HYDROTEX DYNAMICS:
ANALYZING THE SUCCESSFUL COMBINATION OF TWO STRUCTURAL SYSTEMS

Project Location:
Houston, Texas

Project Facts:
3-story Addition to an existing industrial manufacturing facility built in 1972 for Hydrotex Dynamics.

Consists of 7,000 SF of new construction and 5,000 SF of interior office renovation in the existing building.

This project as of the time of this presentation is in the Permit Phase and is being permitted through Harris County.

Project Design Team
Architecture: Proem Design-Build, Inc.
Geotechnical: The Murillo Company
Civil: De Anda Engineering
Structural: Ensight, Inc.
MEP: T&D Engineering

Student Analysis Team
Athavale, Ninad
Buys, Ryan Earl
Messick, T. Keith
Shrivastava, Suruchi
Singh, Tanya

12.01.2011
Facilities Program

Design Statement: The Client requires a design solution that resolves the facilities program AND functionally resolves the fact that the addition; being a three story conventionally framed steel structure will need to be designed independently from, yet has to be able to be openly connected to the existing pre-engineered steel building with internal, two-story, light-framed wood structure.
INTERNATIONAL BUILDING CODES FOR STRUCTURE
2006 EDITION

Governing Building Code for Structural Design
The structure is designed in accordance with the International Building Code, **2006 edition**.

- Structures are classified with respect to occupancy in one or more of the groups listed as in section 302.1 of International Building Code i.e. Business group B (section 304)
- The Ground Snow load \( 'pg' \) For this area is 5 psf or less.
- Per the city of Houston amendments to the IBC, all structures in this jurisdiction shall be assigned to seismic design category A.
- The floor system has been designed to withstand a concentrated load of 2000 pounds placed upon any space 2'-6" square, in accordance with section 1607.4 of the International Building Code.
The design gravity loads are as follows:

<table>
<thead>
<tr>
<th>Superimposed Dead Loads</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Ceiling + mechanical</td>
<td>10 psf</td>
</tr>
<tr>
<td>Built up Roof</td>
<td>6 psf</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Live Loads</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Roof</td>
<td>20 psf</td>
</tr>
<tr>
<td>Partitions</td>
<td>20 psf</td>
</tr>
<tr>
<td>Office space</td>
<td>50 psf</td>
</tr>
<tr>
<td>Corridors above first floor</td>
<td>80 psf</td>
</tr>
<tr>
<td>Assembly areas</td>
<td>100 psf</td>
</tr>
<tr>
<td>Finishes</td>
<td>As required</td>
</tr>
<tr>
<td>Mechanical &amp; Piping loads</td>
<td>As required</td>
</tr>
</tbody>
</table>
International Building codes for reduction in LIVE LOADS (1607.9)

Except for areas of public assembly, and except for live loads which exceed 100 psf, floor uniform live loads are reduced in accordance with section 1607.9 of the International Building Code.

International Building codes for WIND PRESSURES (1607.9)

As per section 1609.1.1 of the International Building Code, the structure has been designed to withstand the wind pressures specified in chapter 6 of ASCE 7, using the following information:

- basic wind speed 110 mph
- wind importance factor 1.00
- building category ii
- wind exposure b
- internal pressure coefficient ±0.18
- basic wind speed is 3-second gust speed at a reference elevation of 33 feet above the ground.
Stairs, guardrails & handrails (1607.1)

- All stairs are designed to safely resist loading as indicated in table 1607.1 of the International Building Code. Stair structure is designed to support a uniform live load of 100 psf.

- Individual treads is designed to resist a minimum concentrated load of 300 pounds on an area of 4 square inches in a position which would cause maximum stress, whichever case may govern.

- Guardrails at exit facilities and balconies are designed to safely resist loading as indicated in section 1607.7.1 of the International Building Code. Railings are designed to support a horizontal load of 50 lbs. per linear foot, or a 200 lb. force acting in any direction, whichever is greater. Forces are to be applied to the top rail.

- Handrails are designed to safely resist loading as indicated in section 1607.7.1.1 of the International Building Code. Handrails are designed to support a concentrated load of 200 lbs. applied in any direction at any point along the top of the rail.

- Intermediate rails are designed to withstand the loading as specified in section 1607.7.1.2 of the International Building Code. Intermediate rails are designed to resist a horizontally applied normal load of 50 lbs. on an area not to exceed one square foot including openings and space between rails.
Site Plan

Design Team had to overcome Site Constraints

Property Lines,
Storm Drainage,
Overhead Power Lines
Parking & Landscape Requirements
Third Floor Framing Plan

Roof Level Framing Plan

Structural Floor Framing Plans
Building Section Thru Existing & New Structures
Structural Axonometric
Multi-Frame End Bay Diagonal Bracing Analysis

110 mph Wind load analyzed from west (left)
Self weight, live load and dead load included
Multi-Frame Multi-Bay Analysis Along Grid Line

110 mph Wind load analyzed from north (left)
Self weight, live load and dead load included
Multi-Frame Multi-Bay Analysis Along Grid Line

110 mph Wind load analyzed from south (right)
Self weight, live load and dead load included
CONNECTIONS TO THE EXISTING STRUCTURAL SYSTEM AND FUNCTIONALITY
FOUNDATION TREATMENT BETWEEN EXISTING AND NEW BUILDING
Sections Through Foundation Pier and Plinth beam
EXPANSION JOINTS BETWEEN EXISTING AND NEW BUILDING
Detail 1 - Vertical expansion joint in plan
Detail-2 - Vertical expansion joint in plan
Detail 3 - Plan detail through...?
Section through the connection between existing building and new construction
DETAIL 4-EXPANSION JOINT DETAIL