Case Study  Leutschenbach School

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CONTENTS

Introduction
  
  Overview & Architect
  
  Precedents
  
  Site analysis
  
  Spatial organization

Structural features
  
  Foundation system
  
  Main structural system
  
  Other building system

Structural analysis
  
  Loads diagram
  
  Multi-frame analysis
OVERVIEW

- Structure: Leutschenbach School
- Architect: Christian Kerez
- Location: Zurich, Switzerland
- Site Area: 11500.0 sqm
- Size: 105,900 sq.ft. / 9840 m²
- Construction Date: August 2002
- Structural engineers:
  Dr. Schwartz Consulting with DSP,
  Walter Kaufmann, Mario Monotti
- Total construction cost
  $51 million !!!
Architect, Christian Kerez

Born: Maracaibo, Venezuela

Educated:
M.Arch in Swiss Federal Institute of Technology Zurich in 1988

Architect, Writer, Photographer, Professor

Works: Liechtenstein Art Museum, Schools in Breiten and Leutschenbach, Warsaw Museum of Modern Art, Holcim Competence Center

Works have been linked to the rawness of concrete art and to the bareness of infrastructural works for which he has an admitted fascination.
PRECEDENTS

Mies van der Rohe’s projected Convention Hall in 1953, Chicago
PRECEDEENTS

Compared to Convention Hall and Leutschenbach School
Characteristics of Steel Construction in School Buildings

Relatively Short Construction Period (in case of a thirty-classroom building)

Reinforced concrete construction takes about 10.2 months.
The same building can be built in about 2.8 months with steel construction.
Adaptability of the Structure

- Flexibility
- Adaptability of space
- Allows for additional constructions, expansions, and renovations
Siegfrid von Vegasack School - Germany

- Large flexible space taking advantage of the long spans
- Façade free from structure – allows for extensive use of glass to let light in
SITE ANALYSIS

Zurich, Switzerland

Lows range from 14 °F to 41 °F
Highs range from 59 °F to 86 °F

Not in Flood Zone

Moderate Earthquake Hazard

Moderately well drained soil
- Calcareous silt
SITE ANALYSIS

Wind Wheel
SITE ANALYSIS

Zurich, Switzerland
North Eastern edge of Zurich
Industrial and Residential
SPATIAL ORGANIZATION
1. Entrance
2. Kitchen/Cafeteria
3. Meeting/Work/Play Area
4. Common Hallway
5. Classroom
6. Staff Room
7. Library
8. Multifunction Room
9. Gym
The children enter on either side of the ground level, which is basically a core with a wide, open area around it. This is where they eat and hang out after class—completely surrounded by unobstructed spans of glass, as if outdoors.
1st, 2nd, & 3rd FLOORS

FIRST FLOOR

1. ENTRANCE
2. KITCHEN/CAFETERIA
3. MEETING/WORK/PLAY AREA
4. COMMON HALLWAY
5. CLASSROOM
6. STAFF ROOM
7. LIBRARY
8. MULTIFUNCTION ROOM
9. GYM
Nine classrooms lining the sides of each floor. Rather than the typical corridor though, he carved a generous communal area between them for group activities and lessons.
FOURTH FLOOR

1. ENTRANCE
2. KITCHEN/CAFETERIA
3. MEETING/WORK/PLAY AREA
4. COMMON HALLWAY
5. CLASSROOM
6. STAFF ROOM
7. LIBRARY
8. MULTIFUNCTION ROOM
9. GYM
On the forth floor, the two stairways running in opposite directions meet at a large foyer which provides access to all the public areas, such as the auditorium and library. The gymnasium, the largest and highest space, crowns the whole building...
Leutschenbach, 5th floor, sportshall
The gym crowns the building and achieves a sense of elation, floating above the immediate site, with views of the mountains that frame Zürich. Not surprisingly, says Kerez, when he asks pupils what they like most about the school, nearly all say the gym.
FOUNDATION

- Waterproofed Basement
  - 50% recycled concrete
  - Sika® Permaton
- Pier foundations
  - basement restoring on pile caps
Ground Floor
- 6 Tripod Columns
- Side Braced
2nd – 4th Floor

- Classrooms
- 2 Girders resting on the 6 Columns
- Truss supported by the Girders
5th Floor

- Library & Multifunction room
- 4 Trusses resting on 6 trusses from 2nd and 4th floor
6th Floor

- 2 Trusses supported by the 5th floor’s 4 trusses
- 2 Trusses supported by the 2 Trusses
Roof

- 2 Trusses resting on the 6th floor
- Solar panels, chimney, etc.
Detail Study
1:20

This detailed study focuses on the concrete ribbed floor and how the floors connect together, and with the other elements. It is a section taken through the second and third floor.

- 30-50mm artificial-stone slab paving
- 2.5m exterior cantilevered balcony, outside circulation space
- Concrete reinforced cantilevered floor
- 300/300mm steel square hollow section (SHS), connects the steel truss to the floor and is supported to the next column
- Glazed barrier
- Concealed aluminum window frame
- Concrete reinforced cantilevered floor
- Concealed aluminum window frame
- 40mm rock-wool insulation slab
- Damp proof membrane (DPM)
- 100mm steel channel section
- Solar blind
- Triple glazing to fit in with the Minergie Standards
- Diagonal truss members, steel hollow section
- Steel I-beam 160mm deep
- 280mm reinforced concrete floor
- 480mm reinforced concrete floor
- Triple glazing
- Glass fin, supporting the triple glazing and transferring the load back to the concrete floor
- 100mm concrete screed
- Under floor heating
- 50mm impact sound insulation
- Ventilation outlet
- Acoustic layer on 48mm mineral underlayer
- Loudspeaker
- Sprinkler
- Light
- Steel I-beam 160mm deep
Heated floor system

- Shaft located on the North
- Heat transferred from an adjacent incinerator
System Glass

Interior
- Semi-translucent
- Triple skin Profilit panels

Exterior
- Concern with conductivity than reflectivity
- Double glazed, translucent channel-glass
System of Mezzanines

- Sun shade (S > N)
- Extended public functions
- Alternative Egress
LOAD TRACING DIAGRAM
MULTI-FRAME ANALYSIS

SNOW LOADING
MULTI-FRAME ANALYSIS

WIND LOADING
MULTI-FRAME ANALYSIS

LIVE LOADING
MULTI-FRAME ANALYSIS

MOMENT SIMULATION

- MOMENT (Mz about major axis)
- MOMENT (My about minor axis)
- SHEAR (Vy parallel to minor axis)
- SHEAR (Vz about major axis)
- AXIAL (Px comp. parallel to member)
- Torque (Tx Torsion along member)

Member Deflection