The Shard of London

19 June 2012

INTRODUCTION

085,277

MEMBER OF PERMASTEELISA GROUP

- WORLDWIDE LEADER IN FACADE CONSTRUCTION & COMPLEX BUILDING ENVELOPES
- OPERATING WITH 50 COMPANIES IN 27 COUNTRIES

QUESTIONS

- MAIN WALL PROFILE
- MAIN FAÇADE PROFILE
- STRUCTURAL CHALLENGES OF THE FAÇADE
- THE SHARD
- INTRODUCTION
PERMASTEELIA PROJECTS

INTRODUCTION

PROJECT BASED DEVELOPMENT, MANUFACTURING AND INSTALLATION OF ARCHITECTURAL FACADE COMPONENTS AND BUILDING ENVELOPES

ARCHITECT: JOHNNY WATSON/HALL, TODD & LITTLEMORE
LOCATION: SYDNEY, AUSTRALIA

SYDNEY OPERA HOUSE

THE SHARD OF LONDON

19 JUNE 2012
SCHELDEBROUW

The Shard of London

INTRODUCTION

Architect: Jean-Paul Viguier, György Fazakas
Location: Vészprém, Hungary

SCHELDEBROUW PROJECTS

INTRODUCTION

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SCHELDEBROUW

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MULTIFUNCTIONAL BUILDING

- OFFICES
- HOTEL, SHANGRI LA
- RESTAURANTS
- SPA
- EXCLUSIVE RESIDENTIAL APARTMENTS
- HIGHEST PUBLIC VIEWING GALLERY

FAÇADE DESIGN

GENERAL DESIGN REQUIREMENTS

- MAXIMUM TRANSPARENCY
- ENTIRE EXTERNAL SURFACE LOW IRON GLASS
- MINIMUM STRUCTURE = SLENDER FRAMING MEMBERS
- VERY LOW U- AND G-VALUES
- Panelized Curtain Wall Elements as Starting Point of Design
- Visual Mock-ups
- Design of Framing Sections
- Rapid Prototyping
- Structural, Thermal & Acoustic Assessments
- Live Full Scale Performance Tests

Facade Design
CURTAIN WALL UNITS MANUFACTURED IN THE FACTORY
- CONDITIONED & CONTROLLED ENVIRONMENT
- TRANSPORTED (SHIPPED) TO THE SITE IN LONDON
- HOISTED AND INSTALLED BY SKILLED INSTALLATION TEAMS

MANUFACTURING, TRANSPORT & INSTALLATION

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STRUCTURAL CHALLENGES

- WIND LOADS
- BUILDING MOVEMENTS & TOLERANCES
- SLENDER FRAMING DESIGN
- MAXIMUM TRANSPARENCY

MAIN FAÇADE PRINCIPLE

- MAXIMUM TRANSPARENCY
- SLENDER DESIGN
- HIGH REQUIREMENTS FOR BUILDING PHYSICS

MAJOR STRUCTURAL CHALLENGES

- CANOPIES
- JUMBO GLASS PANELS GROUND FLOOR
- SPIRES
- WIND WALLS
- MAIN FAÇADE
- SLENDER FRAMING DESIGN
- BUILDING MOVEMENTS & TOLERANCES
- WIND LOADS
**MAIN FAÇADE PRINCIPLE**

- **64/67(0'(6&5,37,21**
- **FLOOR TO FLOOR UNITIZED DOUBLE SKIN CURTAIN WALL ELEMENT**
- **INNER & OUTER SKIN JOINED BY MEANS OF ALUMINUM BRACKETS**
- **FRAMING MADE OF STRUCTURAL ALUMINUM ALLOYS**
- **CAVITY BETWEEN SKINS NATURAL VENTILATED**
- **ELEMENT DIMENSIONS 1500 X 3700 MM, OVERALL SLOPE OF 5º (DEGREES)**

**INNER SKIN**
- **INSULATED DOUBLE GLASS UNIT**
- **OPERABLE FOR MAINTENANCE PURPOSES**

**OUTER SKIN**
- **LAMINATED SINGLE GLASS UNIT**
- **STRUCTURALLY BONDED TO THE FRAMING**

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**WING WALLS**

- **SYSTEM DESCRIPTION**
  - **INNER SKIN DOUBLE GLASS UNIT - OPERABLE FOR MAINTENANCE PURPOSES**
  - **OUTER SKIN SINGLE GLASS UNIT - STRUCTURALLY BONDED TO THE FRAMING**
  - **FRAMING MADE OF STRUCTURAL ALUMINUM ALLOYS**
  - **CAVITY BETWEEN SKINS NATURAL VENTILATED**
  - **ELEMENT DIMENSIONS 1500 X 3700 MM, OVERALL SLOPE OF 5º (DEGREES)**
- Supportation wing wall beam to limit internal conductivity

Machining, Preservation & Finishing

Wing Walls

Installation

Structural Behaviour

Components

Handout Section

- Hollow section to withstand rotation
- High performance structural steel
- Tapered shape due to esthetics
- Twisted due to eccentric dead load brackets
- Worst case eccentric 3.5 m
- Supports at midspan dead 3.5 m and window wash cradle loads

Wing Walls

Installation

Machining, Preservation & Finishing
EXTERNAL BEAM - CUSTOM MADE RHS SECTION FROM WELDED STEEL PLATES
- DIMENSIONS AND SHAPE VARY THROUGH THE BUILDING
- PROVIDED WITH END PLATES SEALING INTERNAL SURFACES TO AVOID AIR CONTACT
- PRESERVED BY MULTY LAYER COATING SYSTEM

CONNECTIONS TO MAIN STRUCTURE
- INTERFACE BRACKET
- INTERFACE BRACKET IMPLEMENTED IN CORNER CLADDING PANEL
- ALLOW ADJUSTMENTS TO ALIGN THE TIP OF EXTERNAL BEAM
- ALL BRACKETS ALLOW ADJUSTMENTS FOR CONSTRUCTION TOLERANCES
- SPECIALLY DESIGNED HIGH DUTY STAINLESS STEEL BOLTS & THREADED BUSHES

INSTALLATION
INSTALLATION SEQUENCE

Fixing Joints
Manufacturing, Preservation & Finishing
Structural Behaviour
Design Principles
Components

WING WALLS
LOWER LEVELS CLADDING

- Span > 8 M
- Architectural slender shape 250 X 25MM
- Recees for reduction thermal conductivity
- Multi-layer coating system for corrosion protection and finish colour
- Insulated double glass jumbo units
- Size 1.5M Width X 7.5M height
- 2x6MM laminated - 16MM cavity - 2x6MM laminated
- 2x6MM laminated - 16MM cavity - 2x6MM laminated

ELEVATION STEEL MULLION

VERTICAL SECTION

PARTIAL ELEVATION

ISOMETRIC VIEW
LOWER LEVELS CLADDING

CANOPIES
CANOPIES

- ARCHITECTURAL SHAPED STEEL
- ALL MEMBERS CUSTOM MADE
- MULTILAYER COATING SYSTEM FOR CORROSION PROTECTION AND FINISH COLOR
- 2x10MM LAMINATED FROTTE GLASS
- FRAME STRENGTHENED STRUCTURE

GLAZING

Steel Structure