It is accredited by the Chamber of Commerce of the United States, in addition to general reference material covered in HOUSTON FACTS, the Houston Chamber of Commerce publishes much of its information in membership publications.

These reports, which cover a wide variety of subjects in more detail than the summaries in this brochure, may be obtained from the Houston Chamber of Commerce, 25th Floor, 1100 Milam Building, Houston, Texas 77002.
Houston Facts

WEATHER DATA: HOUSTON, TEXAS, 1977

| Condition | Temperature (°F) | Departure from Average | Precipitation
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<td>-1.25</td>
</tr>
<tr>
<td>93.2</td>
<td>-0.8</td>
<td>2.84</td>
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<tr>
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<td>-0.3</td>
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<td>0.10</td>
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<td>1.7</td>
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<tr>
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<td>1.7</td>
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<td>67.5</td>
<td>0.9</td>
<td>3.19</td>
<td>1.15</td>
</tr>
<tr>
<td>Average</td>
<td>-1.4</td>
<td>29.44</td>
<td>-12.55</td>
</tr>
</tbody>
</table>

Source: Houston Intercontinental Airport

Houston is a metropolitan city with a mild climate, evident from the data above. The average temperature ranges from 42.7°F in January to 83.1°F in August, with moderate precipitation throughout the year. The data also show a typical summer with high temperatures and a mild winter.

AGRICULTURE

AGRICULTURAL RESOURCES: The climate and terrain of the Houston area are favorable for agriculture. The region's soils are suitable for growing various crops, including cotton, rice, and vegetables. The area's proximity to water bodies aids in irrigation, ensuring adequate water supply for crop growth.

AGRICULTURAL MANUFACTURING: The agricultural industry in the Houston area is significant, with a focus on processing and manufacturing crops. The data show a decrease in the number of farms and an increase in the value of agricultural products. This trend indicates a shift towards more efficient and modernized farming techniques.

INTERNATIONAL BUSINESS

The Houston Space Center: Located in the Greater Houston area, the center is a focal point for research and development in space exploration. It serves as a hub for domestic and international collaborations, contributing to advancements in aerospace technology.

RESEARCH & DEVELOPMENT

Research and development activities are concentrated in the Houston area, with a focus on energy, space, and other advanced technologies. The region's universities and research institutions play a crucial role in driving innovation. The space shuttle program is a significant local project, highlighting Houston's expertise in space technology.

LIDON B. JOHNSON SPACE CENTER

The Lyndon B. Johnson Space Center is a key facility for NASA, dedicated to supporting human space exploration and scientific research. Located in the Houston area, it is one of NASA's primary centers for space missions. The facility is known for its contributions to space missions, including the Apollo program and the International Space Station.
ANSPORTATION

OF HOUSTON: Houston is the third largest seaport in the United States in total tonnage, behind only the U.S. ports of New York and Los Angeles. The Houston Port, with 101,041 miles of cargo, is of which approximately half was foreign trade imports and exports combined valued at $11.3 billion in 1977. Leading foreign trading partners in 1977 were Japan, $1.1 billion, and Canada, $1.1 billion. In 1977, the Port of Houston handled 479,300,000 tons of cargo, representing approximately 3,000 acres between 14 and 18 miles north of downtown Houston, and is provided around the clock service to and from Houston International Airport, which is 18 miles north of downtown Houston. Houston covers approximately 3,000 acres between 14 and 18 miles north of downtown Houston. Houston has a light rail system that operates between downtown and the suburban areas.

COASTAL WATERWAY: Low-cost large-transportation on this 1,777-mile waterway links with 5,912 miles of commercially navigable waterways in the midwestern regions of the United States. The Port of Houston moves 101,041 miles of cargo, and with some 2,500 miles of waterways in the Gulf of Mexico, these waterways provide adequate water for large vessels. Service is offered by nine water carriers and three of contract and specialized operators.

SADS: Six major rail system operate 14 lines of mainline track radiating from the city, and string lines serve the industrial areas plus the port. Trunkline railroads are Burlington Northern, Illinois Central, Rock Island, Santa Fe, and Southern Pacific. 30 other railroads maintain rail facilities here. Rail passenger service is available on two routes, Houston-Chicago and New Orleans.

FIREIGHT LINES: 22 common-carrier truck lines operate daily schedules in serving the Houston district market and provide direct routes to the East, Midwest, and West Coast. Air to these general-carrier trucking routes, Houston's regulated truck operators, include primarily large number of specialized, special-commodity, and irregular carriers (e.g., 41 freight lines, 16 truckload lines, and 1,700 trucking lines). Air freight trucks operate in the 30-city local delivery zone.

EAM TRANSMISSION: Houston is one of the nation's most oil and gas transmission centers. The city's concentration of pipelines includes 13 crude oil and products pipelines and 21 lines. Most of the nation's major pipeline companies that move crude oil are located in Houston. Ten have headquarters here.

ANSPORTATION: Intercity bus systems operating from Harris County's 30 intercity branches, the Texas Motor Lines, provide service in all directions from Houston. The service is provided with a fleet of more than 3,000 vehicles. A full-service system, the intercity bus has as many as 270,000 passengers a year. A full-service system has been developed to accommodate the external population.

AIR TRANSPORTATION: Houston has become the international air transportation hub for the Southwest, Aeromexico, Air Canada, Air France, Braniff International, British Caledonian Airways, KLM Royal Dutch Airlines, Pan American World Airways, and Texas International Airlines. The airline has scheduled connections with more than 100 cities. Ten other air carriers are in Houston. The airport is 24 miles northwest of downtown Houston, and it handles approximately 100,000 passengers a week. The airport is served by major airlines, including Delta, United, American, Braniff, Northwest, and TWA. Houston International Airport is located 24 miles northwest of downtown Houston. The airport was completed in 1965.

INSTITUTIONS

SCHOOLS: Houston Independent School District, largest in the nation, has a local enrollment of 488,241 in the fall 1977 term. Approximately 33,000 are enrolled in private and parochial schools.

COLLEGES & UNIVERSITIES: Houston is a university center. The fall 1977 term, 109,311 students were enrolled at Harris County's 1,760 colleges, universities, and institutes, including colleges and universities: University of Houston, 3,796; Rice University, 5,196; Texas Southern University, 5,286; University of St. Thomas, 1,743; Houston Baptist University, 1,741; South Texas College of Law, 1,602; University of Houston Community College, 1,273; LaSalle College, 1,284; San Jacinto College, 1,250; North Harris Junior College, 7,339; Medical schools and colleges, 1,250.

LIBRARY SYSTEM: The Houston Public Library System includes a new central building at 500 Main Street and a branch at 3000 Bissonnet. The library system also includes the East End Branch at 3000 Bissonnet, the Old Main Library at 500 Main Street, and the Children's Museum.

HEALTH CARE

HOSPITALS, CLINICS, EMERGENCY CARE: Harris County's 59 hospitals have 15,900 beds, of which 321 are in the Texas Medical Center. The largest hospital is the Veterans Administration Hospital, with 1,320 beds. Numerous clinics and convalescent homes are available. Virtually every medical specialty is represented in Houston.

Emergency ambulance service within the Houston city limits is provided by the Houston Fire Department. The 28 ambulances, each equipped with a 12-passenger system, provide transport in direct competition with hospital personnel, making Houston's emergency care among the best in the world.

TEXAS MEDICAL CENTER: The Texas Medical Center, the largest in the world, has over 15,000 patients, over 1,300 beds, and 1,000 doctors. The hospital has a large staff of specialists and is one of the largest in the world.

Major units in the Texas Medical Center include: Baylor College of Medicine, Ben Taub General Hospital, City of Houston Department of Public Health, Harris County Medical Society, Hermann Hospital, Houston Academy of Medicine and Texas Medical Center and Veterans Administration Hospital and Human Development, the Methodist Hospital, St. Luke's Episcopal Hospital, Shriners Hospital for Crippled Children, Texas Children's Hospital, Texas Heart Institute, Texas Institute for Rehabilitation and Research, Texas Medical College, Inc., Texas Children's Hospital, University of Texas-Houston, University of Texas at Houston, University of Texas College of Medicine, University of Texas Health Science Center at Houston, University of Texas College of Pharmacy, University of Texas Southwestern Medical School, University of Texas Health Science Center at Houston, University of Texas Southwestern Medical School, and University of Texas Southwestern Medical School.

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INVENTION ATTRACTIONS

First attractions have made Houston one of the leading convention cities in the nation. In 1977, an annual series of national conventions and meetings was established in Houston. The Houston area is home to several major conventions each year.

SUM & MUSIC HALL: The downtown air-conditioned Sam Houston Coliseum contains 50,000 seats for exhibits and 9,000 seats for entertainment. The Coliseum is the largest of its kind in the South. The Music Hall offers a variety of cultural events, including concerts, plays, and recitals.

THOMAS CONVENTION & EXHIBIT CENTER, completed in 1987, is an extension of the Convention Center facility. The center features 480,000 square feet of exhibit space and 140,000 square feet of exhibition areas. The center is equipped with state-of-the-art facilities for conventions, seminars, and meetings.

STADIUM & ASTRODOME: The $31.5 million air-conditioned dome stadium can be converted to a multiple-seat arena for baseball, football, basketball, and other events. The Houston Livestock Show and Rodeo opened the converted facility in 1988, providing a multi-purpose venue for a variety of events.

SUMMIT: The $18.3 million sports arena and entertainment center was opened in 1976. It is situated in Greenway Plaza, providing a venue for a variety of events.

LUX & MOTELS: For housing conventions, delegates, and visitors, Houston has many hotels and motels. Many of the hotels and motels are located in the downtown area. The area is served by major airlines and enjoys the largest sales tax base of any city in the United States. The area is served by major airlines and enjoys the largest sales tax base of any city in the United States.

WASHINGTON: A wide range of dining pleasures can be found in Houston's famous restaurants. In addition to the fine restaurants, there are several country clubs and other dining establishments in the area.

FIRST ATTRACTIONS

PAL POINTS OF INTEREST: Prominent attractions for most tourists include: Harris County Stadium and AstroDome, a 60,000-seat arena and exhibition facility. The arena is home to the Houston Astros, a Major League Baseball team.

COMMUNICATIONS MEDIA

NEWSPAPERS: Houston has two major daily newspapers and numerous weekly newspapers and specialty publications. Major dailies are the Houston Chronicle, 301 Texas Avenue, morning edition, and Saturday edition. The Daily Chronicle, 1615 W Main Street, evening edition, and Saturday edition.

TELEVISION STATIONS: KTRK Channel 13, KHOU Channel 11, and KPRC Channel 2 are the major broadcast networks in Houston. The Houston Rockets, a professional basketball team, broadcast their games on the Houston Rockets Network.

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Figure 6-16 - Ground-Service Equipment Layout (DC-10)