

History of Industrial Architecture



ZOLLVEREIN COAL MINE INDUSTRIAL
COMPLEX, ESSEN, GERMANY

Aesthetics of Monumentality

ROYAL SALTWORKS AT ARC-ET-SENANS
CLAUDE-NICOLAS LEDOUX
1774

THE HIERARCHICALLY ORGANIZED COMPLEX
HAD AN ENTRY AT THE CENTER, HEATING
POTS AND DRYING OVENS AT ENDS, &
LIVING QUARTERS AT THE PERIMETER.

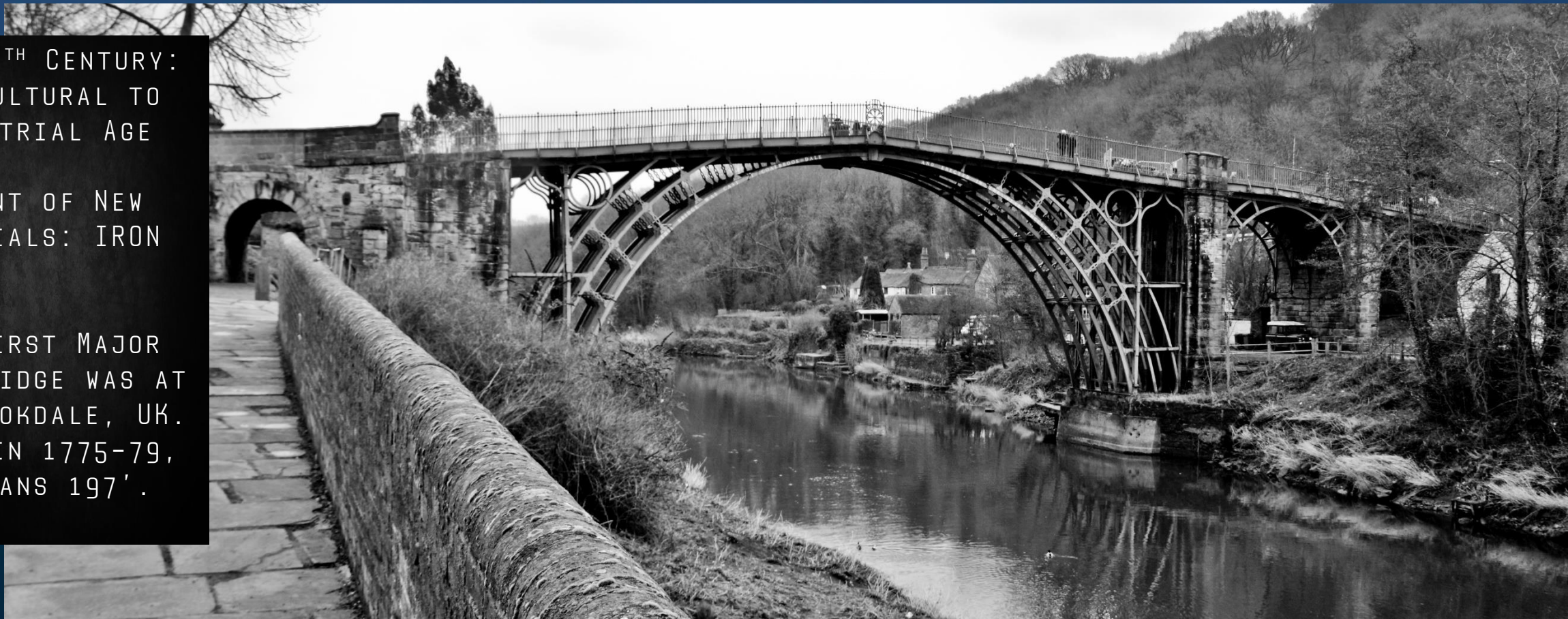


Industrial Materials

LATE 18TH CENTURY:
AGRICULTURAL TO
INDUSTRIAL AGE

ADVENT OF NEW
MATERIALS: IRON

THE FIRST MAJOR
IRON BRIDGE WAS AT
COALBROOKDALE, UK.
BUILT IN 1775-79,
IT SPANS 197'.

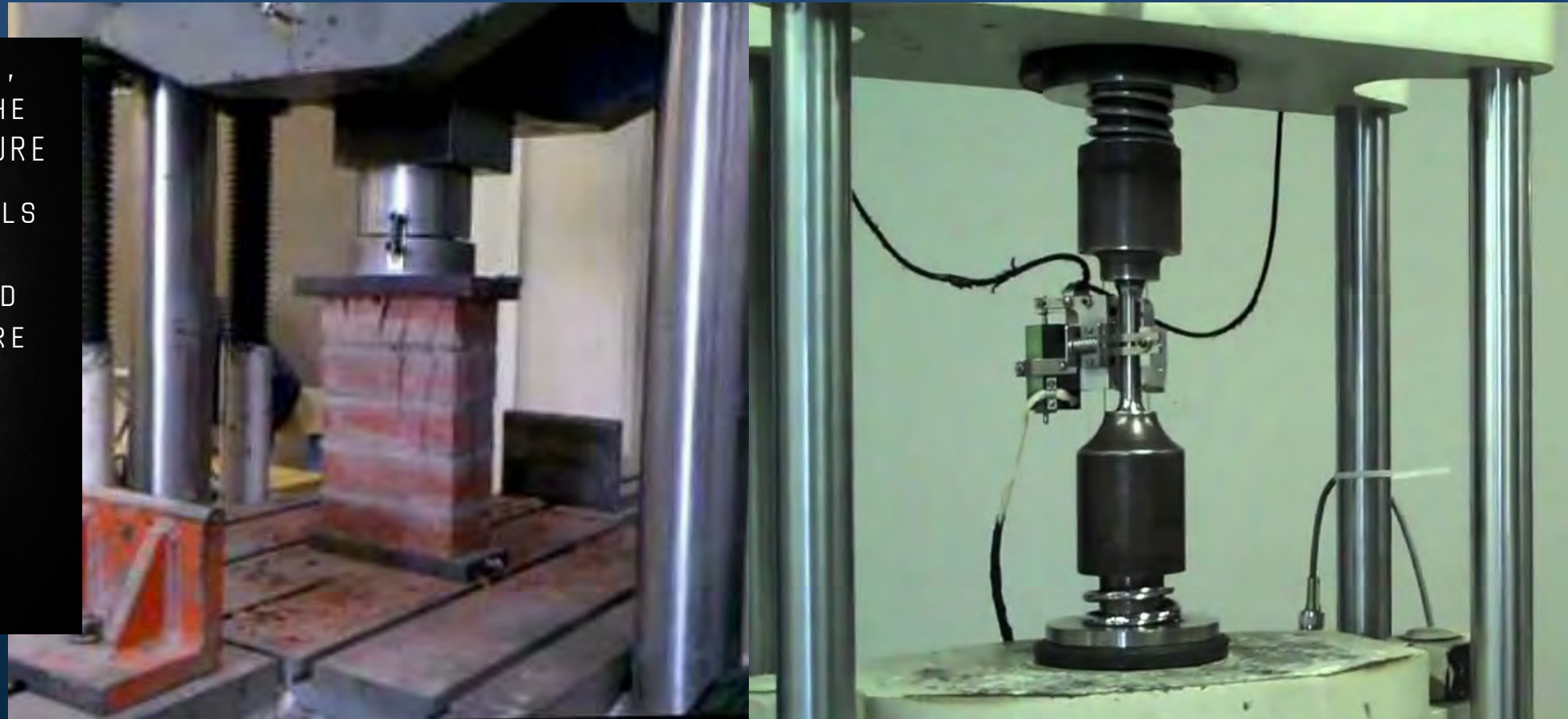


Material Strength

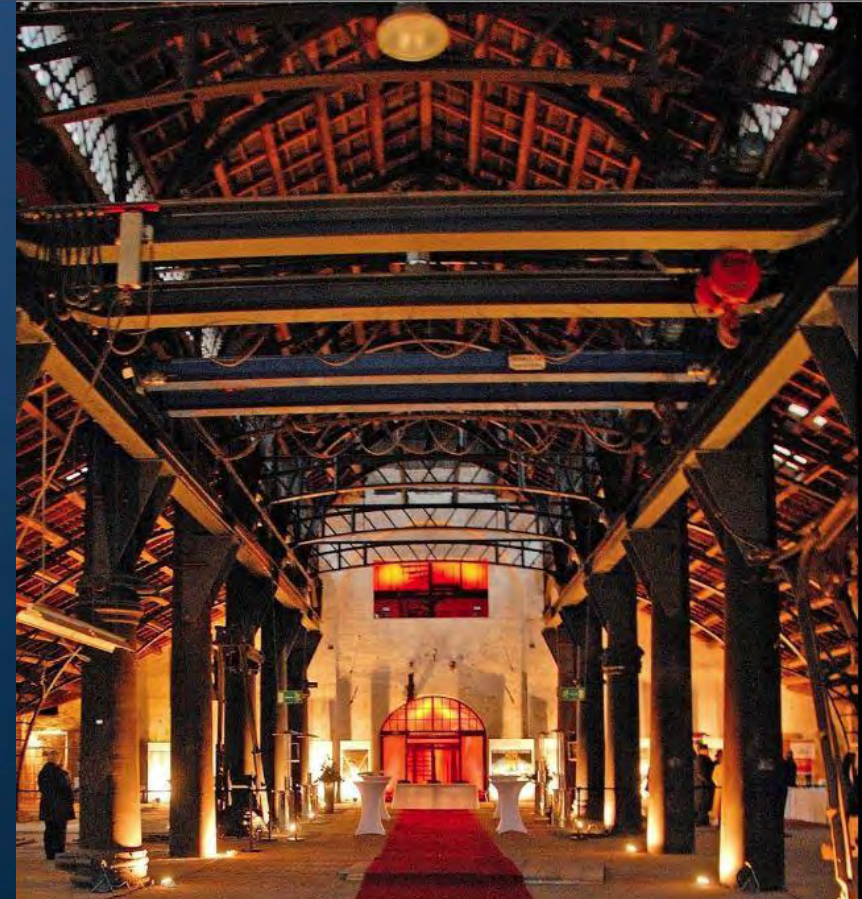
BY MID 18TH CENTURY,
IRON WAS SEEN AS THE
MATERIAL OF THE FUTURE

TRADITIONAL MATERIALS
LIKE MASONRY CAN
GENERALLY WITHSTAND
COMPRESSIVE PRESSURE
AND SHEAR FORCES.

IRON CAN COUNTER
TENSION.



In Search of a Style



SAYNER HUTTE, BENDORF, GERMANY
KARL LUDWIG ALTHANS

IRON CASTING WORKS
1818-1830

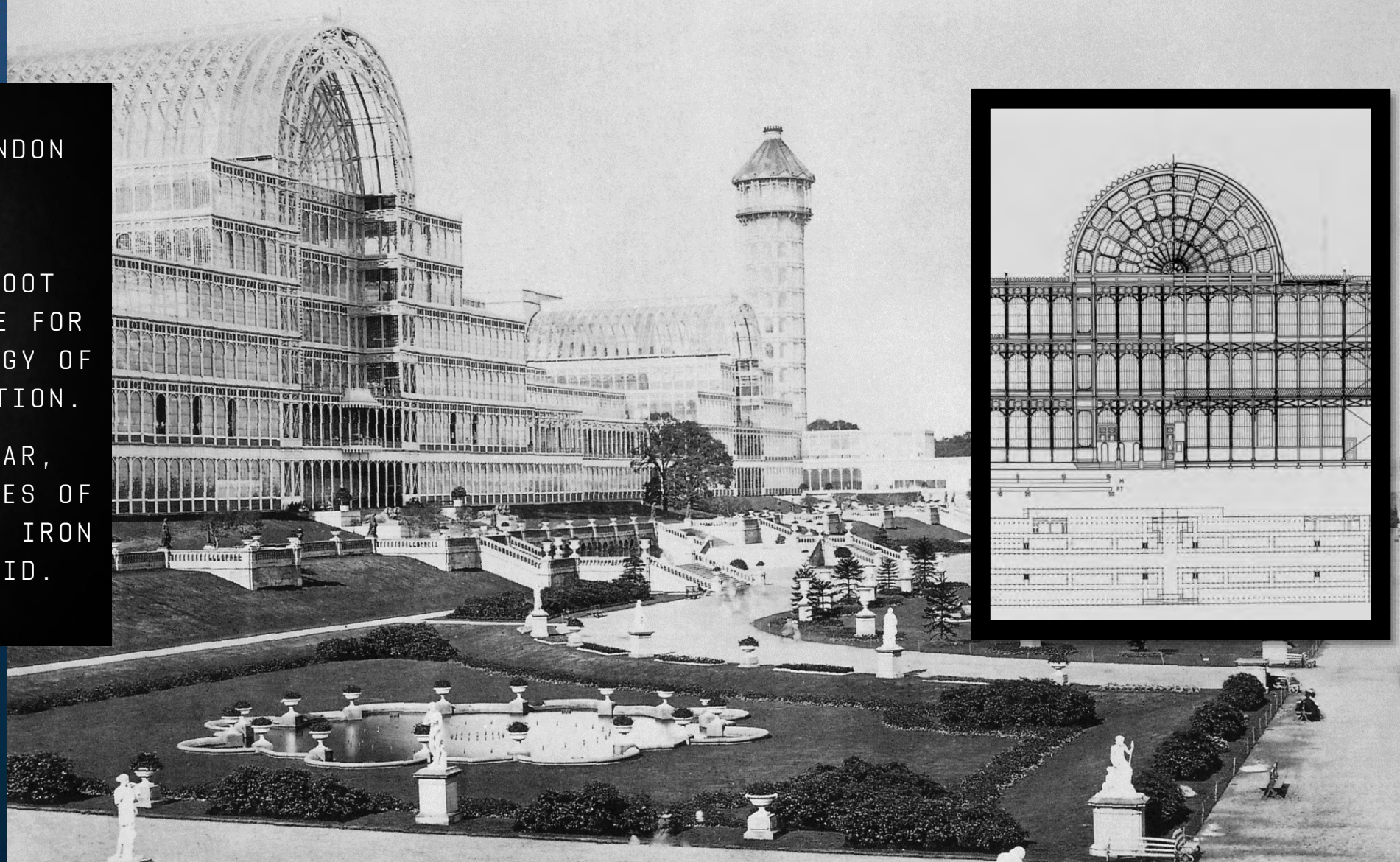
A GOTHIC BASILICA WITH THREE NAVES MADE SENSE FUNCTIONALLY, AS THE CLERESTORY DISTRIBUTED NATURAL LIGHT. THE HOLLOW CAST IRON PILLARS AND ARCHES WERE ALL FABRICATED AT THE WORKS.

Astonishing Prefabrication

CRYSTAL PALACE
GREAT EXHIBITION, LONDON
SIR JOSEPH PAXTON
1851

THE 990,000 SQUARE FOOT
STRUCTURE HOUSED SPACE FOR
EXHIBITORS OF TECHNOLOGY OF
THE INDUSTRIAL REVOLUTION.

THE DESIGN WAS MODULAR,
BASED ON AVAILABLE SIZES OF
GLASS PANES, WITH CAST IRON
CHANNELS IN A 24' GRID.



Steel for its Own Sake

SHEERNESS BOAT STORE
GREAT BRITAIN
GODFREY T. GREENE
1856-1860

A FACTORY BUILDING
WITHOUT HISTORICIZING
OR DECORATIVE
ELEMENTS - A TRUE,
DIRECT EXPRESSION OF
STEEL CONSTRUCTION.

THE BUILDING WAS
BUILT IN STEEL AND
CLAD IN SHEET METAL.



An Enclosure of Iron Vaulting

LA GALERIE DES MACHINES
EXPOSITION UNIVERSELLE, PARIS
DUTERT AND CONTAMIN
1889

THE 520,000 SQUARE FOOT
STRUCTURE OF CAST IRON ARCHES
WAS THE LARGEST VAULTED
STRUCTURE OF ITS TIME.

ADVANCES INCLUDED TRUSSES
WITH A THREE-PINNED HINGE
[PORTAL ARCH].



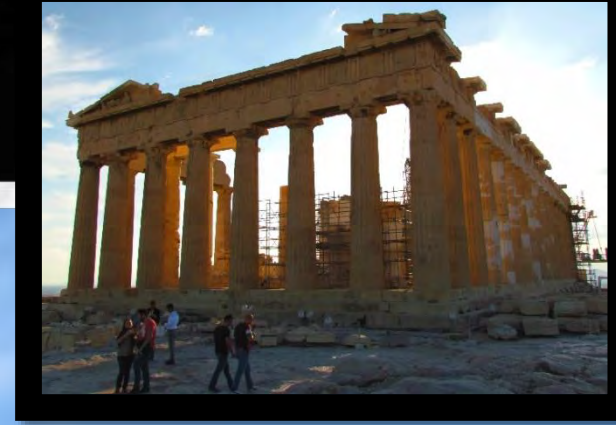
An Immense and Powerful Place

PACKARD FACTORY
DETROIT, MICHIGAN
ALBERT KAHN
1903

3.5 MILLION SQUARE
FOOT COMPLEX MADE OF
REINFORCED CONCRETE,
CLOSED NOW, BUT STILL
MOSTLY INTACT AND
STRUCTURALLY SOUND.



A Temple of Industry



AEG TURBINE FACTORY
BERLIN, GERMANY
PETER BEHRENS
1909

IT "IS" A PARTHENON,
WITH A BOLD TEMPLE
FRONT AND WITH STEEL
COLUMNS FORMING
COLONNADES ON EACH
SIDE.

ITS HEAVY BATTERED
CORNERS ARE ILLUSORY,
AS ALL WEIGHT IS BORNE
BY THE COLUMNS, AND
ALL GLAZING HUNG AS
"CURTAIN WALLS".

GABLE ROOF
AS PEDIMENT

GRID GLAZE
SYSTEM

BATTERED
CORNERS

MAXIMUM
GLAZING

VERTICAL
STEEL
COLUMNS



A Temple of Industry

AEG TURBINE FACTORY
BERLIN, GERMANY
PETER BEHRENS
1909

STILL USED TODAY FOR
THE PRODUCTION OF
TURBINES, THE ASPECT
OF THE AEG IS ONE OF
MONUMENTALITY AND OPEN
SPACE, LIKE ITS TEMPLE
PREDECESSOR.

BEHRENS WAS MENTOR TO
NUMEROUS ARCHITECTS,
INCLUDING GROPIUS,
MIES, & LE CORBUSIER.



A Facade of Pure Light

FAGUS WORKS
ALFELD, GERMANY
GROPIUS AND MEYER
1911-13

IN RESPONSE TO THE NEED
OF THIS SHOE FACTORY
FOR NATURAL LIGHT, THE
COLUMNS ARE MADE QUITE
NARROW, WITH LARGE
EXPANSES OF GLASS,
EVEN AT THE CORNERS.

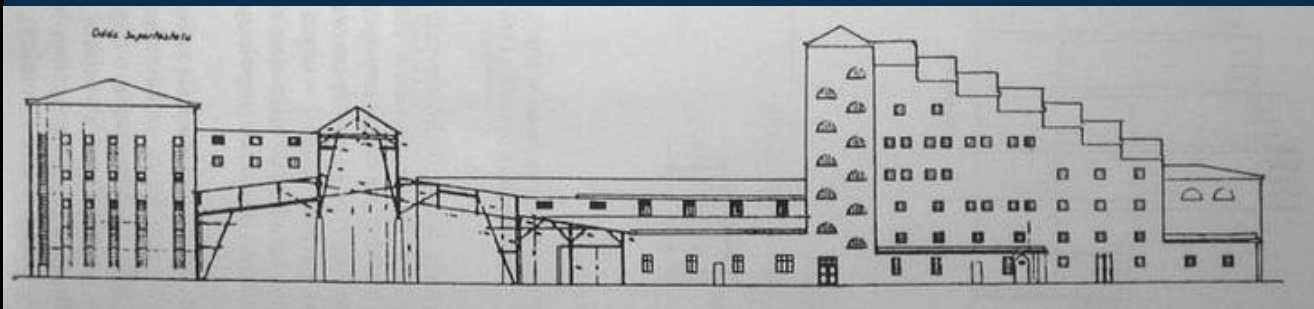
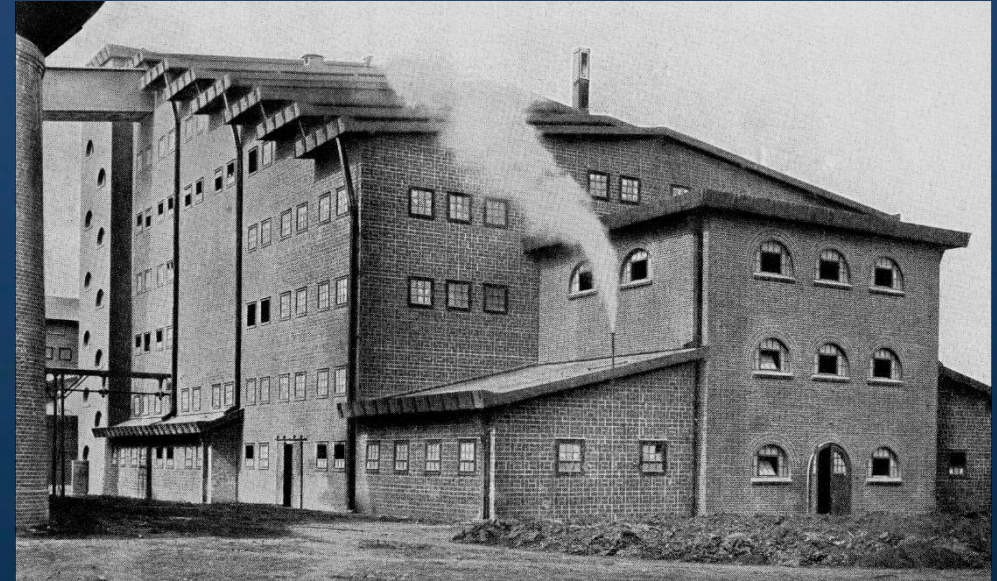


Process Made Visible

CHEMICAL FACTORY
LUBAN, POLAND
HANS POELZIG
1911-12

THE ENTIRE FORM OF THE BUILDING EXPRESSES THE **PROCESS** OF PRODUCTION, WITH EACH STEP CLEARLY ARTICULATED IN SHAPE.

BUILDINGS INCLUDE A KILN HOUSE, A LEAD CHAMBER, AN ADMIN OFFICE, A CHAMBER HOUSE, STORAGE SHEDS, AND ENGINE HOUSE.



BUILDING
ELEVATION

Reduction to Basic Forms

HAT FACTORY
LUCKENWALDE, GERMANY
ERICH MENDELSON
1921

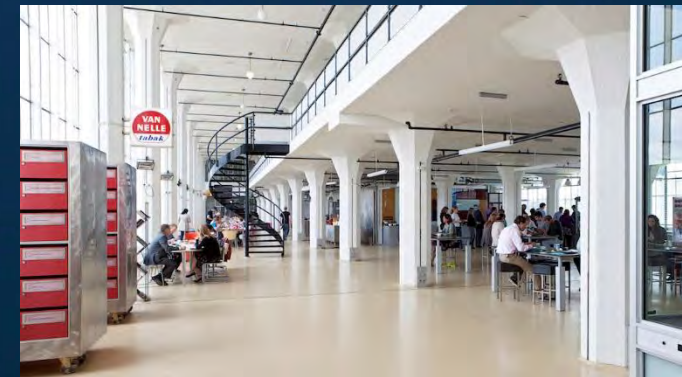
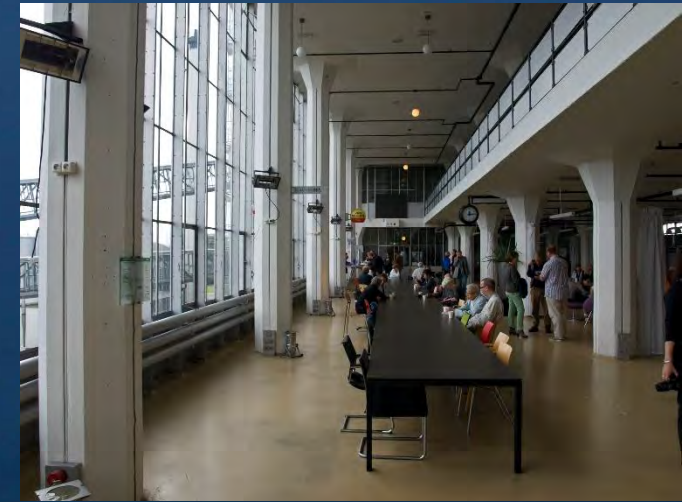
THE DYEING HALL
FUNNELS TOXIC FUMES
UPWARD. IT ALSO LOOKS
LIKE A HAT, WHICH IS
BRILLIANT.



A Poem of Steel and Glass

VAN NELLE FACTORY
ROTTERDAM, NETH.
LEEDERT VAN DER VLUGT
1925-31

GLASS WALLS DEFINE
THE EXTERIOR, WHILE
THE UNIQUE COLUMNS
ARTICULATE THE
INTERIOR VOLUME.



Lifting Up an Expansive Space

JOHNSON WAX HEADQUARTERS
RACINE, WISCONSIN
FRANK LLOYD WRIGHT
1936

DENDRIFORM *(TREE-SHAPED)
COLUMNS SUPPORT THE
CEILING, WHILE SKY-
LIGHTS ALLOW
SOFT LIGHT
TO ENTER THE
WORKROOM.

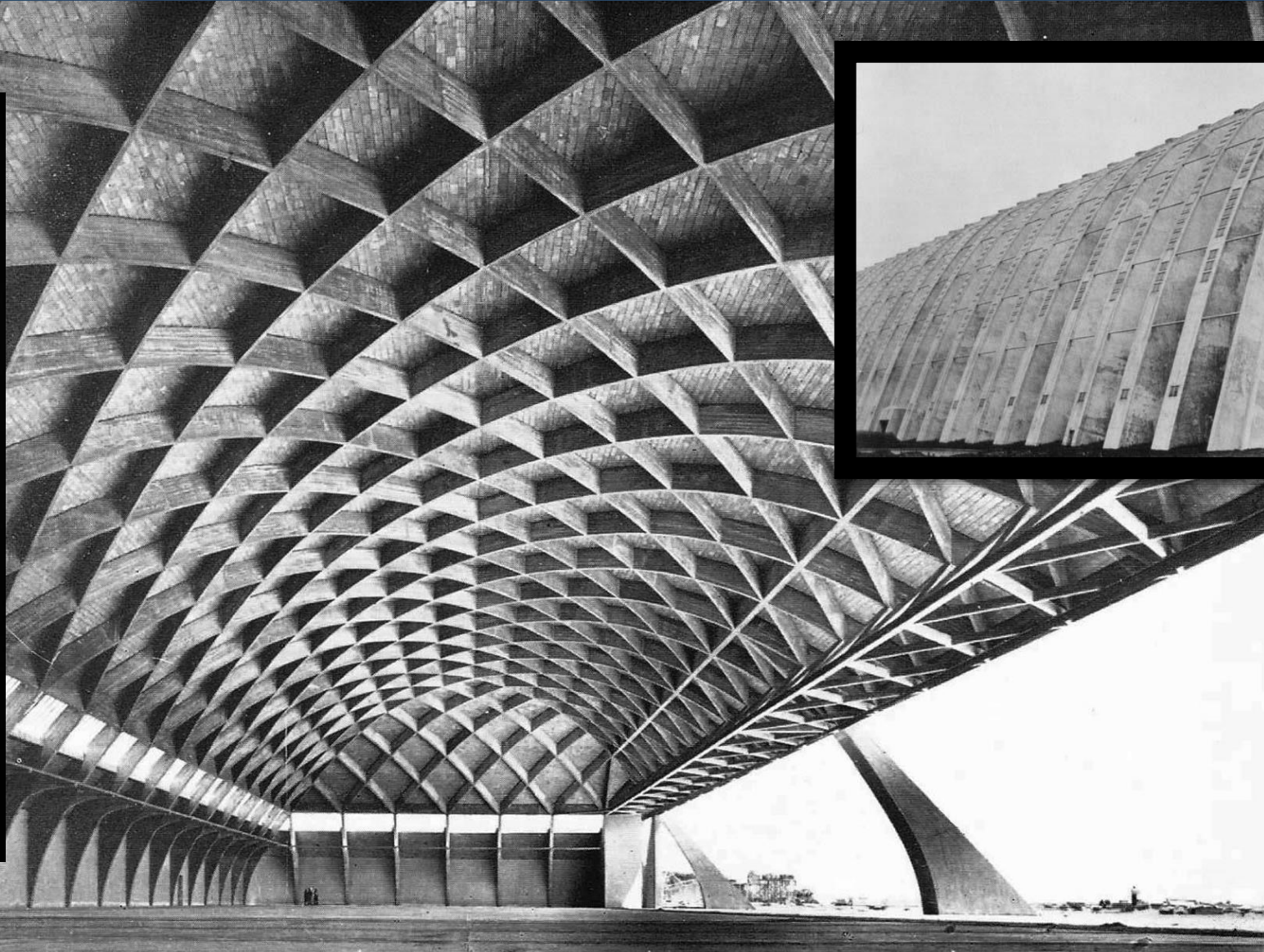


Form as a Diagram of Structural Forces

AIR FORCE HANGARS
ORVIETO, ITALY
PIER LUIGI NERVI
1935

THE STRUCTURE CONSISTS
OF A SERIES OF RIBBED
VAULTS, MAKING STRONG,
LIGHTWEIGHT SHELLS.

DRAWBACKS: ALL NEEDED
TO BE POURED AT ONCE
TO ASSURE MONOLITHIC
STRUCTURE, AND NEEDED
STEEL REINFORCEMENT,
AND BUTTRESSING AT
NEARLY ALL SIDES.



Small Pieces for Massive Spans

TURIN EXHIBITION HALL
TURIN, ITALY
PIER LUIGI NERVI
1948

REMARKABLE SPAN WIDTHS
THROUGH A SERIES OF
SMALL, PREFABRICATED
FERRO-CEMENT CONCRETE
ELEMENTS.

THE ABUTMENTS WERE
CAST IN SITU [IN
PLACE]. WINDOWS ARE
ARRANGED IN THE
CORRUGATIONS OF THE
STRUCTURAL ARCHES.



A Simple, Elegant Curvature

BACARDI RUM FACTORY
CARRETERA, MEXICO
FELIX CANDELA
1959-60

THIN SHELL CONCRETE
VAULTS, STIFFENED AT
THE GROINS AND EDGES
CREATE THIS FORM.

HYPERBOLIC PARABOLOID
GEOMETRY USED HERE WAS
FOUND IN MANY OF FELIX
CANDELA'S WORKS.



THREE VAULTS WERE
FIRST BUILT IN
1960, AND EXPANDED
TO SIX IN 1971.



“Economy, Efficiency, Discipline, & Order”

MYRON GOLDSMITH, FROM HIS 1987 MONOGRAPH

UNITED AIRLINES HANGAR
SAN FRANCISCO, CALIFORNIA
MYRON GOLDSMITH (S.O.M.) 1958
A FLEXIBLE FRAMEWORK OF WELDED STEEL
BEAMS, OFFERING MAXIMUM EXPANSION.

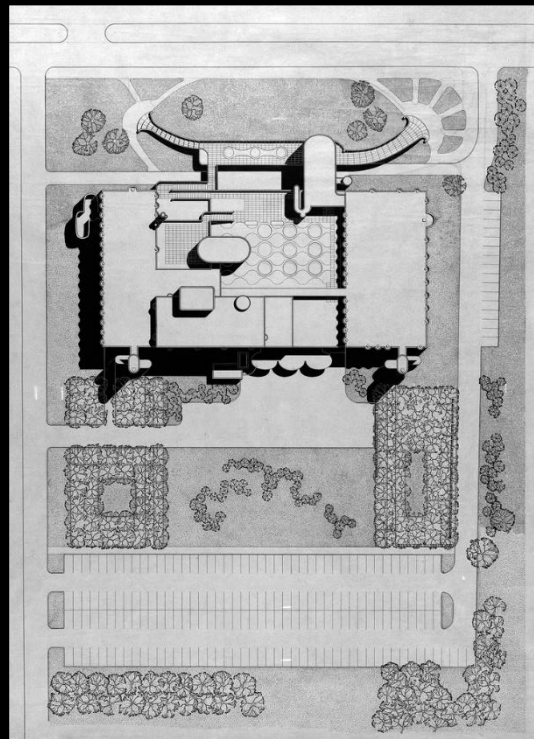


Heavy and Ponderous Buildings

ENDO LABS
NEW YORK CITY
PAUL RUDOLPH
1964

STRUCTURE FOR SOME
BUILDINGS OF THIS
ERA WAS SECONDARY,
AND VOLUMETRIC FORMS
TOOK PRECEDENCE.

THIS WAS THE CASE
WITH **BRUTALISM**, A
HIGHLY EXPRESSIVE,
SCULPTURAL STYLE
POPULAR IN THE
1950S AND 60S.



Freedom within a Module



RELIANCE CONTROLS FACTORY
SWINDON, UNITED KINGDOM
NORMAN FOSTER AND RICHARD ROGERS
1967

ASSEMBLY AND PRODUCTION PROCESSES FOR
ELECTRONICS DEMANDED POTENTIAL
EXPANSION AND CHANGEABILITY TO THE
BUILDING PLAN. A STRONG GRID SYSTEM
DEFINES THE GEOMETRIC FRAME FOR
FLEXIBLE COMPONENTS.



Economic Efficiency meets Flexibility

LEMA FACTORY
GIUSSANO, ITALY
ANGELO MANGIAROTTI
1990

PRINCIPLES ADOPTED IN
THE 1960S OF SITE
ASSEMBLIES OF "KITS OF
PARTS" ARE STILL
UTILIZED HERE.



Present and Future Facilities



Maintenance: A Grand Hall with Workshops



Architekturführer Köln
100 Jahre Architektur und Moderne
Recher und Quartiere

Herausgeber
Dietrich Schell
Ulrich Winkler
Tobias Grell

Verlag
der Buchhandlung
Wulfher Köling

KOLN

WERKSTATTGEBÄUDE GROSSKLÄRWERK KÖLN STAMMHEIM
KÖLN, GERMANY WOLFGANG FELDER 1999

LARGE VOLUME PUMPS REQUIRED TALL SPACES, AND VARIOUS PIECES OF EQUIPMENT REQUIRED SEPARATION. SO THE DESIGN IS EXPRESSED WITH IMMENSE CLARITY AND SIMPLICITY: A COMPREHENSIVELY ARRANGED PLAN, WITH A TWO-STORY HALL MADE OF CONCRETE, WITH ATTACHED STEEL AND GLASS WORKSHOPS. THE HALL IS PROVIDED WITH CLERESTORIES, AND EACH WORKSHOP HAS NATURAL LIGHT AND VIEW.

Production: A Gallery for Assembly



ZAHNER METAL FABRICATOR FACTORY EXPANSION
KANSAS CITY, MISSOURI
CRAWFORD ARCHITECTS 2011

THE LARGE, COLUMN-FREE SPACE NEEDED OPEN VOLUME FOR TWO CRANES TO MOVE MATERIALS, AND A SEAMLESS CONNECTION TO EXISTING FACTORY CIRCULATION. THE EXTERIOR SHOWCASES ZAHNER'S METALS EXPERTISE.

Training the Trades



CENTRE FOR TRADES EDUCATION & INNOVATION
CAMOSUN COLLEGE, VICTORIA, B.C.
B+H ARCHITECTS 2016

THIS NEW PROJECT FEATURES TRAINING FOR
TRADES AND TECHNOLOGIES, AND SHOWCASES
MATERIALS ASSEMBLY THROUGHOUT, WITH A
CENTRAL ATRIUM AND STUDENT COMMONS CENTER
TO SERVE COMBINED TRADES ACTIVITIES.

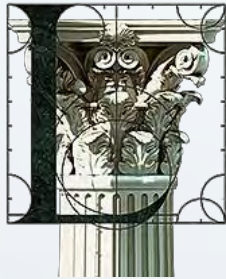


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REPORT
MADE FOR:



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